OS-299 (8-72)

TRANSMITTAL LETTER

Pub. 72, Change #1 to December 1981 Edition

DATE June 1982

ECT:

REVISIONS TO STANDARDS FOR ROADWAY CONSTRUCTION, RC-0-100
CHANGE #1 TO DECEMBER 1981 EDITION

INFORMATION AND SPECIAL INSTRUCTIONS:

The attached revisions and additions should be inserted into your Standards:

SHEET	CHANGE DESCRIPTION
Index Sheet	Revised to include new dates and drawings.
RC-12 (1 of 1)	- Added details for typical cross sections for concrete and metal cribbing; added numerical values to each note and added Note 3 for cribbing backfill.
RC-23 (1 of 2)	- Width of bridge approach slab modified to 25'-0" minimum, either side.
(2 of 2)	- Changed dates and titles.
RC-25 (1 of 3)	- Eliminated note concerning shoulder rounding on Interstate and Other Freeways and Arterials.
(2 of 3)	- Changed dates and titles.
(3 of 3)	- Added details for rumble corrugations. Changed to skewed shoulder joints adjacent to R.C.C. and PL.C.C. pavement. Made partial title change of detail from "PL.C.C. PAVEMENT FOR COLLECTORS & LOCAL HIGHWAYS" to "PLAIN CEMENT CONCRETE PAVEMENT".
RC-26 (1 of 3)	- Changed dates and titles.
(2 of 3)	- Changed dates and titles.
(3 of 3)	- Removed detail for Concrete Joint Spall Repair. Detail replaced by criteria in Circular Letter C-2873-10.
RC-27 (1 of 2)	- Changed title of detail from "PAVEMENT FOR CLASS 3, 4 AND 5 HIGHWAYS" to "ROADWAYS".
(2 of 2)	- Changed dates and titles.
RC-30 (1 of 1)	- Removed detail for placement of combination storm sewer and underdrain in swale and revised detail for placement at curb section.
RC-32 (1 of 1)	- Added details for pipe extension utilizing a concrete collar.
RC-39 (1 of 2)	- Revised dimension for inside diameter of manhole top section.
(2 of 2)	- Revised dimension for inside diameter of modified manhole top section and changed tolerance on structural steel cover and frame. Also revised diameter of cast iron and structural steel cover.

SHEET	CHANGE DESCRIPTION
RC-57 (1 of 5)	Redrawn. Permanent barrier details are provided; terminology was changed from "with" or "without joint continuity" to cast-in-place, slip-form and precast construction; criteria added for use of delineation devices, a 20:1 sloped end transition and impact attenuators.
(2 of 5)	Redrawn. Details are provided for slotted plate and tongue-and-groove barrier connection systems, for typical reinforcement and for ideal barrier orientation on superelevated sections.
(3 of 5)	New sheet. Temporary barrier details are provided which include typical barrier connection systems, reinforcement and delineation requirements and placement of drainage slots.
(4 of 5)	New sheet. Details are provided for typical end transition, reinforcement and minimum flare treatment. Criteria provided for use of impact attenuators.
(5 of 5)	New sheet. Details are provided for typical barrier treatment at piers, transition details and inlet placement.

It is desired that the new revisions to these Standards be incorporated immediately in the preparation of plans. All projects let after August 5, 1982 shall contain these revised drawings. No additional compensation will be allowed for the work involved to conform to these Standards.

The Standard Drawings voided by issuance of this change should be maintained for reference on those projects now under construction.

CANCEL THE FOLLOWING:

SHEET	DATE
Index Sheet	------
RC-12 (1 of 1)	June 1, 1976
RC-23 (1 of 2)	July 16, 1980
(2 of 2)	July 16, 1980
RC-25 (1 of 3)	Sept. 8, 1981
(2 of 3)	Sept. 8, 1981
(3 of 3)	Sept. 8, 1981
RC-26 (1 of 3)	Sept. 8, 1981
(2 of 3)	Sept. 8, 1981
(3 of 3)	Sept. 8, 1981
RC-27 (1 of 2)	May 31, 1979
(2 of 2)	May 31, 1979
RC-30 (1 of 1)	May 1, 1978
RC-32 (1 of 1)	Nov. 15, 1977
RC-39 (1 of 2)	Jan. 31, 1977
(2 of 2)	Jan. 31, 1977
RC-57 (1 of 2)	May 31, 1979
(2 of 2)	May 31, 1979

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APPROVED FOR ISSUANCE BY:
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Secretary of
Transportation

BY: David C. Sims

David C. Sims, P. E.
Deputy Secretary for
Highway Administration

BS-299 (8-72)
CC-0830-3500-0030

TRANSMITTAL LETTER

Pub. 72 - 1981 Edition

DATE 15 December 1981

SUBJECT:

STANDARDS FOR ROADWAY CONSTRUCTION RC 0-100

INFORMATION AND SPECIAL INSTRUCTIONS:

This is a 1981 printing of the Roadway Construction Standard Drawings. This printing includes all previous changes of the 1977 Edition and the changes and revisions described below:

SHEET	CHANGE DESCRIPTION
Index Sheet	- Revised to include new dates and titles.
RC-11 (1 of 2)	- Changed dates and titles.
(2 of 2)	- Changed class of excavation on the Section B-B detail, as per C-408/76-135. Changed dates and titles.
RC-13 (1 of 1)	- Removed pay limits for subgrade from all sketches, as per C-408/76-155. Drawing title was changed accordingly. Changed dates and titles.
RC-20 (1 of 2)	- Changed references in notes to Materials & Testing Division, Bureau of Contract Quality Control. Removed references to Doweled R.C.C. Pavement and Ramps, in the Type D and Type R joint details, respectively. Added notes 11 and 12 to provide additional information, regarding the saw cutting operation. Modified Detail A to accept a $1\frac{1}{4}$" Neoprene Compression Seal, instead of a 1" seal. Changed dates and titles.
(2 of 2)	- Changed dates and titles.
RC-24 (1 of 1)	- Corrected reference to Section 610, Form 408, in Note 3, to Section 612. Changed dates and titles.
RC-25 (1 of 3)	- Revised "shoulder rounding on high side of superelevation" detail to show proper effective shoulder width. Added measurements to shoulder surface treatment depths. Removed line stripe information from Note 5. Changed dates and titles.
(2 of 3)	- Measurements were added to the shoulder surface treatment depths. Clarified detail for Types 6, 6-F and 6-S shoulders to conform to the construction requirements in C-408/76-121. Changed dates and titles.
(3 of 3)	- Changed dates and titles.
RC-26 (1 of 3)	- Changed dates and titles.
(2 of 3)	- Added Note 13 regarding sealant reservoir. Revised note on reinforcement to specify size of welded wire fabric. Changed dates and titles.
(3 of 3)	- Changed dates and titles.
RC-34 (1 of 6)	- Changed dates and titles.
(2 of 6)	- Added dimensions to section drawings for Types C and S inlets to show minimum depths. Changed reference to the Materials & Testing Division, Bureau of Contract Quality Control in the notes. Removed note concerning lightweight grates. Changed dates and titles.
(3 of 6)	- Reference in notes changed to Materials & Testing Division, Bureau of Contract Quality Control. Completely revised design of the structural steel grate to show transverse instead of diagonal bars. Added a detail for a Bicycle-Safe grate. Changed dates and titles.
(4 of 6)	- Reversed details T-2 and T-3 for proper alignment. Changed references in notes to Materials & Testing Division, Bureau of Contract Quality Control. Revised Note 2 regarding welding fabrication requirements. Changed dates and titles.

SHEET	CHANGE DESCRIPTION
RC-34 (5 of 6)	- Changed reference in notes to Materials & Testing Division, Bureau of Contract Quality Control. Changed dates and titles.
(6 of 6)	- Changed dates and titles.
RC-52 (1 of 6)	- Changed dates and titles.
(2 of 6)	- Changed dates and titles.
(3 of 6)	- Added BCT Terminal Section with a diaphragmmed end section. Changed Post Bolt and Splice Bolt dimensions to be consistent with AASHTO Specification M180-78. Changed dates and titles.
(4 of 6)	- Moved BCT Terminal Section detail to sheet 3 of 6. Added bolt and nut detail to Anchor Plate Assembly. Changed welded wire fabric specifications to conform to new Concrete Reinforcing Steel Institute designations. Changed dates and titles.
(5 of 6)	- Added steel diaphragm assembly to detail B for BCT terminal section drawing. Changed dates and titles.
(6 of 6)	- Changed dates and titles.

Please note that metric dimensions have been excluded from some drawings where space is limited. Since providing alternate metric dimensioning serves only to clutter up most drawings, metric dimensions will not be provided on future revisions when complete drawing modifications are involved. To obtain the metric conversion to the English measurement provided, refer to the current AASHTO and ASTM Material Standards, "Standard Metric Practice Guide",AASHTO Designation R-1 (ASTM E-380), which uses the International System of Units (SI), as required by Federal law.

It is desired that the new revisions to these Standards be incorporated immediately in the preparation of plans. All projects let after December 1, 1981 shall contain these revised drawings. No additional compensation will be allowed to the work involved to conform to these Standards.

The Standard Drawings voided by issuance of this new edition should be maintained for possible reference on those projects now under construction.

CANCEL AND DESTROY THE FOLLOWING:

Pub. 72, March 1977 Edition and Changes 1 thru 5.

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APPROVED FOR ISSUANCE BY:

David C. Sims

David C. Sims, P. E.
Deputy Secretary for
Highway Administration

INDEX OF STANDARDS FOR ROADWAY CONSTRUCTION

STANDARD DRAWING NO.	DATE	DESCRIPTION
EARTHWORK		
RC-10	Nov. 15, 1977	CLASSIFICATION OF EARTHWORK
RC-11 (2 Sheets)	Sept. 8, 1981	CLASSIFICATION OF EARTHWORK FOR STRUCTURES
* RC-12	May 6, 1982	BACKFILL AT STRUCTURES
RC-13	Sept. 8, 1981	PAY LIMIT OF SUBBASE
PAVEMENTS		
RC-20 (2 Sheets)	Sept. 8, 1981	PAVEMENT JOINTS
RC-21	May 31, 1979	REINF. FOR R.C.C. PAV'T.
RC-22 (4 Sheets)	May 31, 1979	CONTINUOUSLY REINF. CONC. PAV'T.
* RC-23 (2 Sheets)	May 6, 1982	BRIDGE APPROACH SLAB
RC-24	Sept. 8, 1981	PAVEMENT RELIEF JOINT
* RC-25 (3 Sheets)	May 6, 1982	SHOULDERS
* RC-26 (3 Sheets)	May 6, 1982	CONCRETE PAVEMENT MAINTENANCE
* RC-27 (2 Sheets)	May 6, 1982	PLAIN CEMENT CONCRETE PAVEMENT
DRAINAGE		
* RC-30	May 6, 1982	SUB SURFACE DRAINS
RC-31	May 31, 1979	ENDWALLS
* RC-32	May 6, 1982	SLOPE PIPE FITTINGS & CONNECTORS
RC-33	Nov. 15, 1977	END SECTIONS FOR PIPE CULVERTS
RC-34 (6 Sheets)	Sept. 8, 1981	INLETS
RC-35	Jan. 31, 1977	DRAINAGE DIKE
* RC-39 (2 Sheets)	May 6, 1982	STANDARD MANHOLES
RC-40	Nov. 15, 1977	SLOPE PROTECTION
RC-41	May 31, 1979	SPECIAL MORTARED STONE SLOPE WALL
RC-42	June 1, 1976	REINF. CEM. CONC. SLOPE WALL
RC-43	May 31, 1979	GABIONS

STANDARD DRAWING NO.	DATE	DESCRIPTION
GUARD RAIL & MEDIAN BARRIER		
RC-50	May 1, 1978	GUARD RAIL TRANSITION AT END OF STRUCTURES
RC-51 (3 Sheets)	May 1, 1978	TYPE 1 WEAK POST GUARD RAIL
RC-52 (6 Sheets)	Sept. 8, 1981	TYPE 2 STRONG POST GUARD RAIL
RC-53 (2 Sheets)	May 1, 1978	TYPE 2 WEAK POST GUARD RAIL
RC-54 (3 Sheets)	May 1, 1978	GUARD RAIL & MEDIAN BARRIER PLACEMENT
RC-55	May 1, 1978	TYPE 2 WEAK POST MEDIAN BARRIER
RC-56	May 1, 1978	TYPE 3 WEAK POST MEDIAN BARRIER
* RC-57 (5 Sheets)	May 6, 1982	CONCRETE MEDIAN BARRIER
FENCES & CURBS		
RC-60 (2 Sheets)	Sept. 1, 1978	RIGHT-OF-WAY FENCE
RC-61	Jan. 31, 1977	R/W GATE & REMOVABLE FENCE SECTIONS
RC-62	Jan. 6, 1975	ROADSIDE FENCE
RC-63 (2 Sheets)	Sept. 1, 1978	PERMANENT BARRICADES
RC-64	Sept. 1, 1978	CURBS & GUTTERS
RC-65	Sept. 1, 1978	CONCRETE MOUNTABLE CURBS
RC-66	May 31, 1979	CONCRETE TRAFFIC SEPARATOR
POLLUTION CONTROL		
RC-70 (4 Sheets)	Sept. 1, 1978	EROSION & SEDIMENT CONTROL
HIGHWAY LIGHTING		
RC-80 (2 Sheets)	July 16, 1980	HIGHWAY LIGHTING - FOUNDATIONS
RC-81	July 16, 1980	HIGHWAY LIGHTING - JCT. BOXES - LT. DUTY
RC-82	July 16, 1980	HIGHWAY LIGHTING - JCT. BOXES - HVY. DUTY
RC-83 (2 Sheets)	July 16, 1980	HIGHWAY LIGHTING - LIGHTING POLE DETAILS
RC-84	July 16, 1980	HIGHWAY LIGHTING - LIGHTING & ELECTRIC DETAILS
ROADSIDE DEVELOPMENT & PLANTING		
RC-90	Nov. 15, 1977	TREE WALLS & MISC. DETAILS FOR ROADSIDE REST AREAS
RC-91	June 1, 1976	BRACING & PLANTING DETAILS

* Change #1 to December 1981 Edition
Effective August 5, 1982

VOIDED BY CHANGE #1

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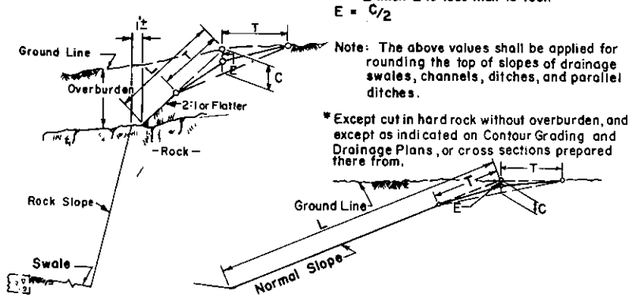
TRACED BY
FINAL BY

L = Length of slope.
* T = 10 feet where L is 10 feet or more.
* T = L when L is less than 10 feet.
E = C/2

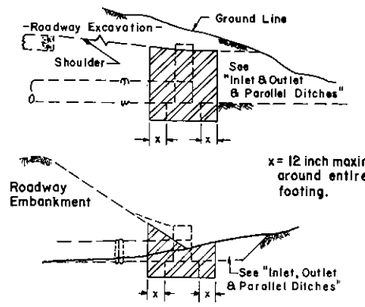
Note: The above values shall be applied for rounding the top of slopes of drainage swales, channels, ditches, and parallel ditches.

* Except cut in hard rock without overburden, and except as indicated on Contour Grading and Drainage Plans, or cross sections prepared there from.



-ROCK CUTS- -NORMAL CUTS-

ROUNDING OF CUT SLOPES

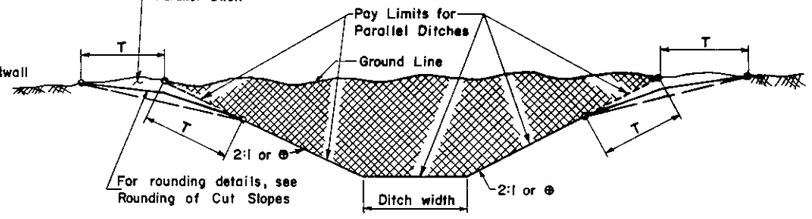


x = 12 inch maximum around entire endwall footing.

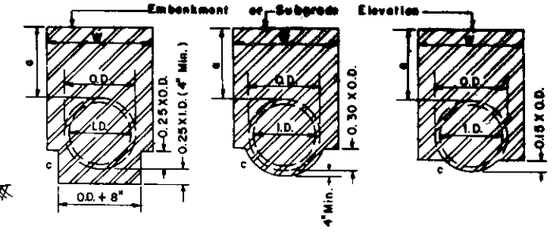
EXCAVATION FOR ENDWALLS

Slope ⊕ As indicated on the construction cross-sections.
Classification is shown for ditch bottom widths of less than 8 feet.
When ditch width is 8 feet or more, all excavation is Class I.

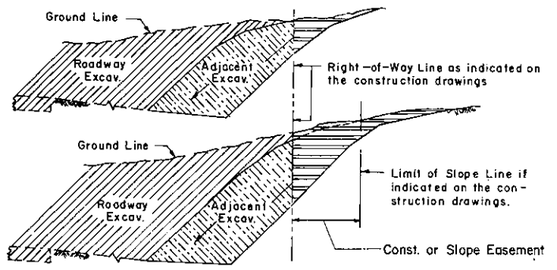
The payment for this area of excavation will be considered incidental to the excavation of the Parallel Ditch



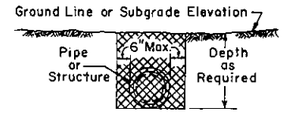
INLET AND OUTLET DITCHES



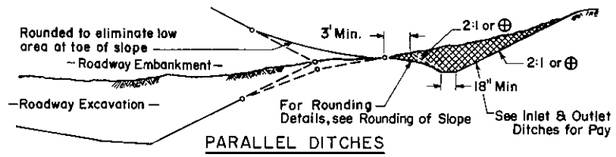
-CLASS A- -CLASS B- -CLASS C-



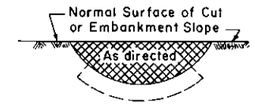
EXCAVATION ADJACENT TO ROADWAY IN LIEU OF COMMON BORROW EXCAVATION



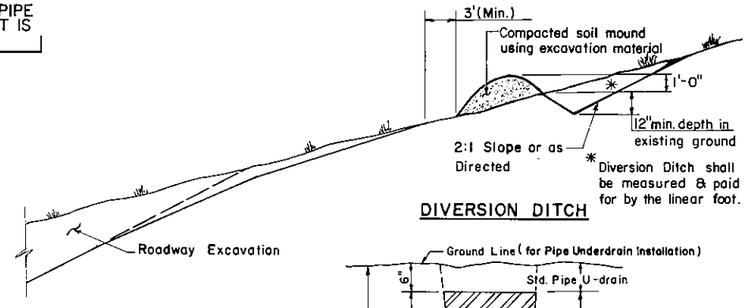
EXCAVATION FOR REMOVAL OF EXISTING PIPE OR STRUCTURE WHERE NO REPLACEMENT IS REQUIRED



PARALLEL DITCHES

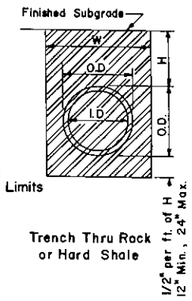


SPILLWAYS

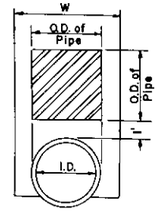


Diversion Ditch shall be measured & paid for by the linear foot.

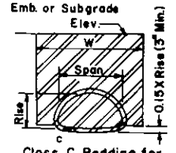
DIVERSION DITCH



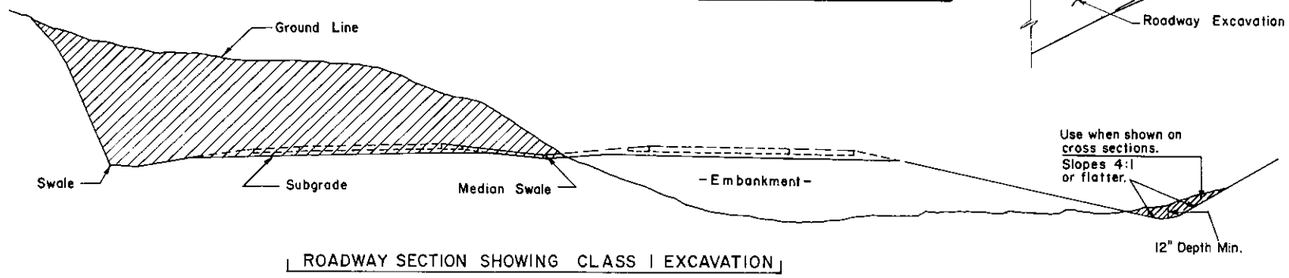
Trench Thru Rock or Hard Shale



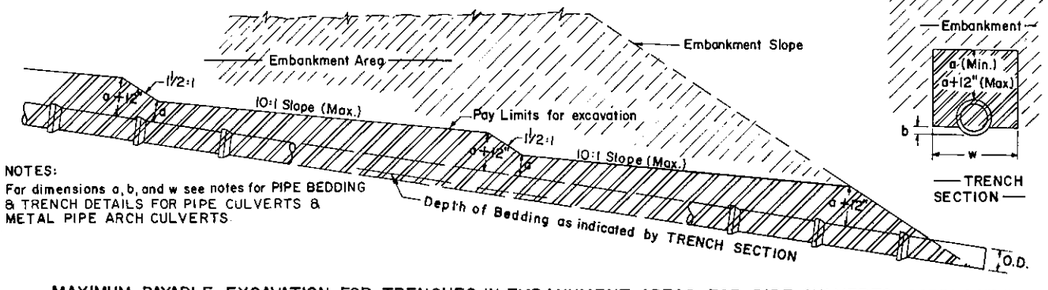
Imperfect Trench



Class C Bedding for Pipe Arch



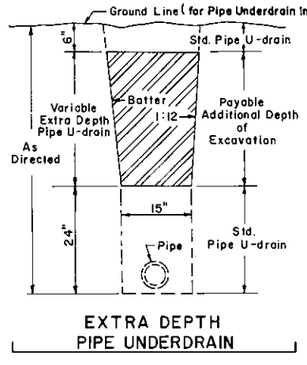
ROADWAY SECTION SHOWING CLASS I EXCAVATION



NOTES:
For dimensions a, b, and w see notes for PIPE BEDDING & TRENCH DETAILS FOR PIPE CULVERTS & METAL PIPE ARCH CULVERTS

MAXIMUM PAYABLE EXCAVATION FOR TRENCHES IN EMBANKMENT AREAS FOR PIPE CULVERTS, CORRUGATED METAL PIPE ARCH CULVERTS, METAL PLATE PIPE CULVERTS & METAL PLATE PIPE ARCH CULVERTS

(For pipes with an inside diameter of less than 8 feet)



EXTRA DEPTH PIPE UNDERDRAIN

I. D. – Nominal inside diameter of pipe.
O.D. – Out side diameter of pipe barrel or shell.
H.D. (Hub Diameter) – Outside diameter of pipe at bell or band.

* W – 2.0 ft. + H.D. for pipes or pipe arches not exceeding 48" I.D. or Span, resp.
2.5 ft. + H.D. for pipes or pipe arches exceeding 48" I.D. or Span, resp.

A tolerance of one foot on each side of the trench will be allowed in excess of the specified trench width. All excavation in excess of the specified trench widths and the additional backfill material required shall be at the contractors expense.

a. 4 ft. minimum, where practicable, in embankment areas
b. Varies in conformance with class of bedding applicable to pipe installation. (See RC-30 for bedding treatment)
c. When the material encountered is unstable, it shall be entirely removed under the pipe for the full width of the trench or as otherwise required for the particular condition.
H. Height of fill over top of pipe.
* The trench width for Combination Storm Sewer and Underdrain shall have a specified width of 1.0 ft. plus H.D. as shown on RC-30

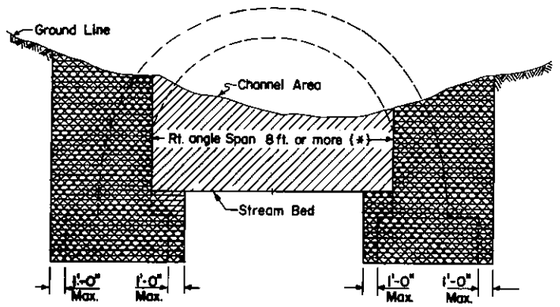
EXCAVATION FOR PIPE BEDDING & TRENCH DETAILS FOR PIPE CULVERTS & METAL PIPE ARCH CULVERTS

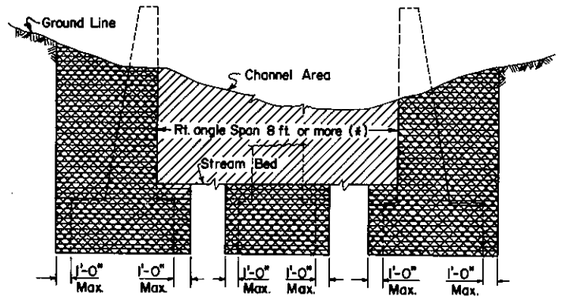
CLASS 1 EXCAV.
CLASS 2 EXCAV.
CLASS 4 EXCAV.
COMMON BORROW EXCAV.
EITHER CLASS 1 or COMMON BORROW EXCAV.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

CLASSIFICATION OF EARTHWORK

Recommended Nov. 15, 1977	Approved Nov. 15, 1977	Sht. 1 Of 1
Director, Bureau of Design	Deputy Chief Hwy. Engr.	RC-10

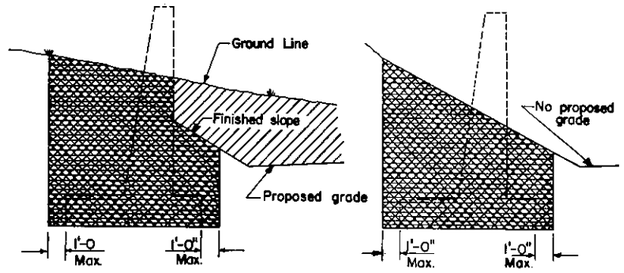




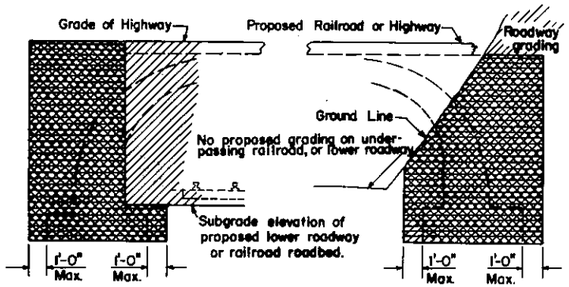
STRUCTURES OVER STREAMS

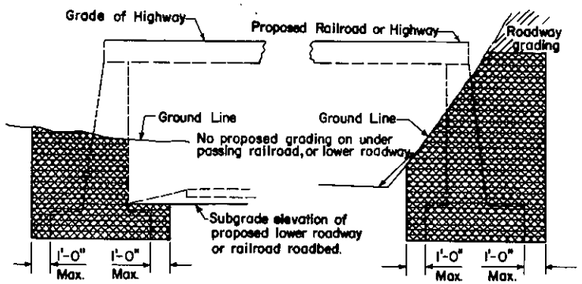
INCLUDING METAL PLATE ARCH WITH FOOTING

When right angle span is less than 8' all excavation is Class 3.

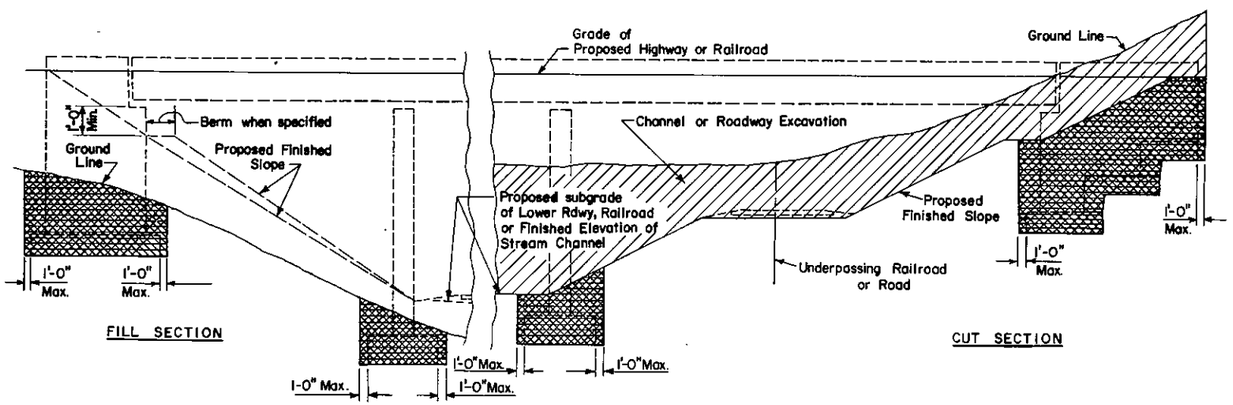


WING WALLS & RETAINING WALLS

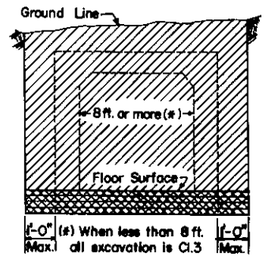




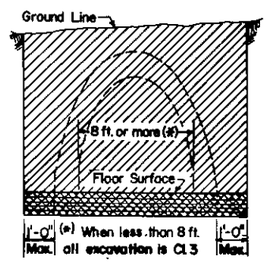
GRADE SEPARATION STRUCTURES



TYPICAL STRUCTURE ELEVATION



R.C. BOX CULVERTS



R.C. TIED ARCH CULVERTS

CLASS 1 EXCAV. →

ROADWAY ITEM
(To be included in Roadway quantities)

CLASS 3 EXCAV. →

STRUCTURE ITEM
(To be included in Structure quantities)

NOTE: Special situations involving excavation not entirely covered by this drawing must be defined on the design drawing by sketches and/or described in the Special Provisions.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

CLASSIFICATION OF EARTHWORK FOR STRUCTURES

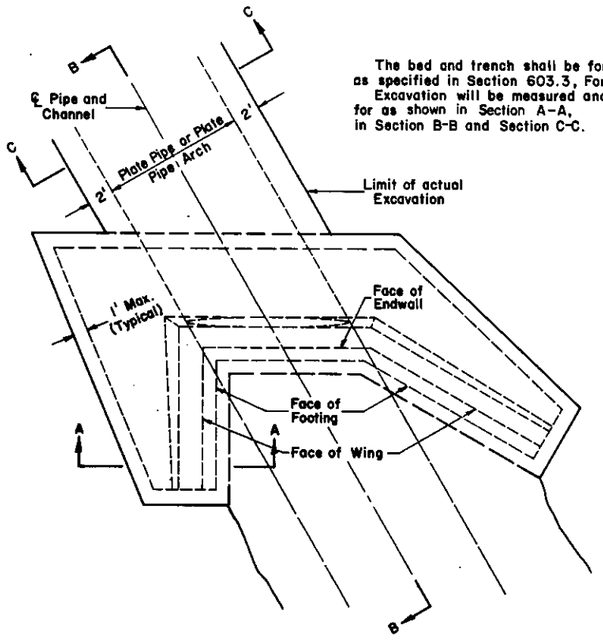
Recommended Sept. 8, 1961
B.D. Rumble
Dir. Bureau of Highway Design

Approved Sept. 8 1961
Alfred D. Tyson
Chief Highway Engineer

Sht. 1 Of 2

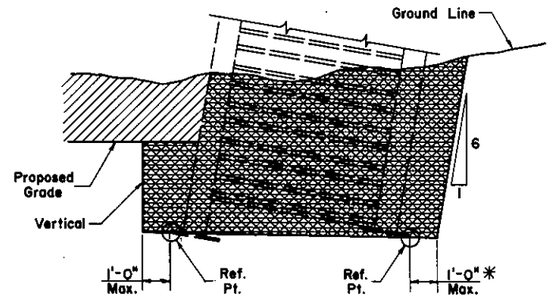
RC-11

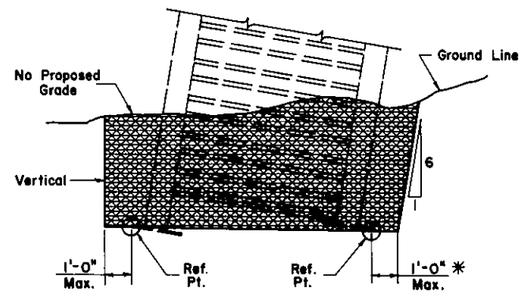
TRACED BY
FINAL BY



PLAN

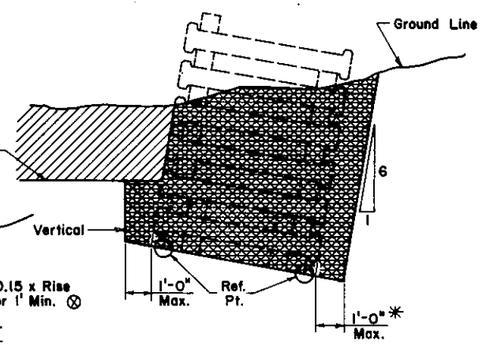
The bed and trench shall be formed as specified in Section 603.3, Form 408. Excavation will be measured and paid for as shown in Section A-A, in Section B-B and Section C-C.

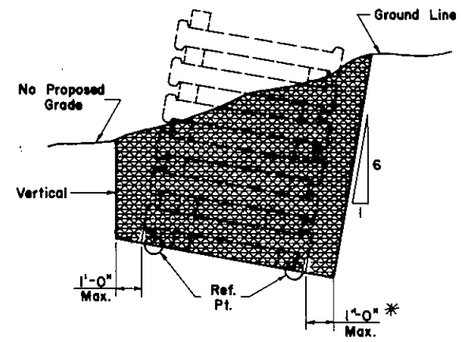




METAL CRIBBING

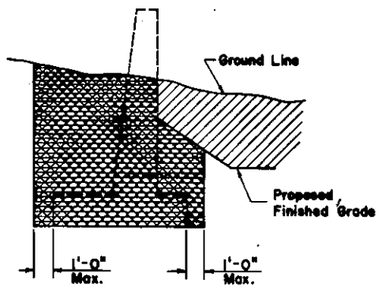
* 1'-6" Max. when a Structure Foundation Drain is required.
Additional Excavation required beyond paylimits for placement of No. 2A course aggregate is incidental to metal cribbing.



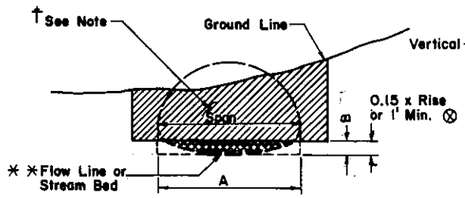


CONCRETE CRIBBING

* 1'-6" Max. when a Structure Foundation Drain is required.

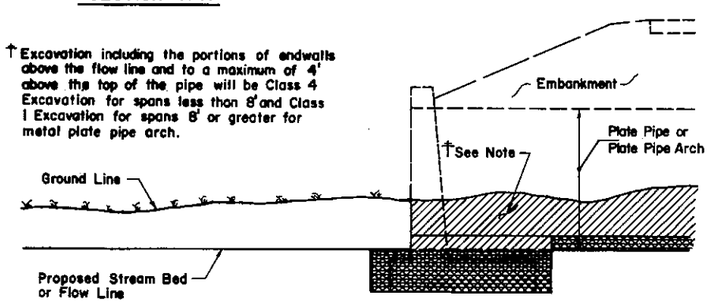


SECTION A-A



SECTION C-C

† Excavation including the portions of endwalls above the flow line and to a maximum of 4' above the top of the pipe will be Class 4 Excavation for spans less than 8' and Class 1 Excavation for spans 8' or greater for metal plate pipe arch.



SECTION B-B

⊗ For Metal Plate Pipe-Arch with spans 8' or greater the excavation between the Flow Line and the lower limit of Cl.1 Excav. shall conform to the area shown with the Cl. 3 Excav. symbol. The Cl.3 Excav. quantity shall be measured & paid for to the rectangular limits shown as A and B in Section C-C.

* * When deemed necessary to excavate below the bottom of the flow line, all excavation within the limits of the bottom of the excavated trench and the top of the existing ground will be paid for as CL.1 Excavation for spans greater than 8' and as CL.4 Excavation for spans 8' and less. The backfill material for the undercut area shall be placed and shaped to conform to the bottom of the culvert, all of which will be considered incidental to the class of Excavation specified.

CLASS 1 or 4 EXCAV.

ROADWAY ITEMS
(To be included in Roadway quantities)

CLASS 3 EXCAV.

STRUCTURE ITEMS
(To be included in Structure quantities)

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

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

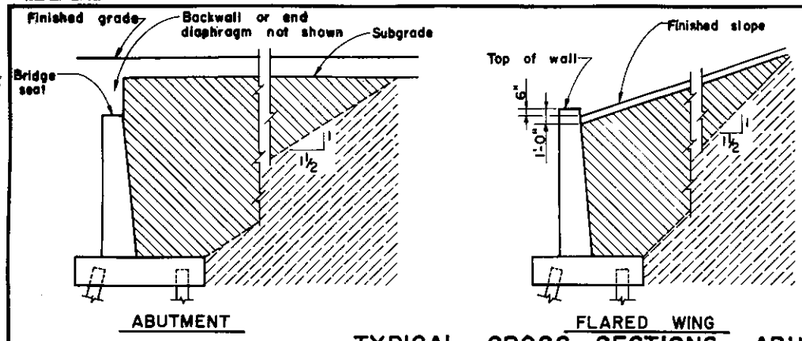
CLASSIFICATION OF EARTHWORK FOR STRUCTURES

Recommended Sept. 8, 1981
B. D. Pumphrey
Dir. Bureau of Highway Design

Approved Sept. 8, 1981
Alfred D. Glynn
Chief Highway Engineer

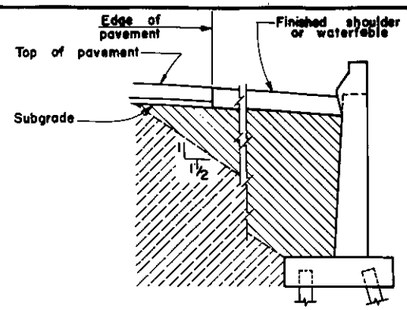
Sht. 2 Of 2
RC-11

TRACED BY
FINAL BY



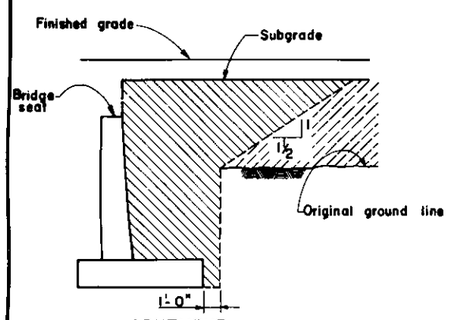
ABUTMENT

FLARED WING



U WING

TYPICAL CROSS SECTIONS - ABUTMENTS ON FILL



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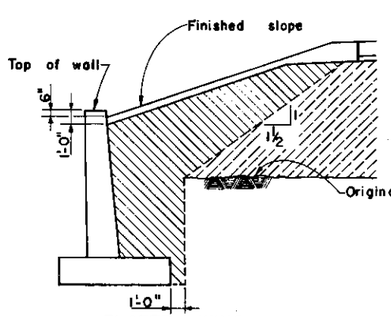

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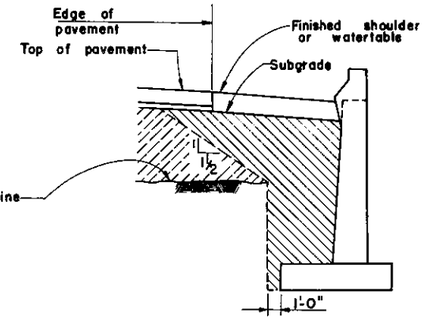
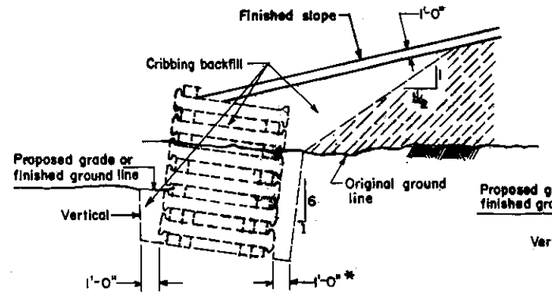
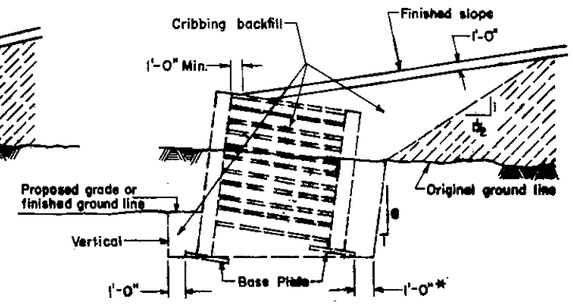


U WING

TYPICAL CROSS SECTIONS - ABUTMENTS IN CUT



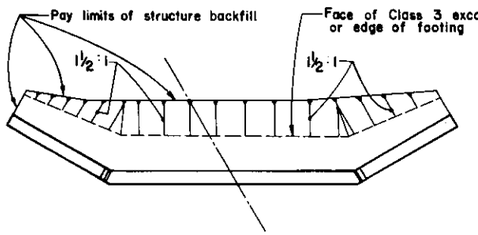
CONCRETE CRIBBING



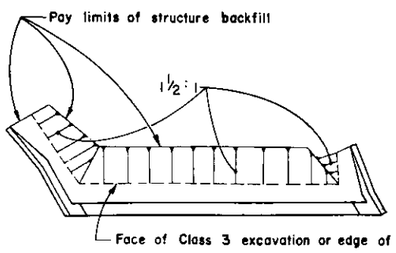
METAL CRIBBING

* 1'-6" When a structure foundation is required.

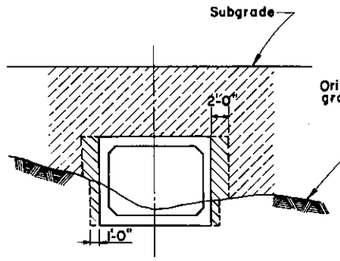
TYPICAL CROSS SECTIONS - CRIBBING



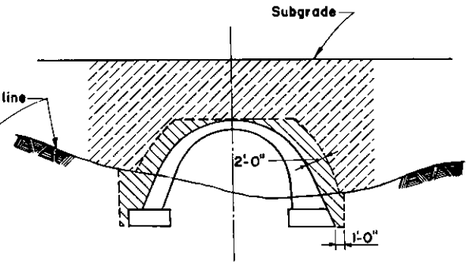
PLAN - ABUTMENT WITH FLARED WINGS



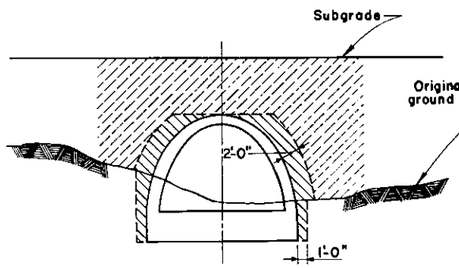
PLAN - ABUTMENT WITH U WINGS



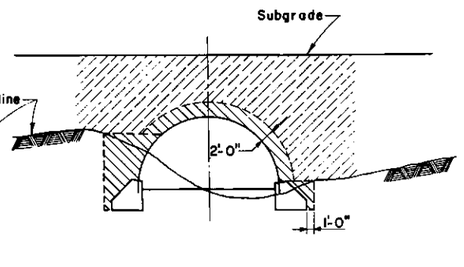
R. C. BOX CULVERT



R. C. ARCH CULVERT



R. C. TIED ARCH CULVERT



METAL PL. ARCH CULVERT

BACKFILL & EMBANKMENT CONSTRUCTION AT STRUCTURES

LEGEND

Structure Backfill

Embankment Material

NOTES

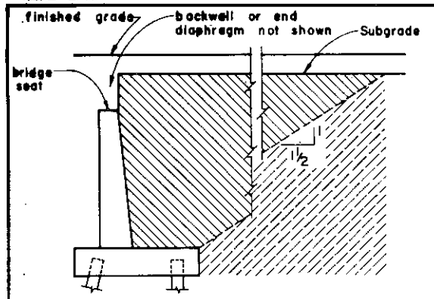
1. Backfill and embankment shall be placed in accordance with this Standard Drawing unless otherwise shown on the structure drawings.
2. Structure backfill shall consist of material meeting the requirements of Section 350.2 of Form 408. Rock which can be placed and compacted in layers of 12 inches or less may be used. However, rock shall not be permitted for structure backfill at metal plate arches. Any shale, regardless of whether it is classified as rock or not, shall not be permitted in structure backfill. Steel Slag shall not be permitted as structure backfill. Structure backfill will be measured and paid for as Selected Borrow Excavation- Structure Backfill.
3. Backfill the space behind cribbing and the interior of bins with rock, not to exceed 8" inches in greatest dimension, rock spalls or stone backfill meeting the requirement of Section 613, Form 408, obtained from available excavation, which shall be thoroughly compacted in layers having a maximum depth of 12 inches.
4. Backfill limits at retaining walls and wingwalls for culverts shall be treated the same as flared abutment wingwalls.
5. Backfill construction at R.C. Box Culverts with the top slab at roadway grade shall be treated the same as abutments.
6. Backfill construction at curverts where the top of the culvert is near subgrade shall be considered as a special case and shall be treated as shown on the structure drawings or as directed by the engineer.
7. Structure backfill and adjoining embankment shall be placed simultaneously unless otherwise permitted by the engineer.
8. Material removed beyond the specified limits of Class 1, 2, or 3 excavation shall be replaced with Structure Backfill and no payment will be made for material removed or for structure backfill placed beyond the specified limits of Class 1, 2, or 3 excavation.
9. Drainage details are not shown. See structural drawings for drainage, weep holes, etc.
10. Structure backfill quantities are shown on the structure drawings.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

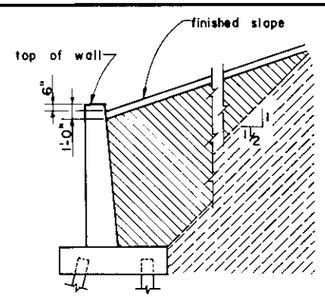
BACKFILL AT STRUCTURES

Recommended May 6, 1982 — Chief, Highway Design	Recommended May 6, 1982 — Chief Highway Engineer	Sht. 1 Of 1
		RC-12

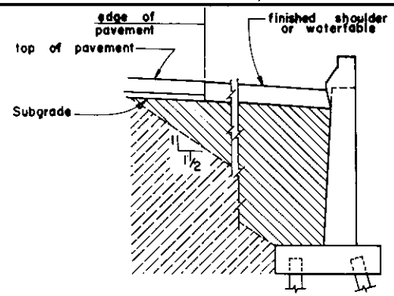
VOIDED BY CHANGE #1



ABUTMENT

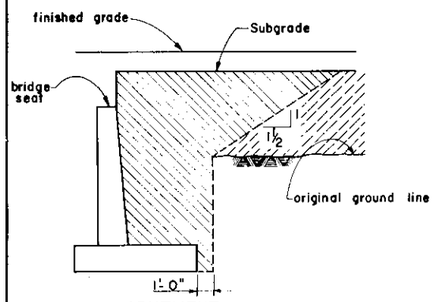


FLARED WING



U WING

TYPICAL CROSS SECTIONS - ABUTMENTS ON FILL



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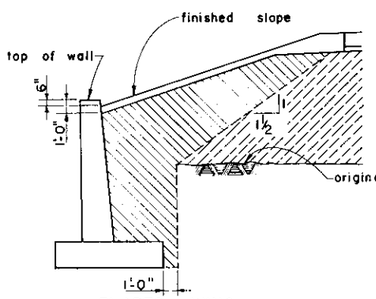

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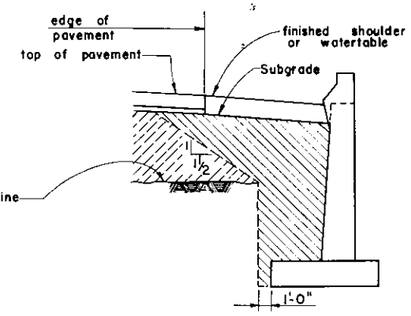
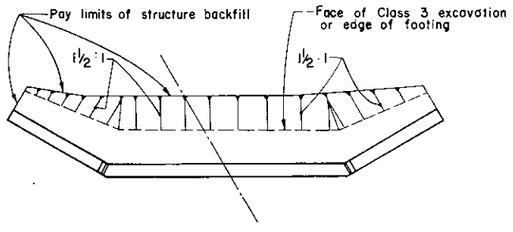
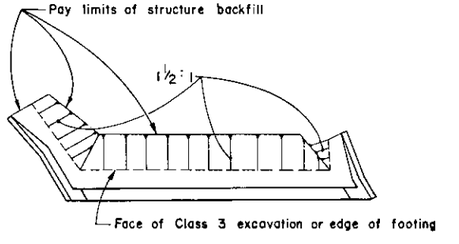


U WING

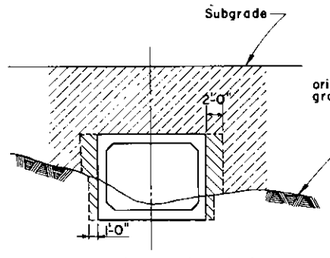
TYPICAL CROSS SECTIONS - ABUTMENTS IN CUT



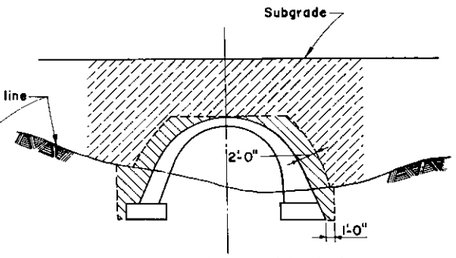
PLAN - ABUTMENT WITH FLARED WINGS



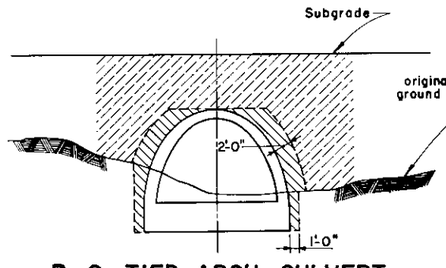
PLAN - ABUTMENT WITH U WINGS



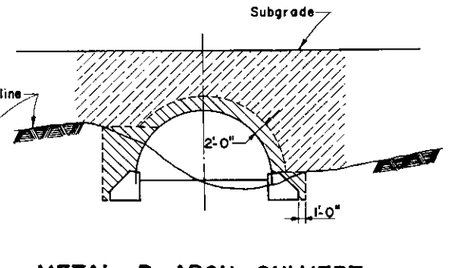
R. C. BOX CULVERT



R. C. ARCH CULVERT



R. C. TIED ARCH CULVERT



METAL PL ARCH CULVERT

LEGEND

Structure Backfill

Embankment Material

BACKFILL & EMBANKMENT CONSTRUCTION AT STRUCTURES

NOTES

1. • Backfill and embankment shall be placed in accordance with this Standard Drawing unless otherwise shown on the structure drawings.
2. • Structure backfill shall consist of material meeting the requirements of Section 350.2 of Form 408. Rock which can be placed and compacted in layers of 12 inches or less, may be used. However, rock shall not be permitted for structure backfill at metal plate arches. Any shale, regardless of whether it is classified as rock or not, shall not be permitted in structure backfill. Steel Slag, such as that resulting from the production of steel in basic oxygen or electric arc furnace or by open hearth, shall not be permitted as structure backfill.
3. • Structure backfill will be measured and paid for as Selected Borrow Excavation - Structure Backfill
4. • Backfill limits at retaining walls and wingwalls for culverts shall be treated the same as flared abutment wingwalls.
5. • Backfill construction at R.C. Box Culverts with the top slab at roadway grade shall be treated the same as abutments.
6. • Backfill construction at culverts where the top of the culvert is near subgrade shall be considered as a special case and shall be treated as shown on the structure drawings or as directed by the engineer.
7. • Structure backfill and adjoining embankment shall be placed simultaneously unless otherwise permitted by the engineer.
10. • Structure backfill quantities are shown on the structure drawings.
11. • Material removed beyond the specified limits of Class 1, 2, or 3 excavation, shall be replaced with Structure Backfill and no payment will be made for material removed or for structure backfill placed beyond the specified limits of Class 1, 2, or 3 excavation.
9. • Drainage details are not shown, see structural drawings for drainage, weep holes, etc.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

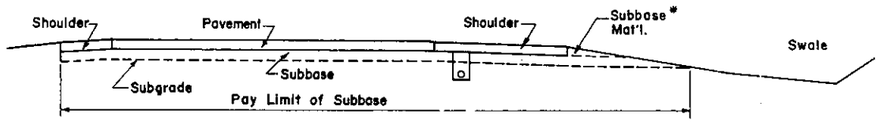
BACKFILL AT STRUCTURES

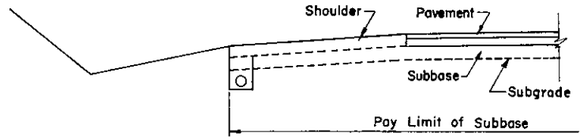
Recommended June 1, 1976
Chief Bridge Engineer

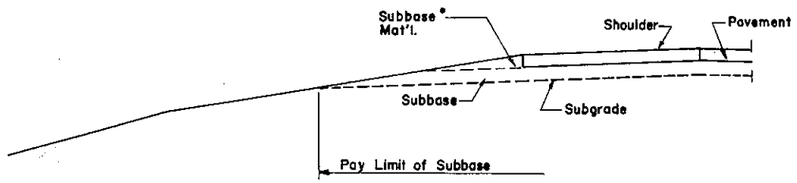
Approved June 1, 1976
Deputy Chief Hwy. Engr.

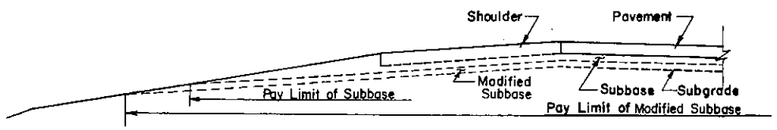
Sht. 1 Of 1

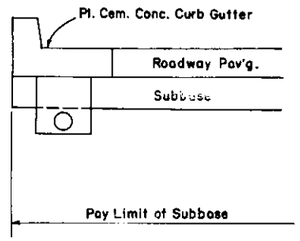
RC-12

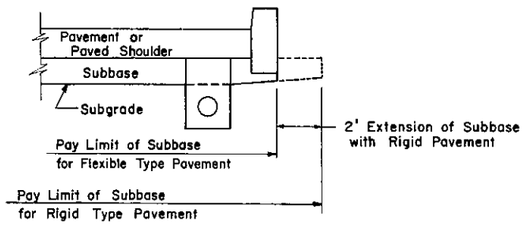


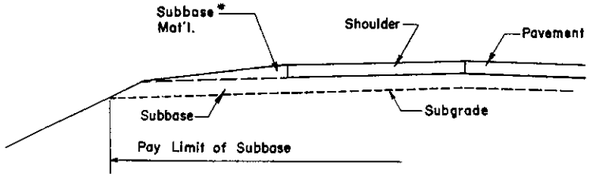












* The payment for this area of subbase will be considered incidental to the shoulder.

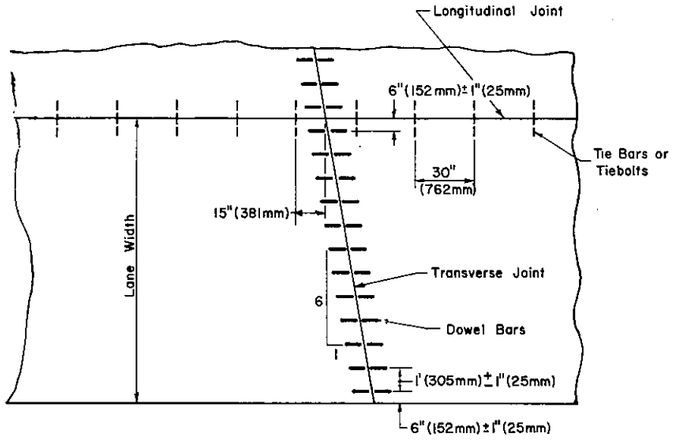
NOTES

1. Payment for subgrade will be considered incidental to the items of subbase or modified subbase, whichever is applicable.

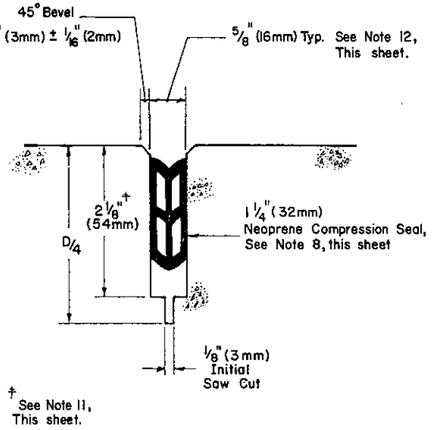
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

PAY LIMIT OF SUBBASE

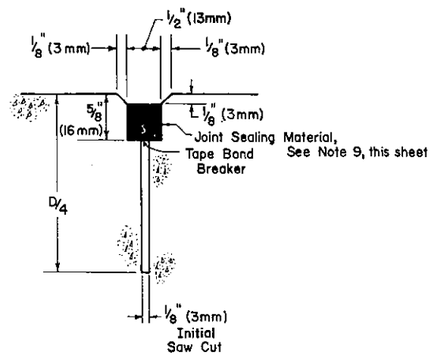
Recommended Sept. 8, 1981	Approved Sept. 8, 1981	Sht. 1 Of 1
B.D. Bomba	Alfred Tyng	RC-13
Dir. Bureau of Highway Design	Chief Highway Engineer	



TYPICAL LAYOUT



Detail A

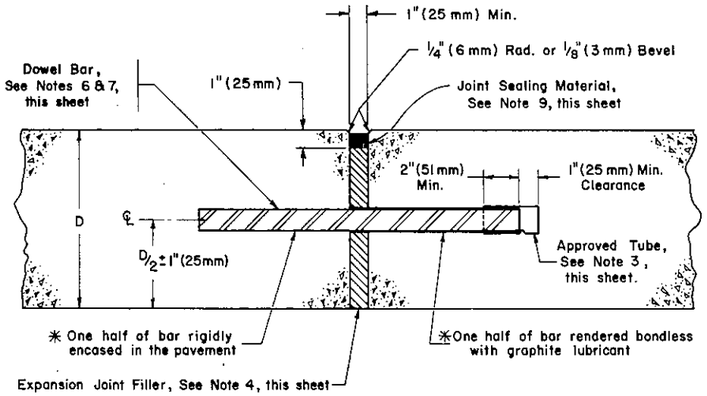


Detail B

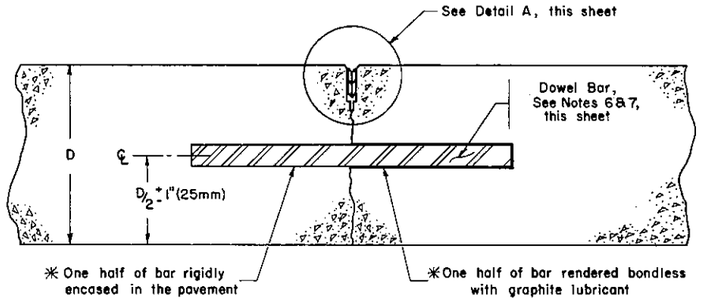
NOTES

1. This standard does not show the details for the load transfer units. Only load transfer units which are supplied by an approved manufacturer as listed in Bulletin No. 15 will be permitted. Any manufacturer desiring to be listed in Bulletin No. 15 for these units shall submit a 22"x 36" (559 mm x 914 mm) reproducible drawing to the Materials and Testing Division, Bureau of Contract Quality Control for approval. The drawing must show all necessary details for the load transfer units to support the dowel bars in correct horizontal and vertical position and to retain the expansion joint material in a vertical position and prevent it from being displaced or bent during construction.
2. The requirements for lubricating and bonding the dowel bars do not apply to plastic coated dowel bars.
3. An approved tube shall be placed over the graphited end of all dowel bars to be used in Type E joints and shall provide a minimum 1" (25 mm) clearance pocket assured by means of a positive spacing device.
4. Expansion joint filler material shall be cut to conform to the cross section of the pavement and shall be furnished in strips equal to the width of the pavement slab. The top surface shall be smooth and holes punched for the dowel bars shall provide a snug fit without loss in thickness of the material.
5. All transverse joints shall be constructed on a 6:1 counterclockwise skew. On curves, the skew will be measured from a perpendicular to a tangent on the long radius side of the curve.
6. Dowel bars for pavement depths of 10" (254mm) or less shall be 1 1/4" (32 mm) in diameter and 18" (457mm) long. Dowel bars for pavement depths of greater than 10" (254mm) shall be 1 1/2" (38mm) in diameter and 18" (457mm) long.
7. Dowel bars shall be placed parallel to the centerline and surface of the slab. The vertical or horizontal skew from one end of the dowel bar to the other end shall not exceed 1/4" (6mm).
8. Neoprene seals shall be installed to a uniform depth. The top of the installed seal shall not be less than 1/4" (6mm) nor more than 3/8" (10mm) below the level of the pavement surface. The top edges of the contact surfaces on both sides of the seal shall be at the same elevation.
9. The top of the joint sealing material shall not be less than 1/16" (1.5mm) nor more than 3/16" (5 mm) below the surface of the pavement.
10. The initial saw cut for Type D and Type R joints is not required for construction joints.
11. Increase saw depth where warranted by manufacturer recommendations. (Max. compressed height + 3/8") (10mm)
12. Widths of the second saw cut should be adjusted according to the pavement temperature at the time of sawing, according to the following:

Width of sawcut	Pavement surface temperature °F
1/2"(13mm)	80 to 100
5/8"(16mm)	60 to 79
3/4"(19mm)	35 to 59

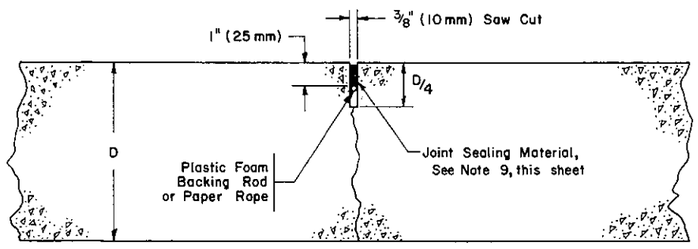


TYPE E
Expansion

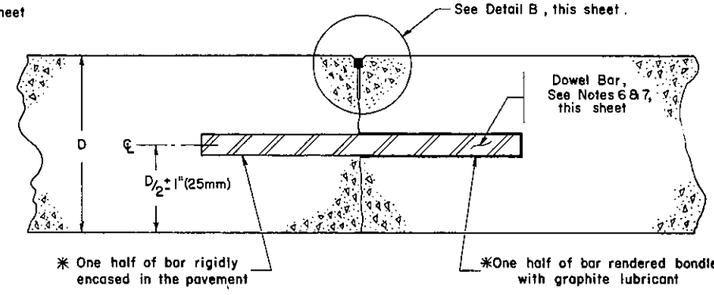


TYPE D

* See Note 2, this sheet



TYPE P
Pl. Cem. Conc. Pav't



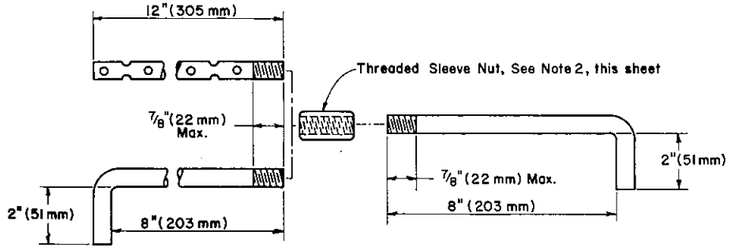
TYPE R

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

CEMENT CONCRETE PAVEMENT JOINTS

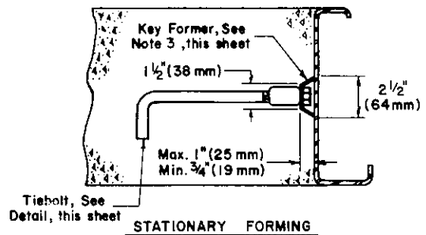
Recommended Sept. 8, 1981	Approved Sept. 8, 1981	Sht. 1 Of 2
B.D. Kowalski	Alfred L. Lyn	RC-20
Dir. Bureau of Highway Design	Chief Highway Engineer	

TRACED BY
FINAL BY

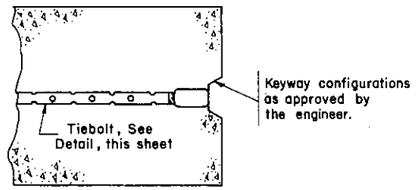


TIEBOLT DETAIL

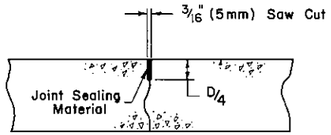
Tiebolts shall be 9/16" (14 mm) Ø bar with rolled threads or 5/8" (16 mm) Ø bar with cut threads.
The assembled tiebolt shall withstand a minimum pull-out or yielding load of 15,000 pounds (66,725 N).
Only Tiebolts which are supplied by an approved manufacturer as listed in Bulletin No. 15 will be permitted.



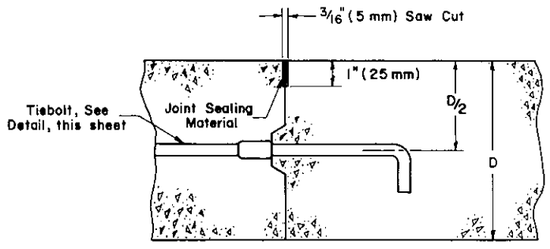
STATIONARY FORMING



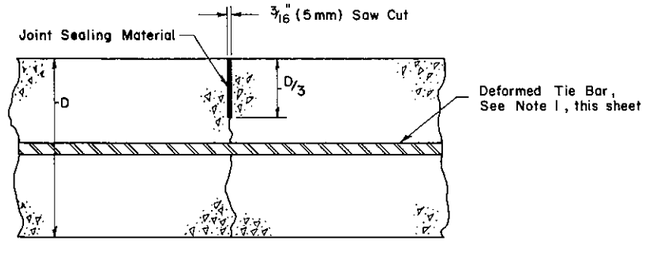
SLIP FORMING



TRANSVERSE JOINT

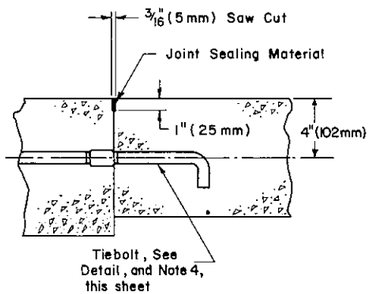


Construction



Contraction

TYPE L



LONGITUDINAL JOINT

SHOULDER JOINTS

NOTES

1. Tie bars shall be 30" (762mm) in length and spaced at 30" (762mm) intervals. Tie bar depth shall be measured from the top of pavement to the top of bar.

Pavement Depth	Bar Size	Bar Depth	Tolerance
6"(152mm)	4	3"(76mm)	± 1/2"(13mm)
7"(178mm)	4	3 1/4"(83mm)	± 1/2"(13mm)
8"(203mm)	4	3 3/4"(95mm)	± 3/4"(19mm)
9"(229mm)	4	4 1/4"(108mm)	± 3/4"(19mm)
10"(254mm)	5	4 1/2"(114mm)	± 3/4"(19mm)
11"(279mm)	5	5"(127mm)	± 3/4"(19mm)
12"(305mm)	5	5 1/2"(140mm)	± 3/4"(19mm)
13"(330mm)	5	6"(152mm)	± 3/4"(19mm)

2. The threaded sleeve nut shall be made from steel pipe or hexagonal steel bar 1 1/16"(27 mm) in diameter and 1 7/8" (48 mm) long or high strength steel bar 27/32" (21 mm) in diameter and 2" (51 mm) long.

3. The key former shall be securely fastened to the steel form. The contractor shall have a method, acceptable to the engineer, of temporarily securing the tiebolt to the key former or form during placement of the concrete.

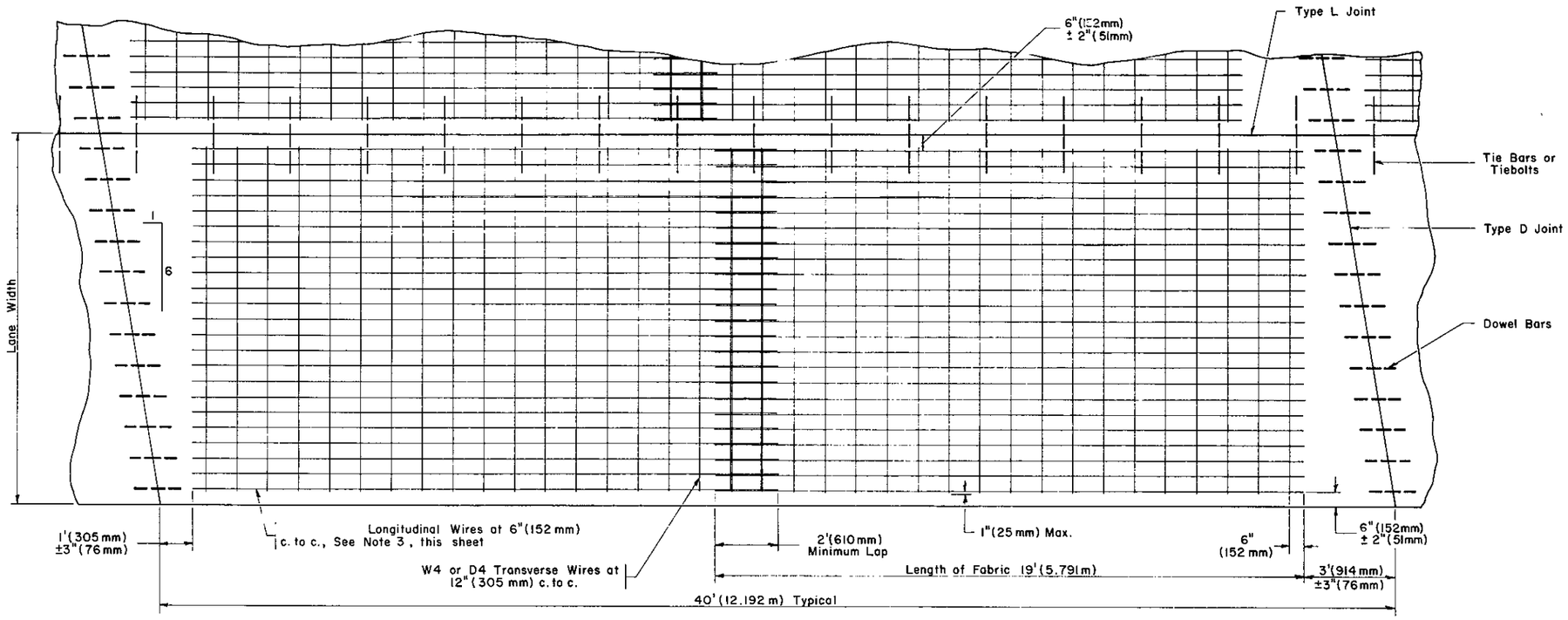
4. Tiebolt hooks shall be parallel with the grade when placing 6" (152mm) concrete shoulders.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

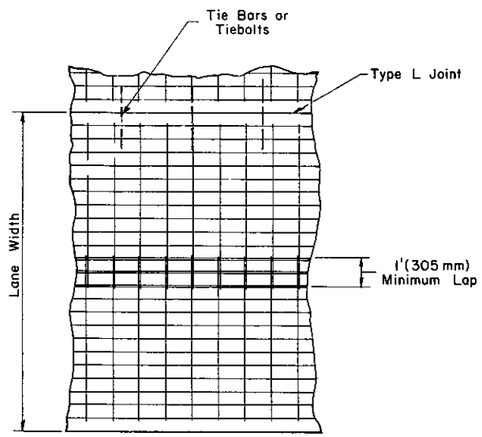
CEMENT CONCRETE PAVEMENT JOINTS

Recommended Sept. 8, 1981	Approved Sept. 8, 1981	Sht. 2 Of 2
B. D. Ramsie	Alfred Clark	RC-20
Dir. Bureau of Highway Design	Chief Highway Engineer	

TRACED BY
FINAL BY



WIRE FABRIC REINFORCEMENT



ALTERNATE LAPPED FABRIC

NOTES

1. For variable width pavement the reinforcement shall be cut as required.
2. Wire fabric reinforcement may be placed with transverse wires above or below longitudinal wires.
3. Longitudinal wires for wire fabric reinforcement shall be of the following minimum sizes:

Pav't. Depth	Min. Long. Wire Size
8"(203mm)	W 5.5 or D5
9"(229mm)	W 5.5 or D5
10"(254mm)	W 5.5 or D5
11"(279mm)	W 6 or D5.5
12"(305mm)	W 6.5 or D6
13"(330mm)	W 7 or D6.5

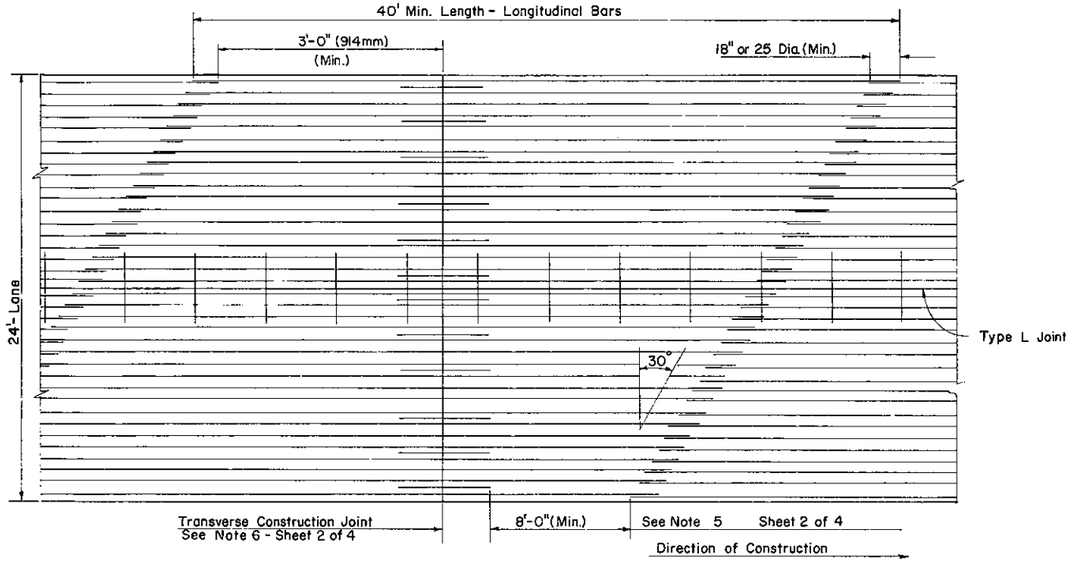
4. Hinged fabric reinforcement may be used. Hinge detail must be approved by the engineer.
5. All longitudinal and transverse laps of wire fabric reinforcement shall be securely tied.
6. On projects where additional lanes are being added to existing cement concrete pavements and the existing joint spacing is more than 46.5' (14.173m), the longitudinal wire size shall be a minimum of W6 or D5.5.
7. Wire fabric reinforcement may be constructed of smooth wire (sizes designated by W) or deformed wire (sizes designated by D) or a combination of both.
8. See RC-20 for joint details.
9. Depth for placement of wire fabric reinforcement, measured from top of pavement to top of fabric shall be a minimum of $2\frac{1}{2}$" (64 mm) to a maximum of one half the pavement depth minus $\frac{1}{2}$" (13mm).

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

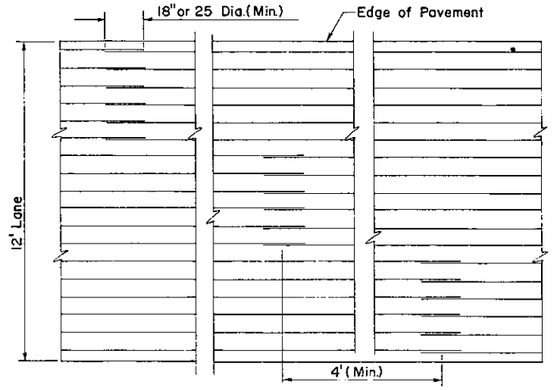
REINFORCED CEMENT CONCRETE PAVEMENT

Recommended	Approved	Sht. 1 Of 1
May 31, 1979	May 31, 1979	RC-21
B.O. Fouskie	David C. Wilmot	
Director, Bureau of Design	Chief Hwy. Engr.	

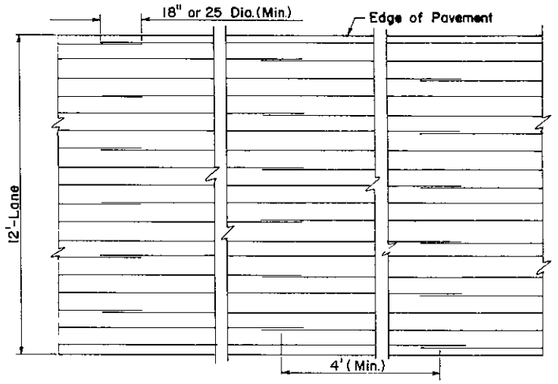
TRACED BY
FINAL BY



PLAN
LOOSE BARS



ALTERNATE PLAN
LOOSE BARS
See Note 3

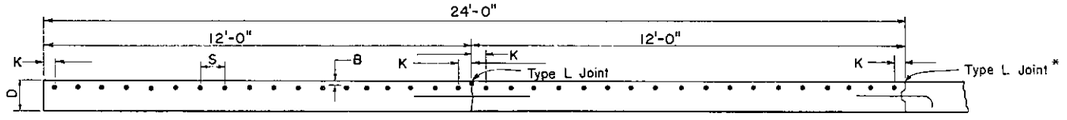


ALTERNATE PLAN
LOOSE BARS
See Note 3

TABLE I

	Thickness D (inches)	Longitudinal Steel 12' Lane				Transverse Bars ⊕ (when required)
		No. of Bars	Bar Size	S (in.)	K (in.)	
Overlay Only	6	17	#5	8½	4	#3 Bars @ 26"(660mm) or #4 Bars @ 48" (1.219m)
	7	20	#5	7¼	3⅛	#3 Bars @ 26"(660mm) or #4 Bars @ 48" (1.219m)
New Pavement or Overlay	8	23	#5	6¼	3¼	#3 Bars @ 22" or #4 Bars @ 40" or #5 Bars @ 48"
		16	#6	9	4½	
	9	25	#5	5¾	3	#4 Bars @ 34" or #5 Bars @ 48"
		18	#6	8	4	
	10	28	#5	5	4½	#4 Bars @ 30" or #5 Bars @ 48"
		20	#6	7¼	3⅛	

⊕ Transverse bars required by special provision only



* See Note 4

TYPICAL CROSS SECTION
LOOSE BARS

NOTES

1. All Longitudinal Bars shall have a minimum lap of 18"(457mm) or 25 diameters whichever is greater
2. Bars of high yield strength shall not be bent.
3. Other lapping patterns may be used as approved by the engineer provided that no more than one-third of the longitudinal bars are lapped within the same transverse plane.
4. For Type L Joints see Standard Drawing RC-20. For 48'(14.630m) pavement width the center joint shall be a Type L construction joint without tiebolts.
5. Transverse steel bars, when required by special provision, may be provided in full width lengths for 24'(7.315m) and 36'(10.973m) pavement widths, and tie bars will not be required. When Transverse Bars are provided in one lane widths, tie bars shall be provided and be positioned between the Transverse Bars. Transverse Bars shall have a 2"(51mm) min. clearance from end of bar to edge of pavement or lane.
6. The target depth for longitudinal bar placement measured from top of pavement to the top of bar shall be as indicated below:

D	B	Tolerance
6" (152mm)	3" (76mm)	±½" (13mm)
7" (178mm)	3¼" (83mm)	±½" (13mm)
8" (203mm)	3¼" (83mm)	±¾" (19mm)
9" (229mm)	3½" (89mm)	±¾" (19mm)
10" (254mm)	3¾ (95mm)	±¾" (19mm)

7. For pavement depths of 6"(152mm) and 7"(178mm) the tie bar and tiebolt locations given on RC-20 will conflict with the longitudinal bars. In these cases the tie bars and tiebolts shall be placed directly under the longitudinal bars.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

CONTINUOUSLY REINFORCED CONCRETE PAVEMENT

Recommended May 24 1979
B.D. Kunkle
Director, Bureau of Design

Approved May 24 1979
David B. Simmel
Chief Hwy. Engr.

Sht. 1 Of 4
RC-22

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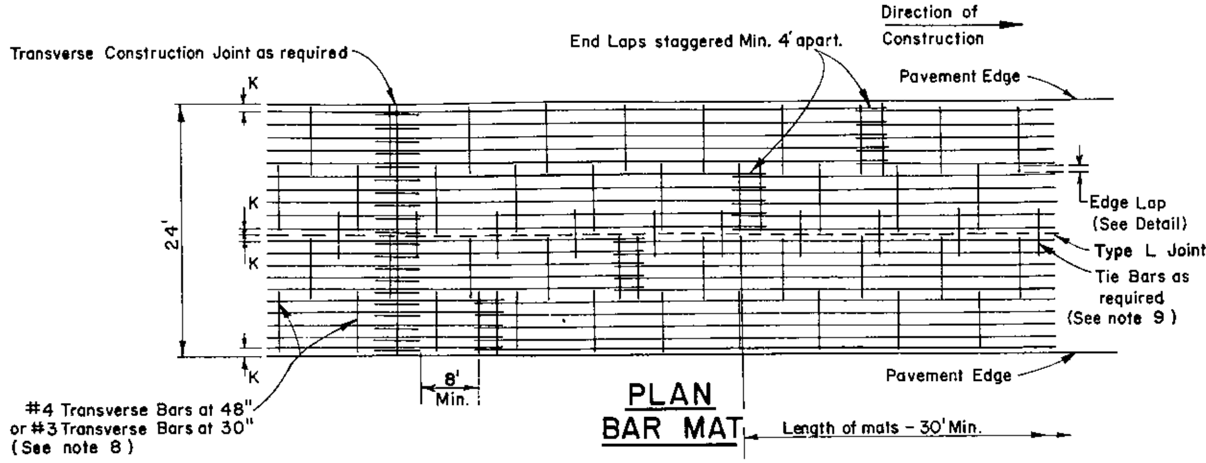
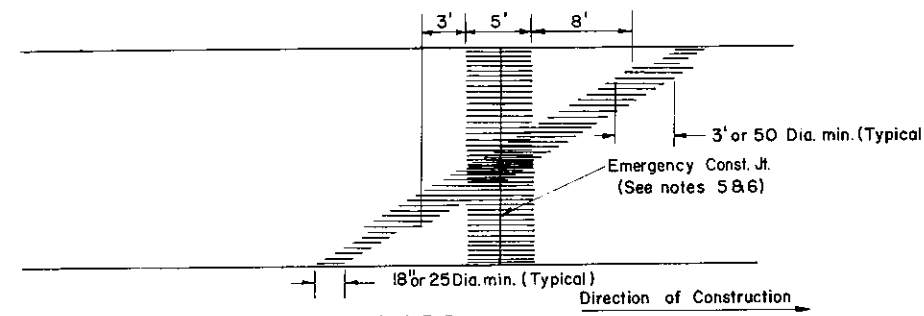
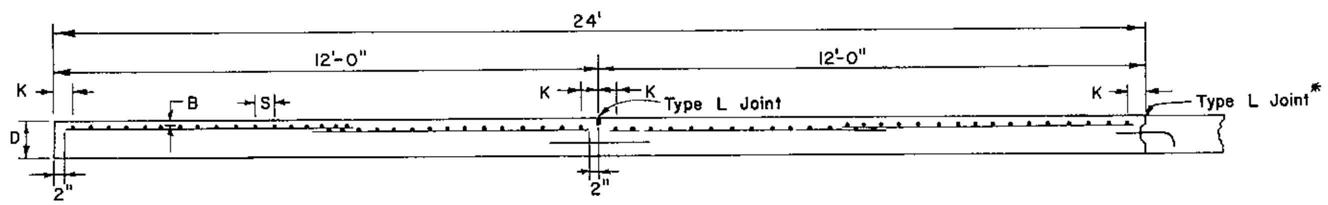
FINAL BY



PLAN
BAR MAT



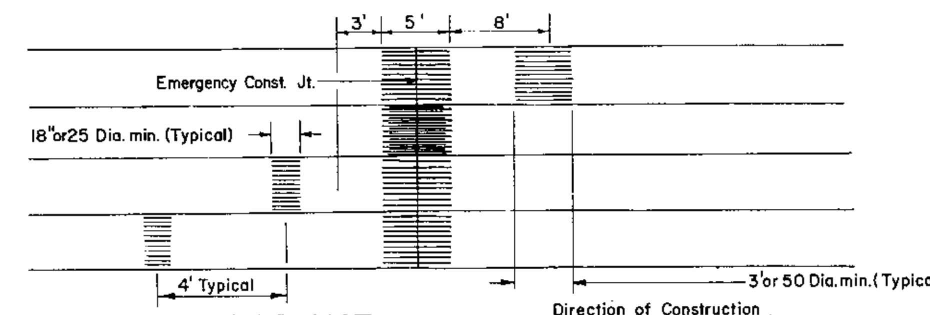
LOOSE BARS
EMERGENCY CONSTRUCTION JOINT



TYPICAL CROSS SECTION
BAR MAT

*See note 4 Sheet 1 of 4

NOTE:
See table 1 for values of S,K,D Sheet 1 of 4



BAR MAT
EMERGENCY CONSTRUCTION JOINT

NOTES

1. Bar mat reinforcing shall not be allowed for pavement depths less than 8" (203mm).

2. All Longitudinal Bars shall have a minimum lap of 18" or 25 Diameters which ever is greater.

3. Bars of high yield strength shall not be bent.

4. The target depth for longitudinal bar placement measured from top of pavement to the top of bar shall be as indicated below with a tolerance of $\pm 3/4$":

D	B
8"	3¼"
9"	3½"
10"	3¾"

Transverse steel may be on the top or bottom except as qualified in note 9.

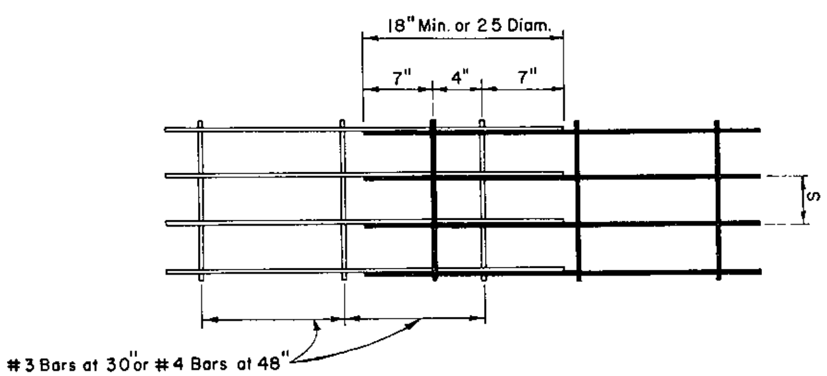
5. At all Lap splices occurring within 8 feet beyond the Joint limits, in the direction of paving and 3 feet back of the Construction Joint limits, the length of lap shall be double that normally specified, (3' or 50 Diameters minimun whichever is greater) or each splice shall be strengthened by splicing in symmetrically with the lap, a 6 foot length of deformed bar of the same nominal size as the longitudinal reinforcement.

6. Transverse Construction Joints and Emergency Construction Joints when loose bars or bar mats are utilized shall be strengthened by the addition of supplementary deformed bars, 5' (1.524m) long and of the same nominal size as the longitudinal reinforcement, placed symmetrically with the joint and at a uniform spacing. The number of supplementary bars shall be such as to increase the area of steel through the joint by at least one-third.

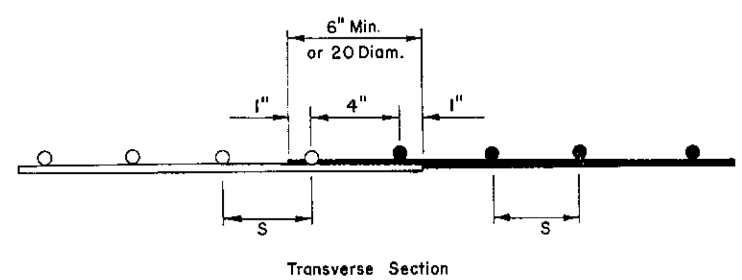
7. Bar Mats shall have a nominal width of 4', 6', or 8'.

8. When transverse bars are required by special provision, the transverse bars for bar mats shall be as indicated in Table 1 on Sheet 1 of 4.

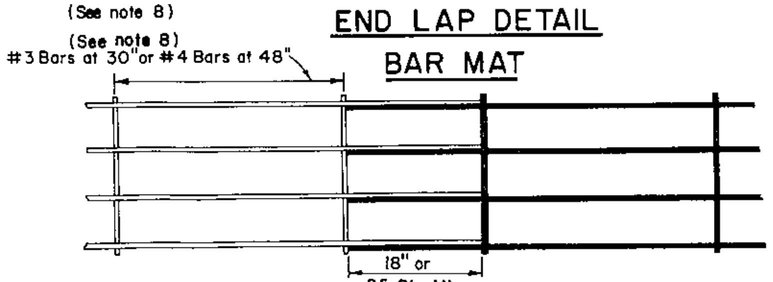
9. When 8' mats are used, the tie bar shall not be used because the bar mat extends through the longitudinal joint and transverse steel must be on the bottom.



END LAP DETAIL
BAR MAT



EDGE LAP DETAIL
BAR MAT

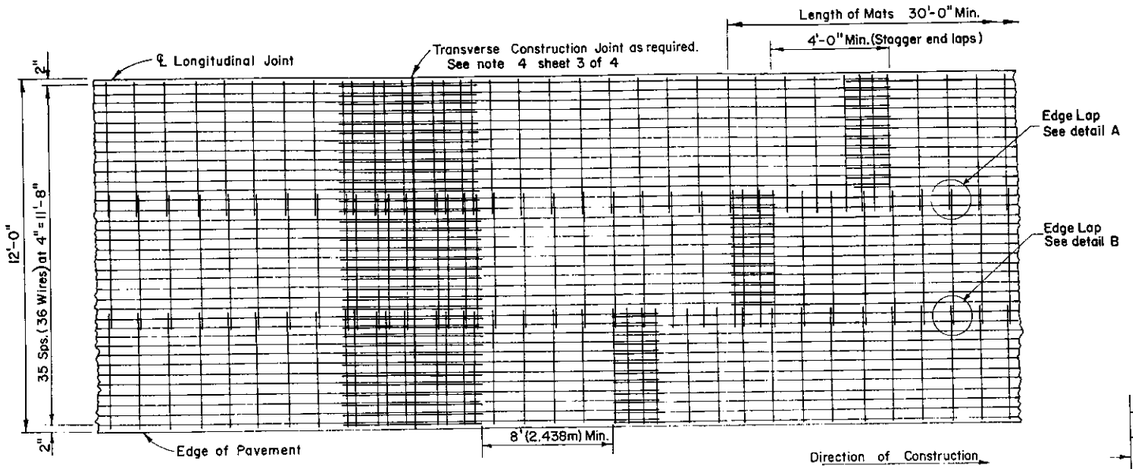


ALTERNATE END LAP DETAIL-BAR MAT

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

CONTINUOUSLY REINFORCED CONCRETE PAVEMENT

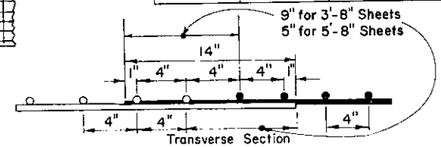
Recommended May 31, 1979	Approved May 31, 1979	Sht. 2 Of 4
B.D. [signature] Director, Bureau of Design	David C. Sims Chief Hwy. Engr.	RC-22



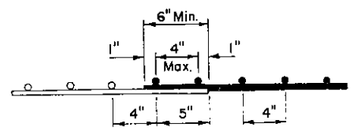
TYPICAL REINFORCING PLAN USING DEFORMED WELDED WIRE FABRIC

TABLE 2

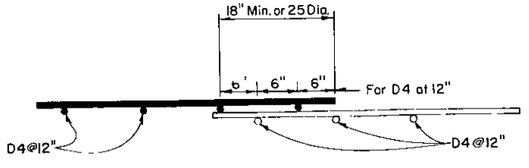
DEFORMED WELDED WIRE FABRIC DETAILS					
12' Slab		Longitudinal Steel 12' Slab			Transverse Steel
Slab Thickness D (Inches)	Cross Sectional Area of 12' Slab Sq. In.	Req'd Cross Sectional Area of Steel Sq. In.	36 at 4"		
			Wire Size	Area Sq. In.	Size & Spacing
8	1,152	6.912	D-19.2	6.912	W4 or D4 @ 12"
9	1,296	7.776	D-21.6	7.776	W4 or D4 @ 12"
10	1,440	8.640	D-240	8.640	W4 or D4 @ 12"



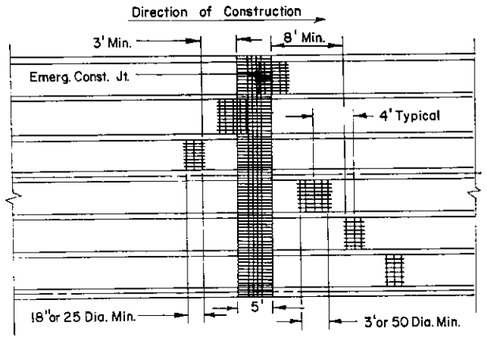
EDGE LAP DETAIL
Detail A



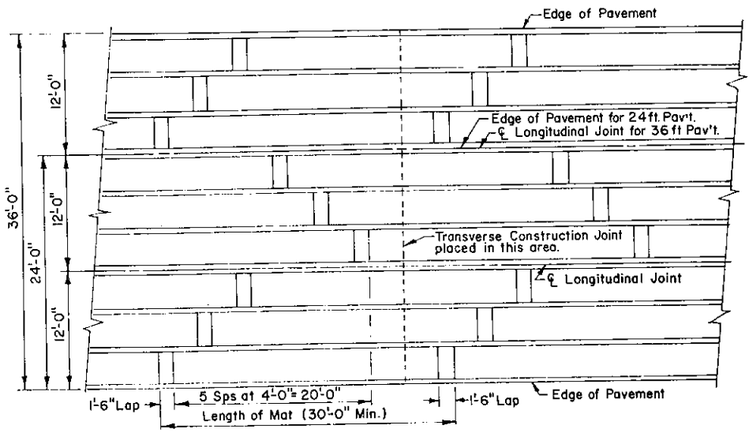
EDGE LAP DETAIL
Detail B



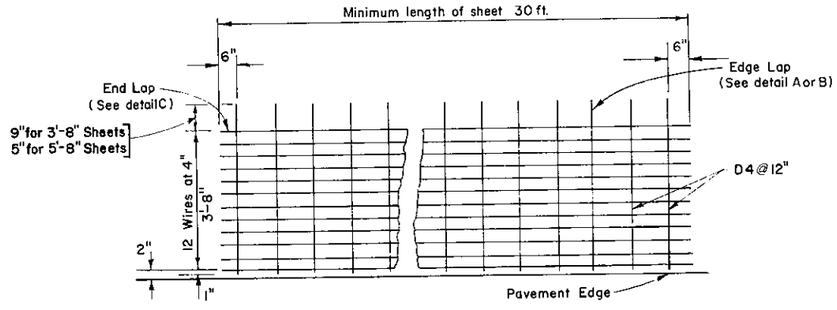
END LAP DETAIL
Detail C



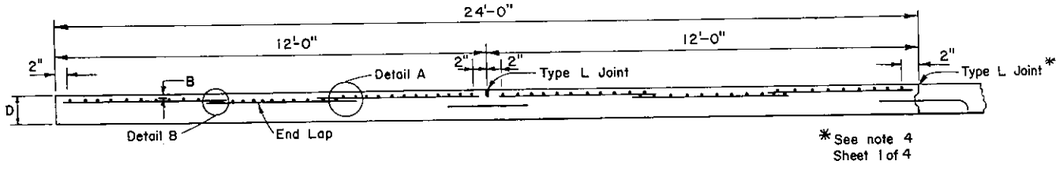
EMERGENCY CONSTRUCTION JOINT DEFORMED WELDED WIRE FABRIC



TYPICAL MAT PLACEMENT PATTERN DEFORMED WELDED WIRE FABRIC



TYPICAL REINFORCING PLAN DEFORMED WELDED WIRE FABRIC



TYPICAL CROSS SECTION

NOTES

1. Deformed wire fabric reinforcing shall not be allowed for pavement depths less than 8" (203mm).
2. All Longitudinal Wires in the Fabric shall have a minimum Lap of 18" (457mm) or 25 Dia., whichever is greater.
3. Transverse Wires in the consecutive Fabric sheets shall have a minimum edge lap of 6" (152mm).
4. Transverse Construction Joints and Emergency Construction Joints shall be strengthened by the addition of supplementary deformed welded wire fabric (or #5 deformed bars) 5' (1.524m) in length, placed symmetrically with the joint when deformed welded wire fabric is utilized. The supplementary steel shall be such as to increase the area of steel through the joint by at least one-third.
5. At all Lap splices occuring within 8 feet beyond the Const. Joint limits, in the direction of paving and 3 feet back of the Const. Joint limits, the length of lap shall be double that normally specified, (3' or 50 Diameters minimum whichever is greater) or each splice shall be strengthened by splicing in symmetrically with the lap, a 6 foot length of deformed bar of the same nominal size as the longitudinal reinforcement.
6. Deformed Welded Wire Fabric may have a nominal width of either 4', 6' or 8'. A Type L Joint is required at center line of 24' pavement width. (See Note 9 on RC-22, Sheet 2 of 4)
7. The target depth for longitudinal wire placement measured from top of pavement to the top of wire shall be as indicated below with a tolerance of ± 3/4":

D	B
8"	3 1/4"
9"	3 1/2"
10"	3 3/4"

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

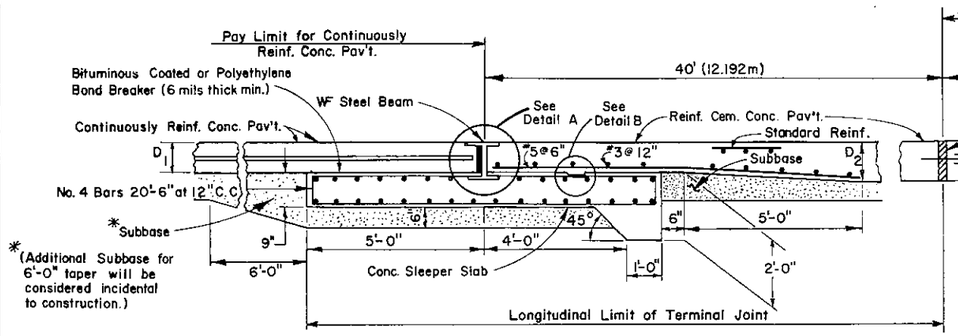
CONTINUOUSLY REINFORCED CONCRETE PAVEMENT

Recommended May 31, 1979
Director, Bureau of Design

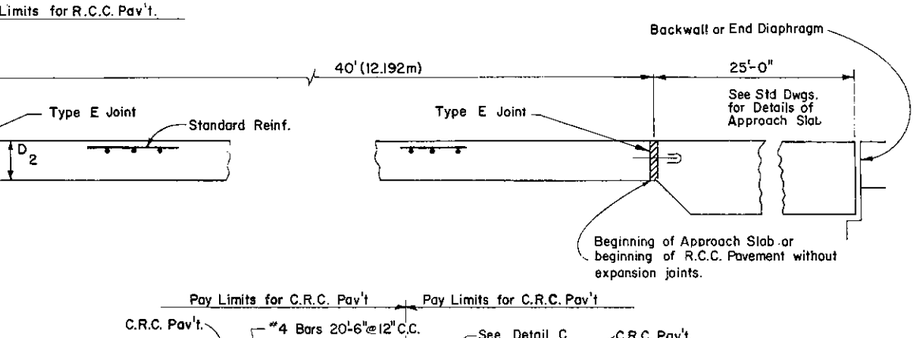
Approved May 31, 1979
Chief Hwy. Engr.

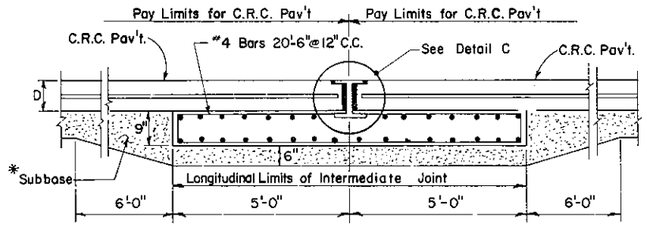
Sht. 3 Of 4

RC-22

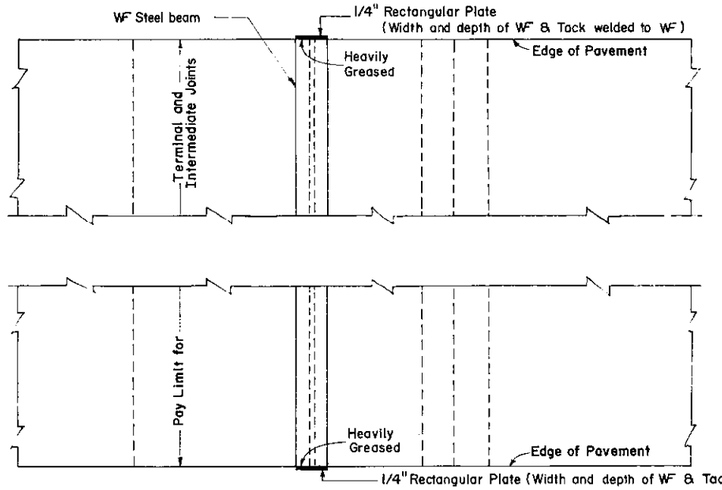


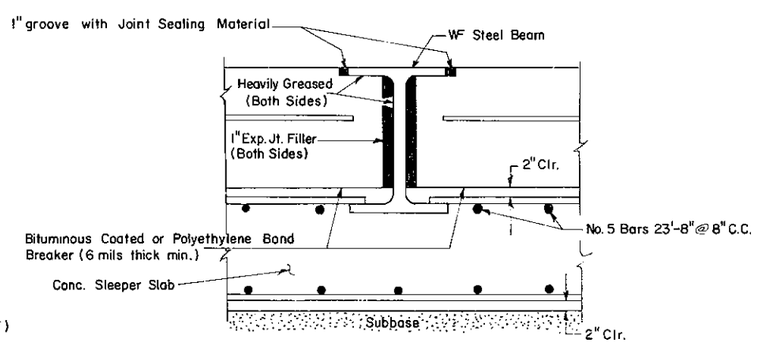
TERMINAL JOINT



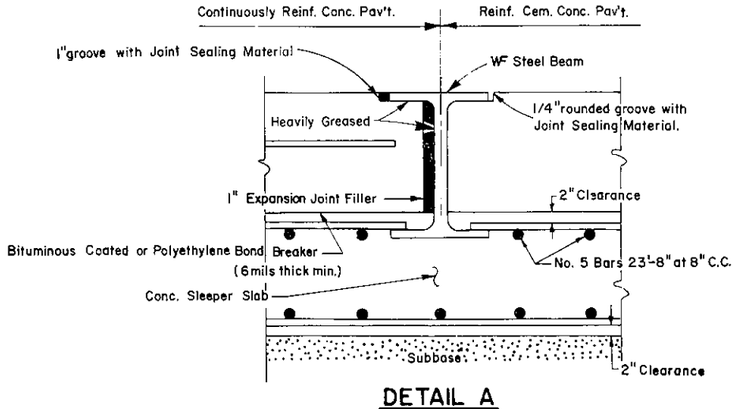


INTERMEDIATE JOINT

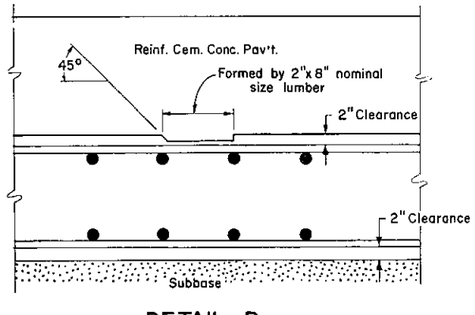




DETAIL C



DETAIL A



DETAIL B

NOTES

1. The surface of the conc. sleeper slab on the continuously reinforced conc. pavement side of the joint shall be steel trowel finished
2. Pavement Base Drain, (See details RC-30) shall be used for transverse drainage under the Sleeper Slab on the upgrade side and will be measured and paid for as specified in Section 610 of Form 408.
3. For lengths under 500'(152.400m) between stuctures use conventionally jointed Reinforced Cement Concrete Pavement only.
4. For construction at ramps see RC-27.
5. Length 500' and over between structures-use:
   a. Continuously Reinforced Concrete Pavement.
   b. One (1) Terminal Joint at each end of pavement at struct.
   c One (1), 40' length slabs, conventionally joinred (exp. jt.) pavement, at each end of pavement between terminal joint and approach slab.
   d. One (1) Bridge Approach Slab adjacent to each structure.
6. At the termini of each continuously reinforced paving project, an Intermediate Joint will be required if the adjacent projects are not paved during the some construction season. If paving an adjacent project started during the same construction season the "Emergency Construction Joint" may be utilized at the project terminus.

TABLE 3

WIDE FLANGE WEIGHT & DIMENSIONS

Pavement Thickness D (inches)	Embedment in Sleeper Slab (inches)	Beam Weight Lb.	Beam Depth (inches)	Flange Width (inches)	Flange Thickness (inches)	Web Thickness (inches)
6	4 1/8	54	10 1/8	10	5/8	3/8
7	3 1/8	54	10 1/8	10	5/8	3/8
8	4 1/4	58	12 1/4	10	5/8	3/8
9	3 1/4	58	12 1/4	10	5/8	3/8
10	3 7/8	61	13 7/8	10	5/8	3/8

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

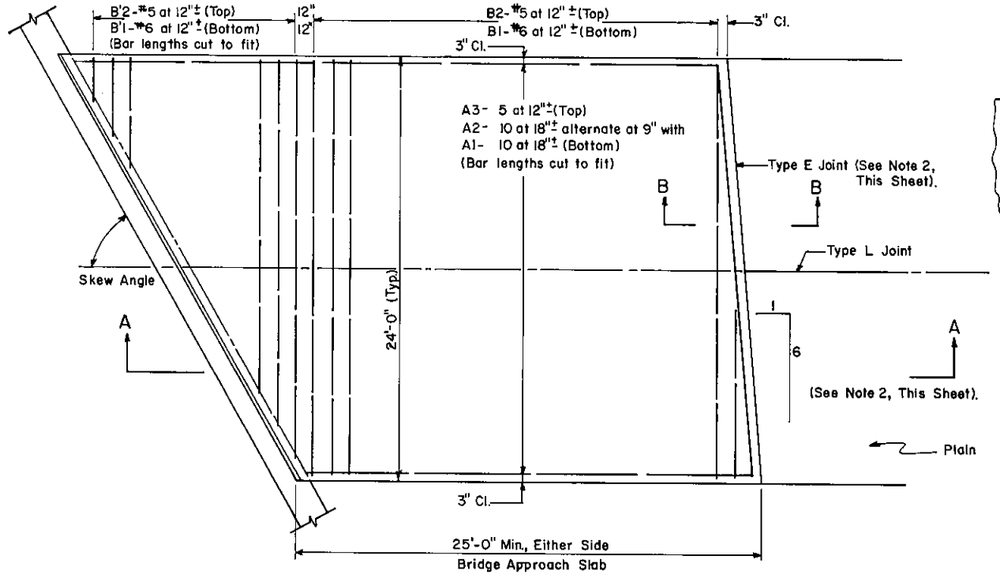
CONTINUOUSLY REINFORCED CONCRETE PAVEMENT

Recommended May 31, 1979
B.D. Rowshia
Director, Bureau of Design

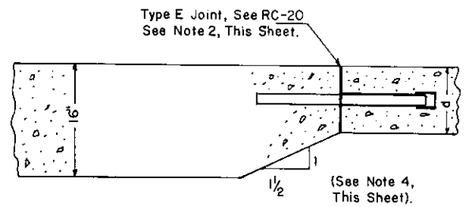
Approved May 31, 1979
David C. Lind
Chief Hwy. Engr.

Sht. 4 Of 4

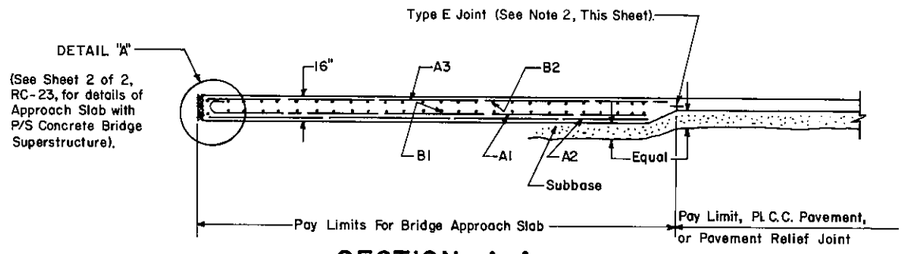
RC-22



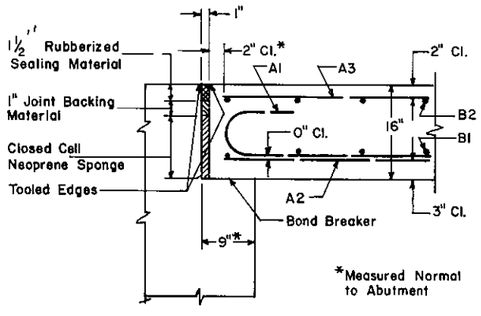
PLAN



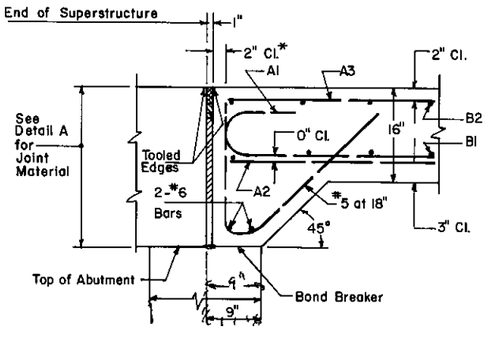
SECTION B-B



SECTION A-A



DETAIL A



DETAIL A (ALTERNATE)

(TO APPLY ONLY WHEN INDICATED ON STRUCTURE DRAWINGS)

NOTES

1. Bridge Approach Slab shall be constructed in accordance with this Standard Drawing, unless otherwise modified or shown on the structure drawings.
2. The skewed Type E joint does not apply when approach slab is being constructed in conjunction with a Pavement Relief Joint, see RC-24.
3. The standard Bridge Approach Slab shall be constructed in 2 lane widths; for 3 lane construction an additional single lane Bridge Approach Slab shall be connected to the standard Bridge Approach Slab using a tied longitudinal construction joint; for 4 lane construction, 2 standard Bridge Approach Slabs shall be connected by a tied longitudinal construction joint.
4. The end of the approach slab shall be constructed at full 16" depth when constructed in conjunction with a Pavement Relief Joint, see RC-24.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

BRIDGE APPROACH SLAB

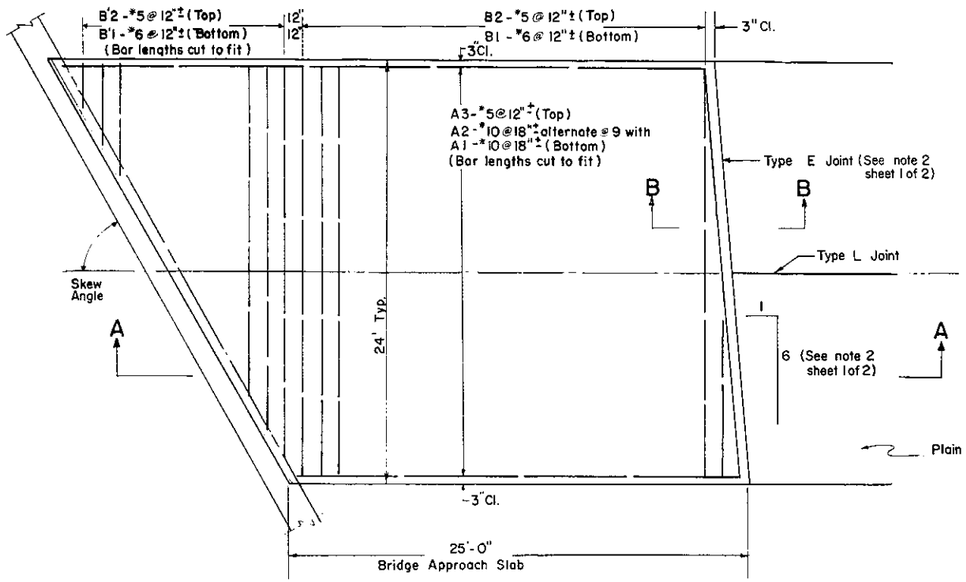
Recommended May 6, 1982
James M. O'Brien
Director, Bureau of Highway Design

Recommended May 6, 1982
Alfred J. Tuzzi
Chief Highway Engineer

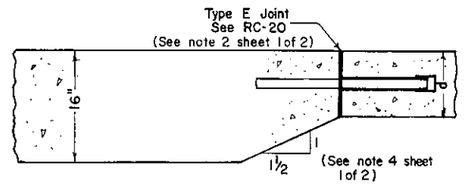
Sht. 1 Of 2
RC-23

TRACED BY
FINAL BY

VOIDED BY CHANGE #1



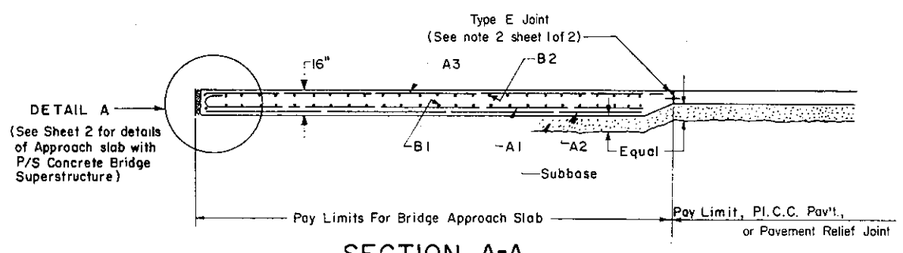
PLAN



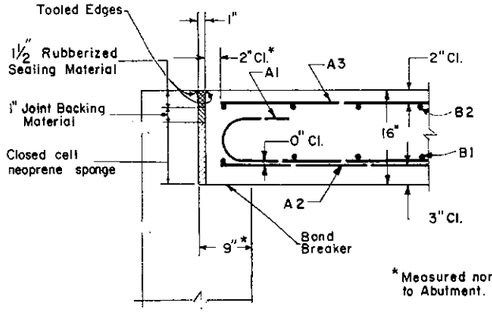
SECTION B-B

NOTES

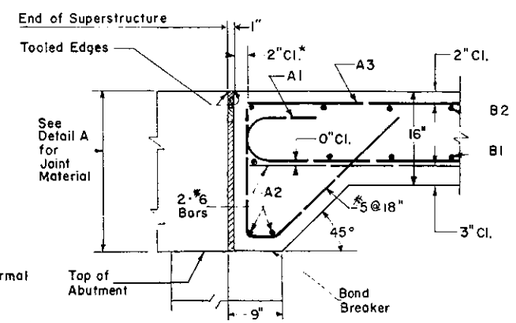
1. Bridge Approach Slab shall be constructed in accordance with this Standard Drawing unless otherwise modified or shown on the structure drawings.
2. The skewed Type E joint does not apply when approach slab is being constructed in conjunction with a Pavement Relief Joint, See RC-24.
3. The standard Bridge Approach Slab shall be constructed in 2 lane widths; for 3 lane construction an additional single lane Bridge Approach Slab shall be connected to the standard Bridge Approach Slab using a tied longitudinal construction joint; for 4 lane construction, 2 standard Bridge Approach Slabs shall be connected by a tied longitudinal construction joint.
4. The end of the approach slab shall be constructed at full 16" (406mm) depth when constructed in conjunction with a Pavement Relief Joint, See RC-24.



SECTION A-A



DETAIL A



DETAIL A (ALTERNATE)

(TO APPLY ONLY WHEN INDICATED ON STRUCTURE DRAWINGS)

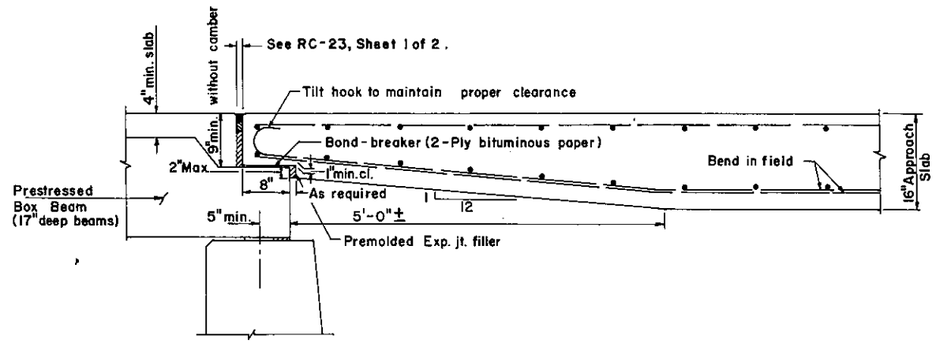
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

BRIDGE APPROACH SLAB

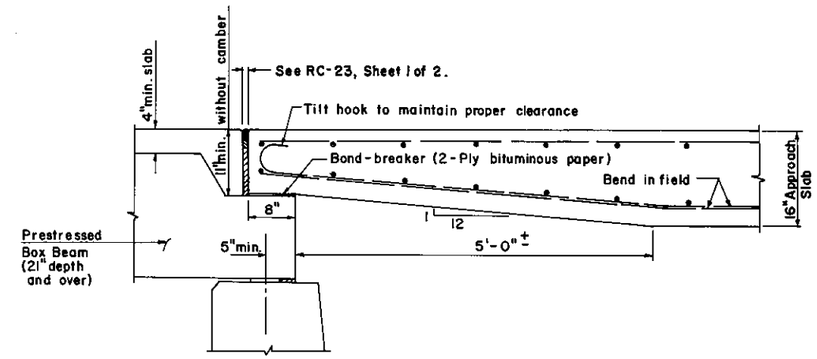
Recommended	Approved	Sht. 1 Of 2
Director, Bureau of Design	Deputy Sec. for Highway Admin.	RC-23

NOTES FOR CONSTRUCTION REVISIONS

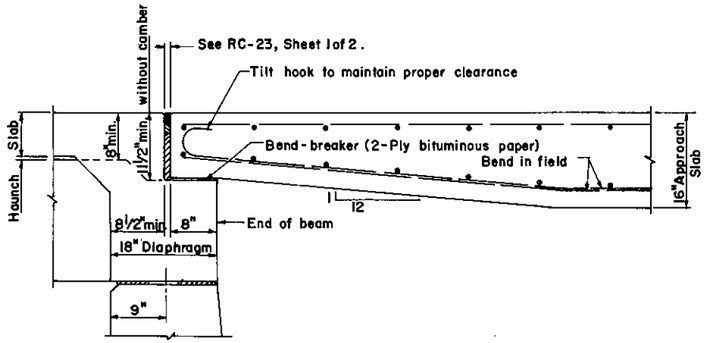
1. When making construction changes in the field, this drawing is to serve as a guide for modifying notch details shown on P/S Standard Drawings for accommodating the Standard 16" Bridge Approach Slab.
2. At beam ends, burn off reinforcement protruding into approach slab notch.
3. Increase in field, providing overhang, if required.



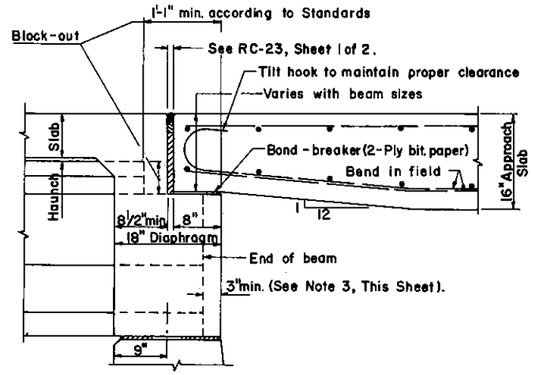
17" DEEP ADJACENT COMPOSITE BOX BEAMS WITH 9" DEEP APPROACH SLAB NOTCH



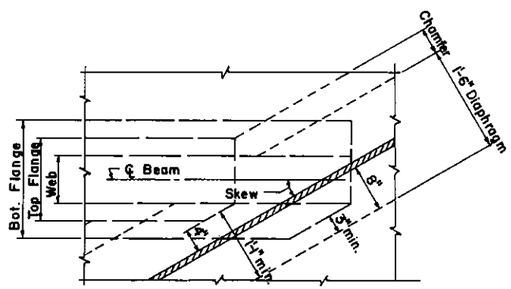
21" TO 48" DEEP ADJACENT COMPOSITE BOX BEAMS WITH 11" DEEP APPROACH SLAB NOTCH



SPREAD BOX BEAMS WITH APPROACH SLAB NOTCH 11 1/2" OR DEEPER



I-BEAMS



PLAN - I-BEAMS

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

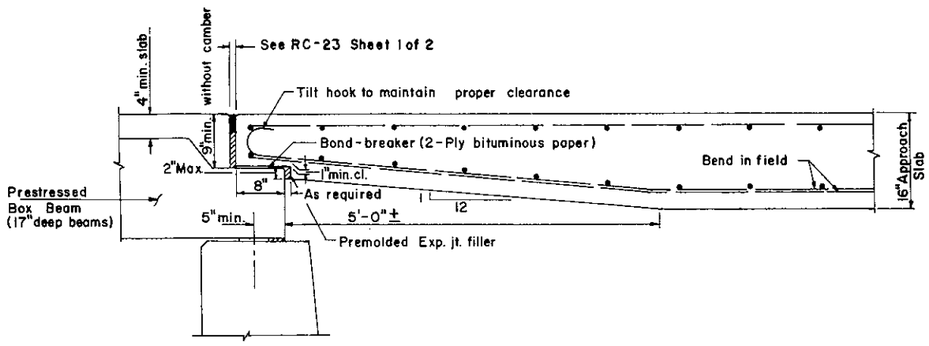
BRIDGE APPROACH SLAB

Recommended May 6, 1982	Recommended May 6, 1982	Sht. 2 Of 2
Dir., Bureau of Highway Design	Chief Highway Engineer	RC-23

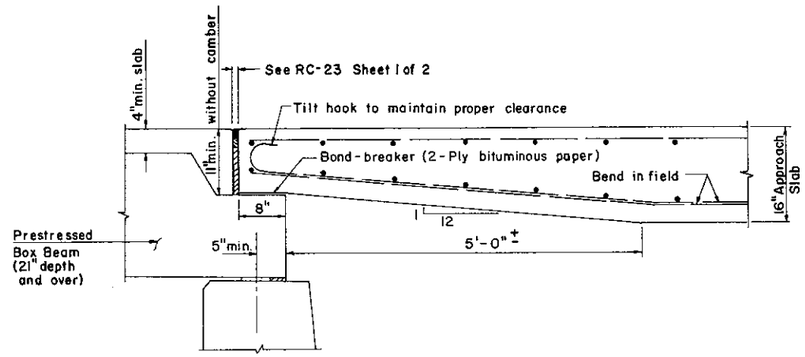
VOIDED BY CHANGE #1

Notes for Construction Revisions

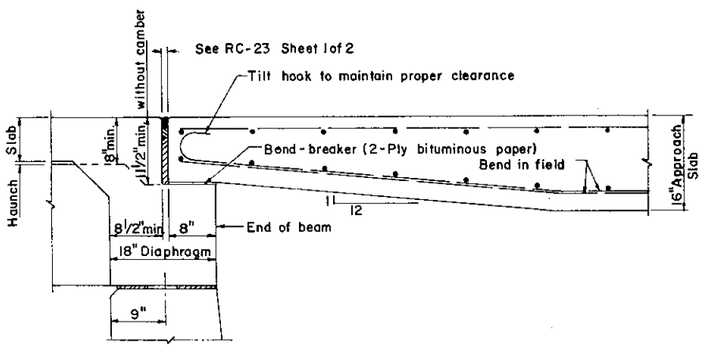
- When making construction changes in the field this drawing is to serve as a guide for modifying notch details shown on P/S Standard Drawings for accommodating the Standard 16" Bridge Approach Slab.
- At beam ends, burn off reinforcement protruding into approach slab notch.
- * Increase in field, providing overhang, if required.



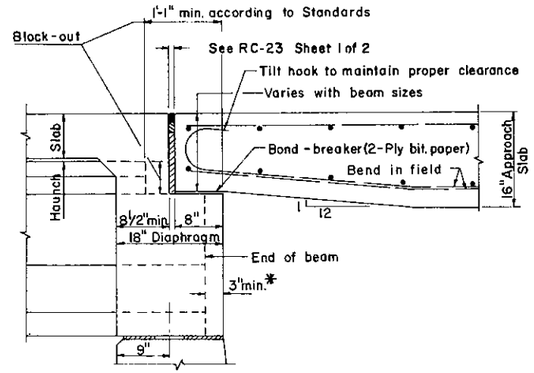
17" DEEP ADJACENT COMPOSITE BOX BEAMS WITH 9" DEEP APPROACH SLAB NOTCH



21" TO 48" DEEP ADJACENT COMPOSITE BOX BEAMS WITH 11" DEEP APPROACH SLAB NOTCH



SPREAD BOX BEAMS WITH APPROACH SLAB NOTCH 11½" OR DEEPER



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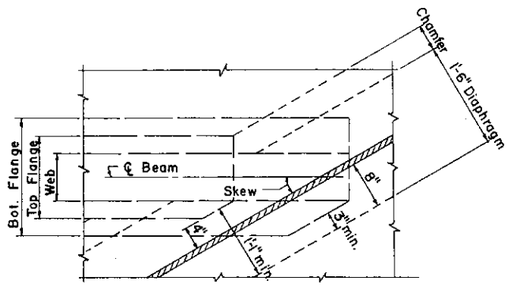


PLAN - I-BEAMS

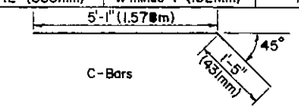
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

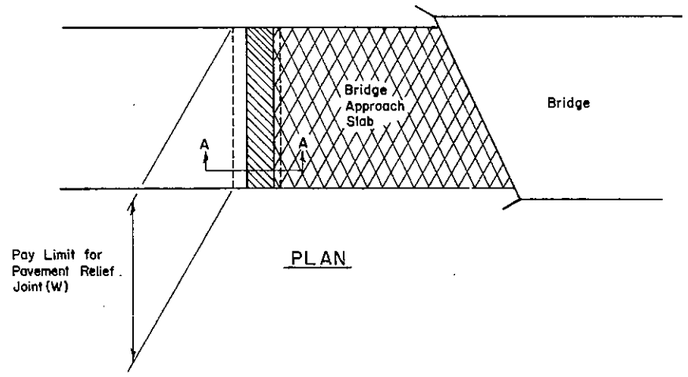
BRIDGE APPROACH SLAB

Recommended	Approved July 24, 1980	Sht. 2 Of 2
Director, Bureau of Design	Deputy Sec. for Highway Admin.	RC-23

SCHEDULE OF REINFORCEMENT STEEL

MARK	SIZE	SPACING C-C	LENGTH	NO. REQ'D
A	4	12" (305mm)	4' (1.219m)	(W)
B	4	12" (305mm)	W minus 4" (102mm)	5
C	4	6" (152mm)	6'-6" (1.981m)	(W) (2)
D	4	12" (305mm)	W minus 4" (102mm)	7

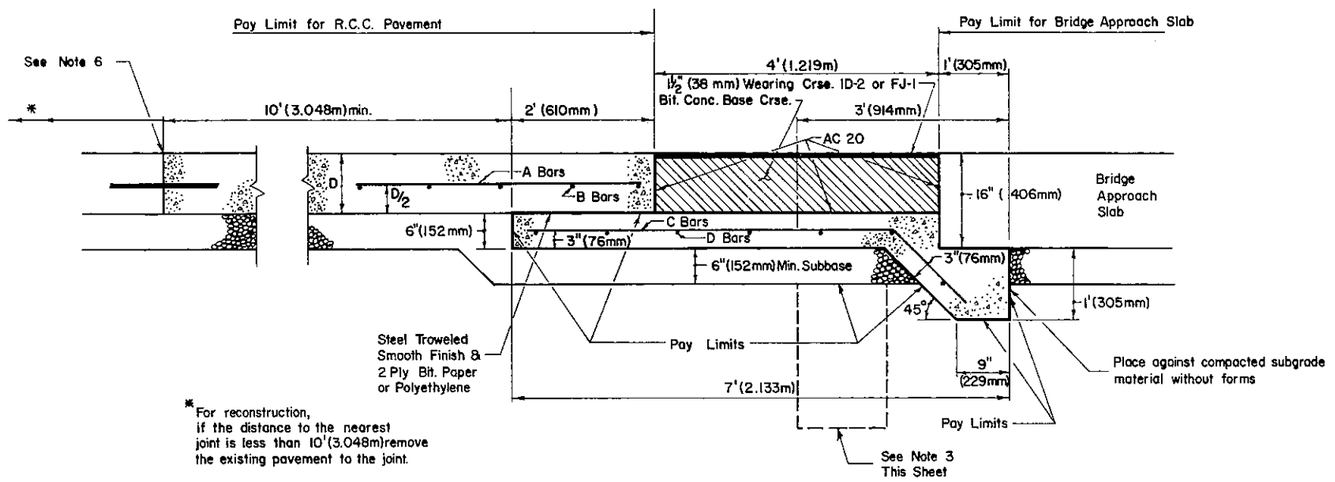




PLAN

GENERAL NOTES

1. Concrete in subslab to be Class AA (at contractors option subslab concrete may be H.E.S.)
2. Portions of reinforcing bars which are outside of the indicated pay lines are to be included in bid price for Pavement Relief Joint.
3. When the pavement grade causes drainage towards the bridge, a Subgrade Drain (See RC-30) shall be placed under the 6" (152 mm) portion of the subslab and will be measured and paid for as specified in Section 612 of Form 408.
4. Where bridges are located less than 1,000 ft. (304.800m) apart, measured from the face of the nearest abutments, no relief joint will be used between the bridges.
5. Where bridges are located between 1,000 ft. (304.800m) and 1,500 ft. (457.200m) apart, one relief joint shall be placed midway between the bridges. In these cases the subslab shall be a uniform 6in. (152mm) thick and 8ft. (2.438m) wide.
6. For joint details on new construction see RC-20. For joint details on reconstruction see RC-26.



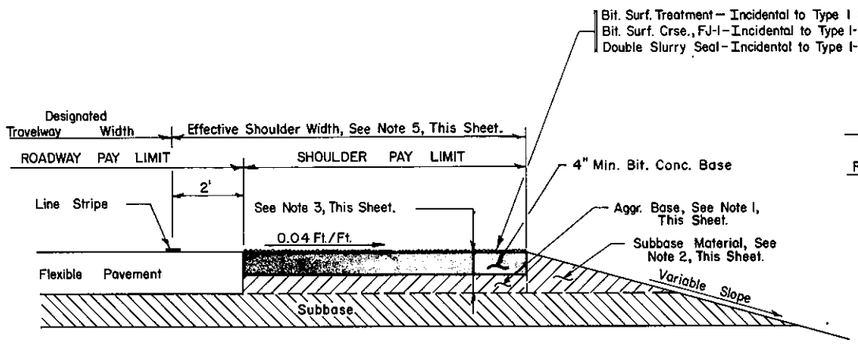
SECTION A-A

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

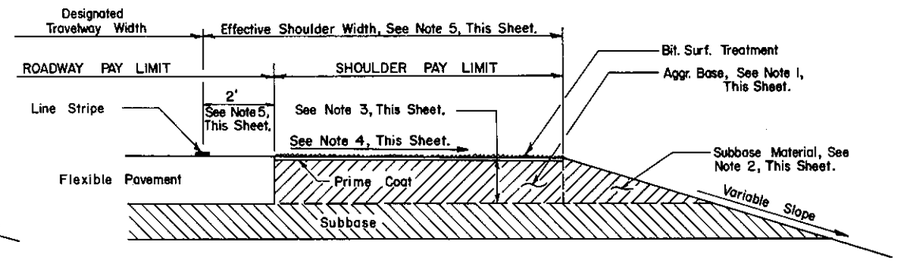
PAVEMENT RELIEF JOINT

Recommended Sept. 8, 1981	Approved Sept. 8, 1981	Sht. 1 Of 1
B. D. Ponchis	Alfred T. Ayre	RC-24
Dir. Bureau of Highway Design	Chief Highway Engineer	

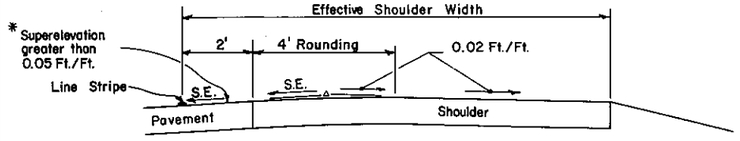
TRACED BY
FINAL BY



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



TYPE 3 SHOULDER



* For superelevations under 0.05 Ft./Ft., eliminate the 4' rounding and use the 0.02 Ft./Ft. shoulder slope beginning from the edge of pavement.

SHOULDER ROUNDING ON HIGH SIDE OF SUPERELEVATED CURVES

NOTES

1. The Aggr. Base shall be constructed as specified in Section 350.3, Form 408, and shall be considered part of the shoulder.
2. The payment for this area of subbase material shall be considered incidental to the shoulder.
3. Depth of shoulder to be the combined depth of surface and base courses.
4. Slope shoulder at 0.06 Ft./Ft. for effective shoulder widths ≤ 8 Ft.
   Slope shoulder at 0.04 Ft./Ft. for effective shoulder widths > 8 Ft.
5. For effective shoulder widths 6 Ft. and less, pave out-to-out of shoulders with full depth roadway pavement.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

SHOULDERS

Recommended May 6, 1982
Dir. Bureau of Highway Design

Recommended May 6, 1982
Chief Highway Engineer

Sht. 1 Of 3

RC-25

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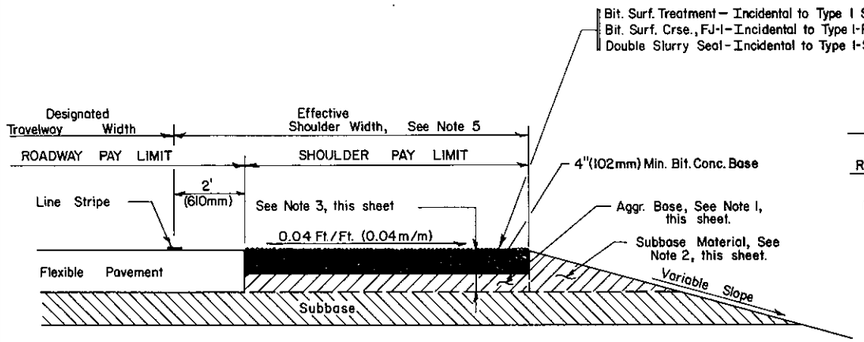
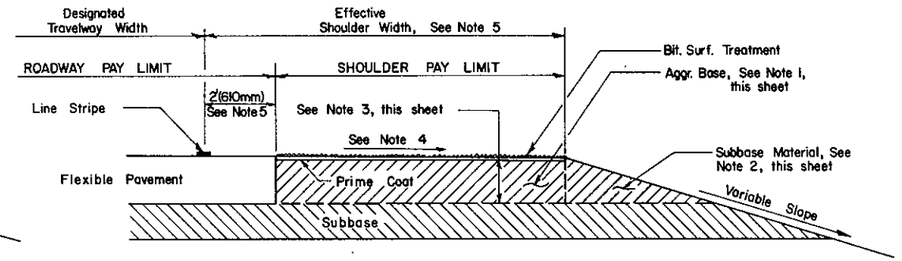
VOIDED BY CHANGE #1



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



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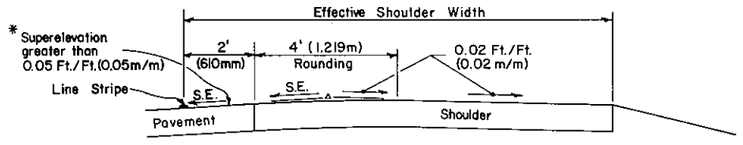

* For superelevations under 0.05 Ft./Ft., eliminate the 4' (1.219m) rounding and use the 0.02 Ft./Ft. (0.02 m/m) slope on the shoulder, beginning from the edge of the pavement.

SHOULDER ROUNDING ON HIGH SIDE OF SUPERELEVATED CURVES

NOTE: Shoulder rounding is to be used only on Interstate & Other Freeways and Arterial unless otherwise shown on the typical sections.

NOTES

1. The Aggr. Base shall be constructed as specified in Section 350.3, Form 408, and shall be considered part of the shoulder.
2. The payment for this area of subbase material shall be considered incidental to the shoulder.
3. Depth of shoulder to be the combined depth of surface and base courses.
4. Slope shoulder at .06 1/1 (.06 m/m) for effective shoulder widths ≤ 8' (2.438m). For effective shoulder widths >8' (2.438m) slope shoulder at .04 1/1 (.04 m/m).
5. For effective shoulder widths 6' (1.829m) and less, pave out to out of shoulders with full depth roadway pavement.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

SHOULDERS

Recommended Sept. 8, 1981	Approved Sept. 8, 1981	Sht. 1 Of 3
B. D. Kowalski	Chief Highway Engineer	RC-25
Dir. Bureau of Highway Design		

TRACED BY
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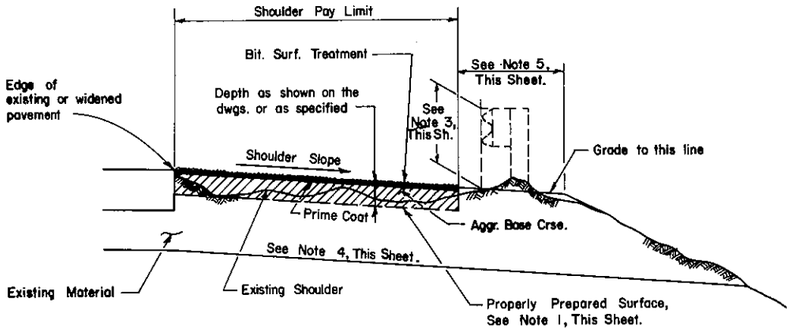
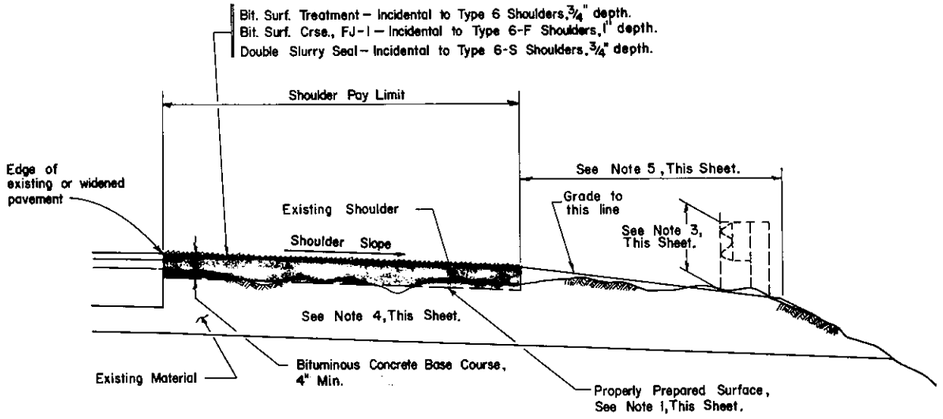


TYPE 4 SHOULDER



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

NOTES

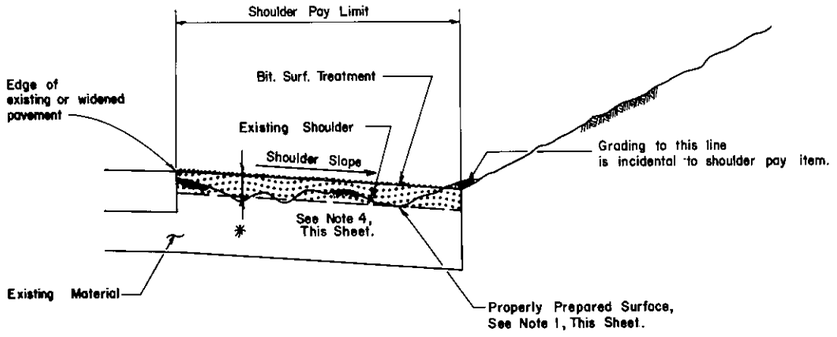
1. For Type 4, Type 5, and Type 6 Shoulders, a properly prepared surface is one that is either shaped and/or scarified and/or compacted. Shaping includes removal of existing shoulder material and the placement of graded material from the shaping operation into the low areas. Where there is insufficient graded material from the shaping operation, the Contractor shall complete the work by adding additional aggr. base crse. material. The additional material is incidental to the shoulder item.

2. For Type 7 Shoulders, a properly prepared existing paved shoulder is one that is cleaned and patched.

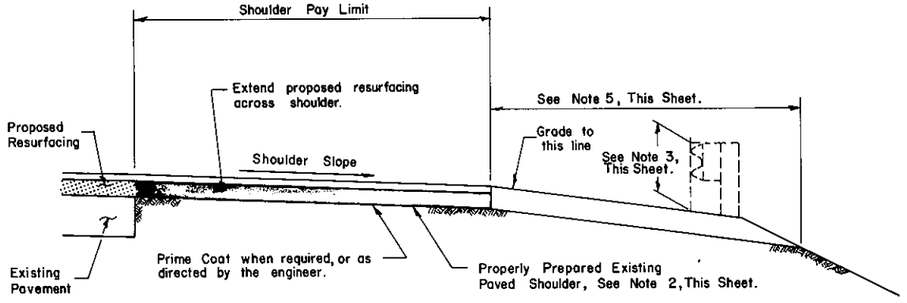
3. The guard rail type, height and location from shoulder may vary, but when the height from the top of the rail to the proposed surface becomes less than 24", the guard rail shall be removed, replaced and/or reset in accordance with current guard rail standards. Where guard rail has rubbing rail attached, the rubbing rail shall be removed when the height of guard rail becomes less than 27".

4. Remove unsuitable material as directed, excavate, and backfill with material meeting the requirements of Section 350 or 351, Form 408. Shoulder excavation and backfill will be measured and paid for in accordance with Sections 654, 655 and 656, Form 408. (Cross sections not required.)

5. Grading will be considered incidental to the shoulder pay item. Where there is insufficient graded material from the grading operation to complete this operation, material meeting the requirements of Sect. 350 or 351, Form 408, shall be used and will be paid for as Tons of Selected Borrow Excavation. Where there is an excess of material from the shoulder excavation or grading operation, removal of this material shall be made as soon as possible and will be incidental to the shoulder pay item.



TYPE 5 SHOULDER



TYPE 7 SHOULDER

✳ The following min. dimensions shall apply:
- 5" for Aggr. Bit.
- 5" for Aggr. Lime Pozzolan
- 5" for Aggr. Cement Base
- 3" for FB-1 Binder
- 3" for DP-1

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

RECONSTRUCTED SHOULDERS

Recommended May 6, 1982 Dir, Bureau of Highway Design	Recommended May 6, 1982 Chief Highway Engineer	Sht. 2 Of 3 RC-25

TRACED BY
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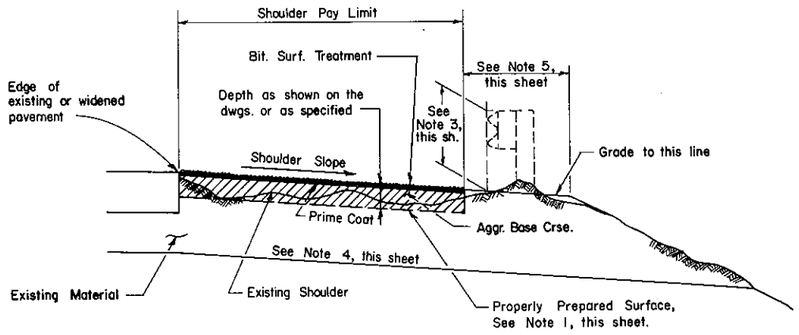
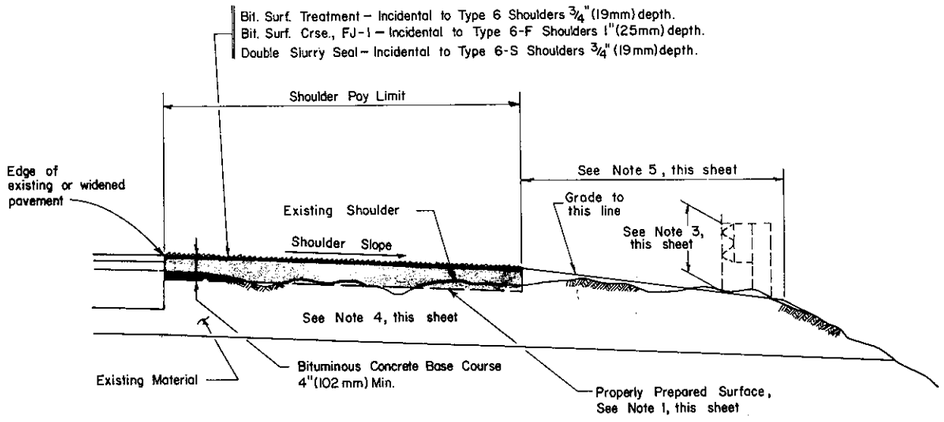


TYPE 4 SHOULDER



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

NOTES

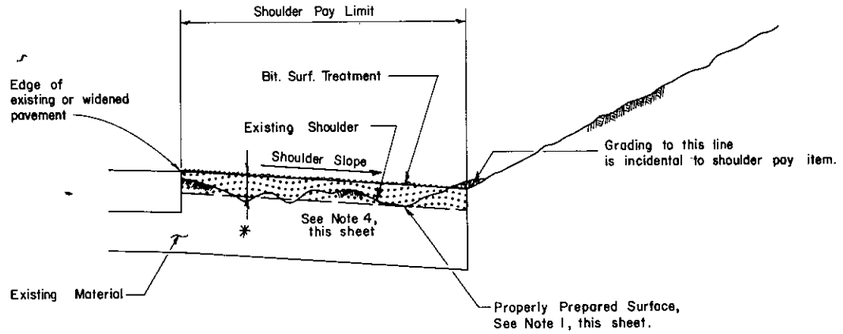
1. For Type 4, Type 5, and Type 6 Shoulders, a properly prepared surface is one that is either shaped and/or scarified and/or compacted. Shaping includes removal of existing shoulder material and the placement of graded material from the shaping operation into the low areas. Where there is insufficient graded material from the shaping operation, the Contractor shall complete the work by adding additional aggr. base crse. material. The additional material is incidental to the shoulder item.

2. For Type 7 Shoulders, a properly prepored existing paved shoulder is one that is cleaned and patched.

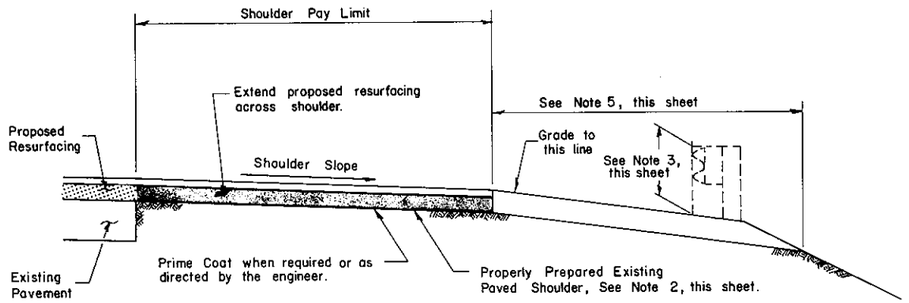
3. The guard rail type, height and location from shoulder may vary, but when the height from the top of the rail to the proposed surface becomes less than 24" (610mm), the guard rail shall be removed, replaced and/or reset in accordance with current guard rail standards. Where guard rail has rubbing rail attached, the rubbing rail shall be removed when the height of guard rail becomes less than 27" (686 mm).

4. Remove unsuitable material as directed, excavate, and backfill with material meeting the requirements of Section 350 or 351, Form 408. Shoulder excavation and backfill will be measured and paid for in accordance with Sections 654, 655, and 656, Form 408. (Cross sections not required.)

5. Grading will be considered incidental to the shoulder pay item. Where there is insufficient graded material from the grading operation to complete this operation, material meeting the requirements of Section 350 or 351 shall be used and will be paid for as Tons of Selected Borrow Excavation. Where there is an excess of material from the shoulder excavation or grading operation, removal of this material shall be made as soon as possible and will be incidental to the shoulder pay item.



TYPE 5 SHOULDER



TYPE 7 SHOULDER

* The following min. dimensions shall apply:
  5" (127mm) for Aggr. Bit.
  5" (127mm) for Aggr. Lime Pozzolan
  5" (127mm) for Aggr. Cement Base
  3" (76mm) for FB-1 Binder
  3" (76mm) for DP-1

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

RECONSTRUCTED SHOULDERS

Recommended Sept. 8, 1981	Approved Sept. 8, 1981	Sht. 2 Of 3
B.D. Kowalski	Alfred L. Clyx	RC-25
Dir. Bureau of Highway Design	Chief Highway Engineer	

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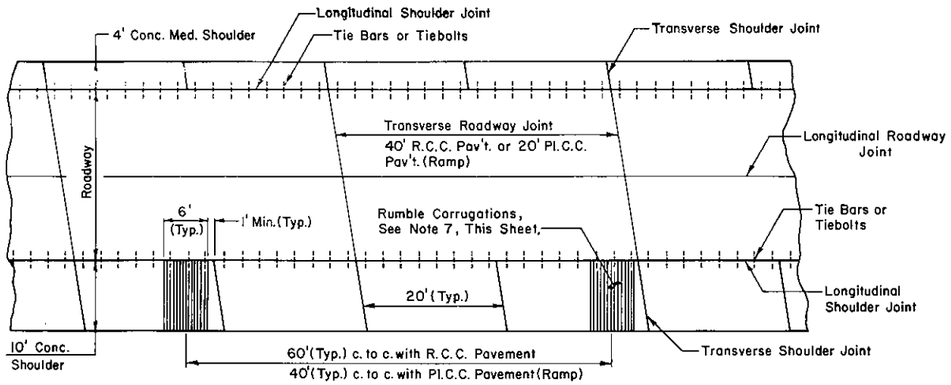
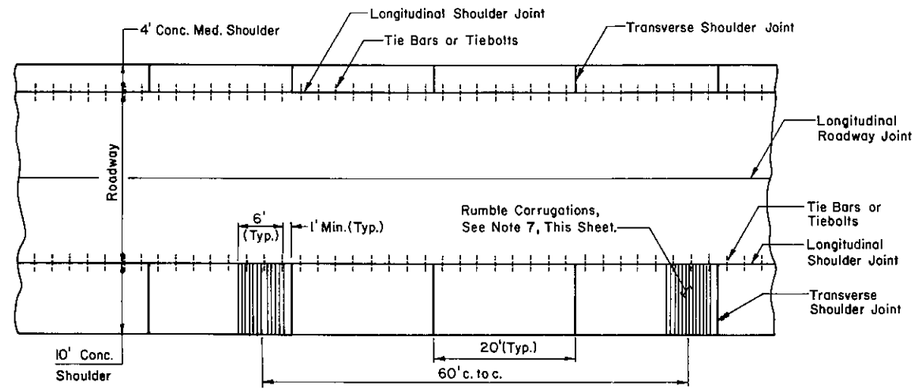
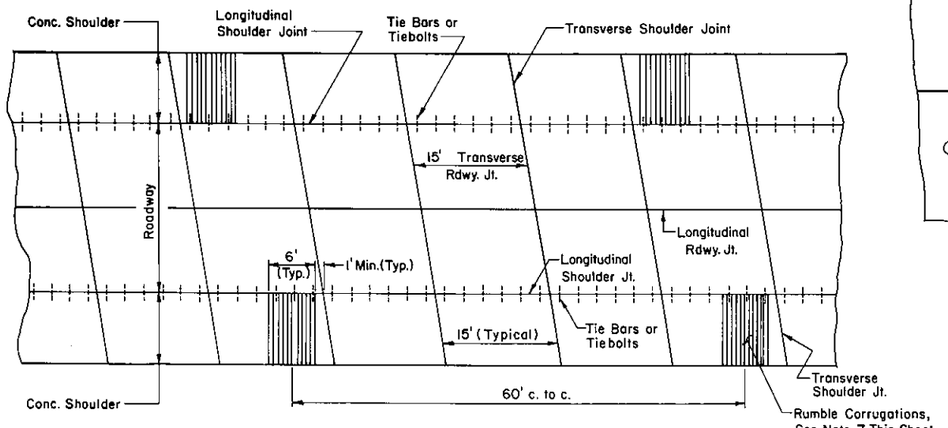


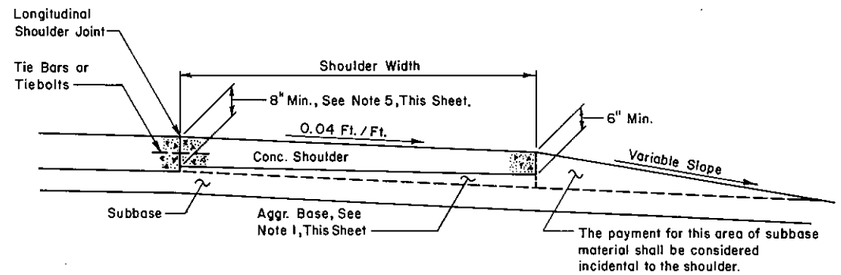
CONCRETE SHOULDERS ADJACENT TO R.C.C. PAVEMENT AND PL.C.C. PAVEMENT (RAMP)



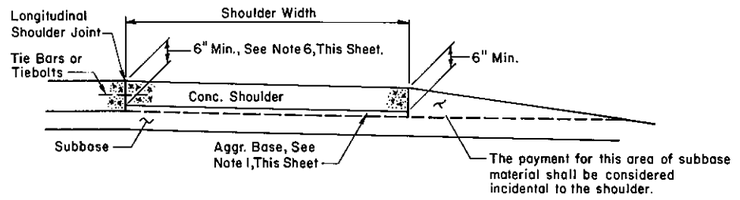
CONCRETE SHOULDERS ADJACENT TO C.R.C. PAVEMENT



CONCRETE SHOULDERS ADJACENT TO PLAIN CEMENT CONCRETE PAVEMENT

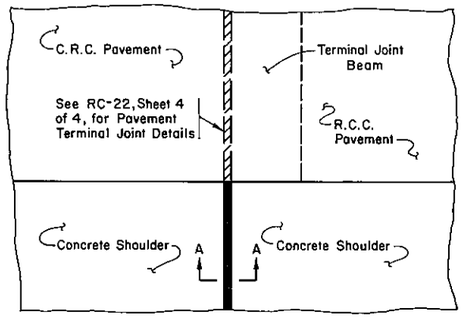


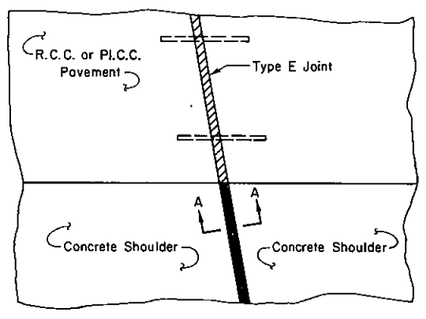
CONCRETE SHOULDER - TYPE 1

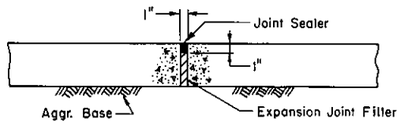


CONCRETE SHOULDER - TYPE 2

TYPICAL SECTION





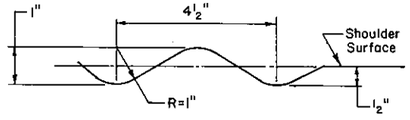


SECTION A-A

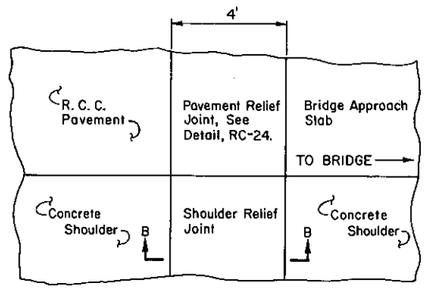
CONCRETE SHOULDER EXPANSION JOINTS

NOTES

1. The Aggr. Base shall be as specified in Section 350.3, Form 408, and shall be considered part of the shoulder.
2. All shoulder joints shall be sealed in accordance with Section 501.3(q), Form 408.
3. For joint details, see RC-20.
4. See RC-25, Sheet 1 of 3, for shoulder rounding detail on high side of superelevations.
5. At the contractors option, Type 1 concrete shoulders may be constructed as shown or at a uniform 8" depth and/or constructed at the same depth as the pavement, at no additional expense to the Department.
6. At the contractors option, Type 2 concrete shoulders may be constructed on a taper, with a 6" minimum depth, or at the same depth as the pavement, at no additional expense to the Department.
7. Start rumble corrugations 2" from the edge of the roadway pavement. Where a curb is used at the outside edge of the shoulder, the corrugations should be terminated at the gutter or a minimum of 1' from the curb.



CORRUGATION DETAIL



SECTION B-B

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DESIGN

SHOULDERS (CONCRETE)

Recommended May 6, 1982 Louis H. O'Brien Dir., Bureau of Highway Design	Recommended May 6, 1982 Chief Highway Engineer	Sht. 3 of 3 RC-25

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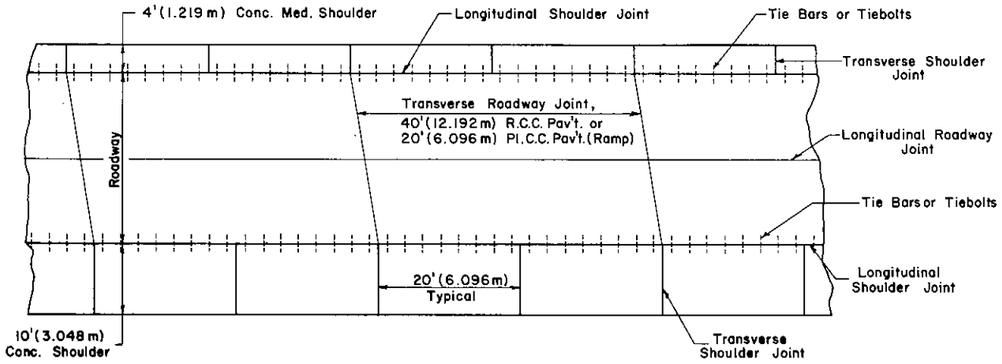
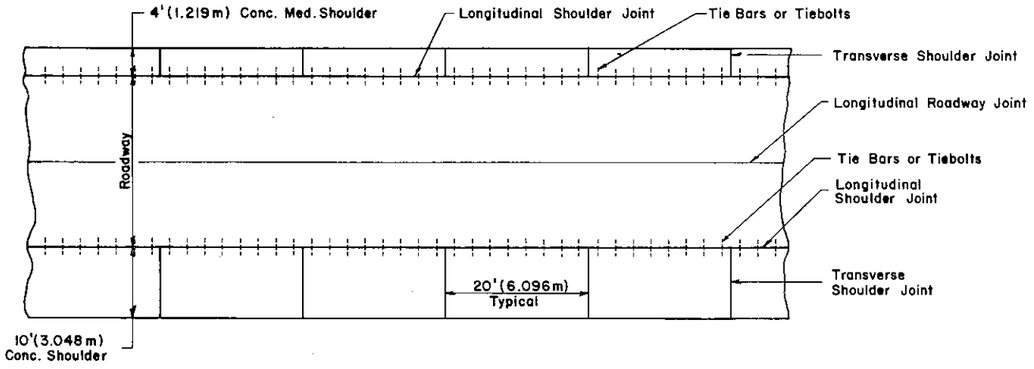
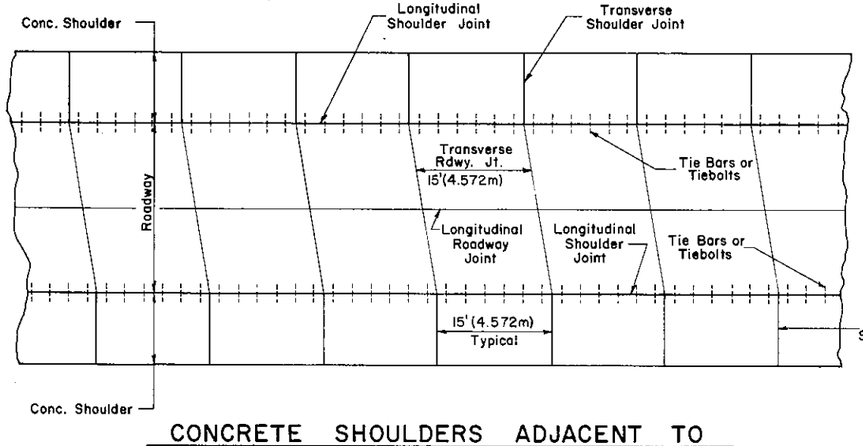
VOIDED BY CHANGE #1



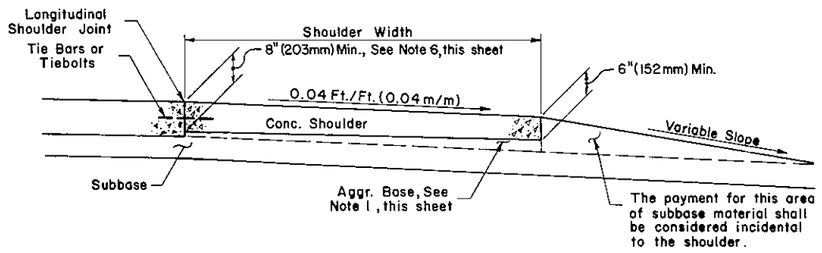
CONCRETE SHOULDERS ADJACENT TO R.C.C. PAVEMENT AND PL.C.C. PAVEMENT (RAMP)



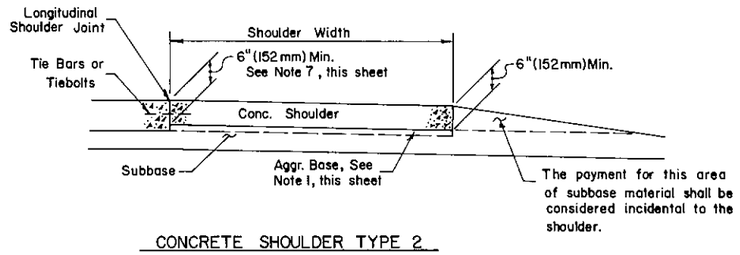
CONCRETE SHOULDERS ADJACENT TO C.R.C. PAVEMENT



CONCRETE SHOULDERS ADJACENT TO PL.C.C. PAVEMENT FOR COLLECTOR & LOCAL HIGHWAYS



CONCRETE SHOULDER TYPE 1



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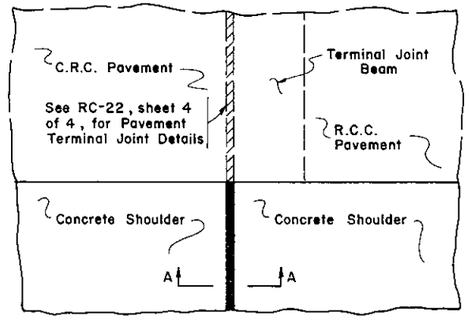
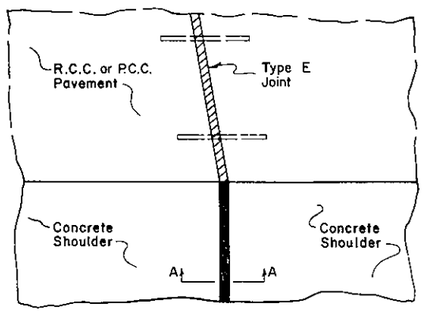


SECTION A-A

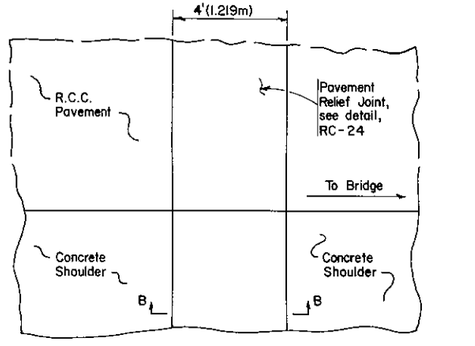


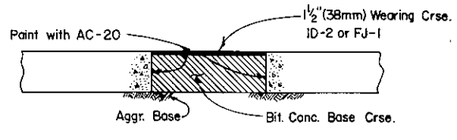
TYPICAL SECTION

CONCRETE SHOULDER EXPANSION JOINTS

NOTES

1. The Aggr. Base shall be as specified in Section 350.3, Form 408, and shall be considered part of the shoulder.
2. All shoulder joints shall be sealed in accordance with Section 501.3(q), Form 408.
3. For joint details, see RC-20.
4. See RC-25, sheet 1 of 3, for shoulder rounding detail on high side of superelevations.
5. At the contractors option, shoulder joints may be placed at a skew in line with the skewed joints of the roadway pavement.
6. At the contractors option, Type 1 concrete shoulders may be constructed as shown or at a uniform 8"(203mm) depth and/or constructed at the same depth as the pavement, at no additional expense to the Department.
7. At the contractors option, Type 2 concrete shoulders may be constructed on a taper, with a 6"(152mm) minimum depth, or at the same depth as the pavement, at no additional expense to the Department.





SECTION B-B

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

SHOULDERS (CONCRETE)

Recommended Sept. 8, 1981	Approved Sept. 8, 1981	Sht. 3 Of 3
B.D. Barkis	Alfred D. Hess	RC-25
Dir. Bureau of Highway Design	Chief Highway Engineer	

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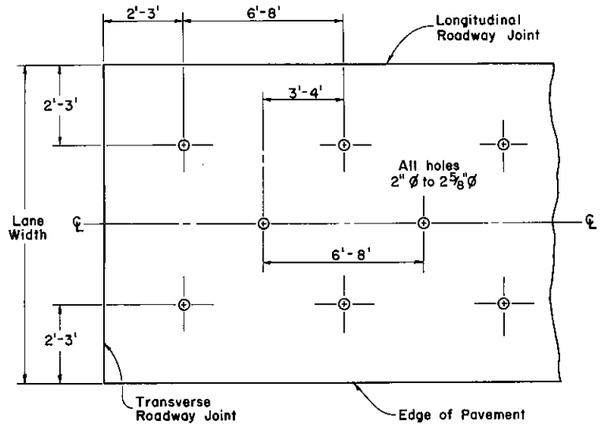
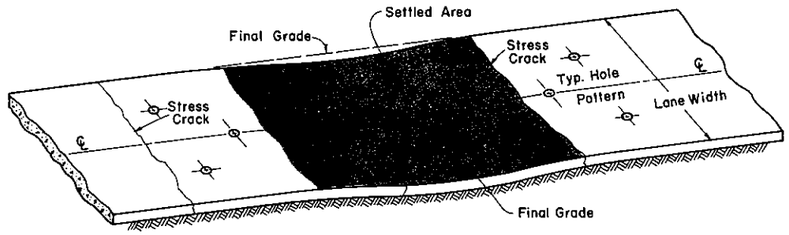
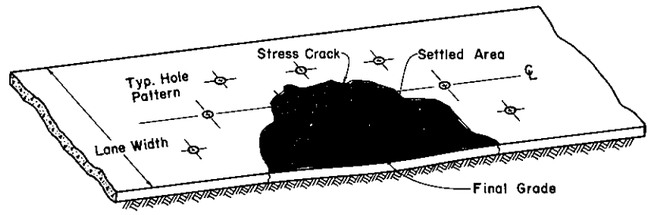


TYPICAL GUIDE FOR SLABJACKING HOLE ARRANGEMENT



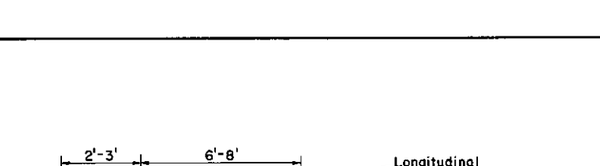
FULL LANE WIDTH SETTLEMENT



EDGE SETTLEMENT

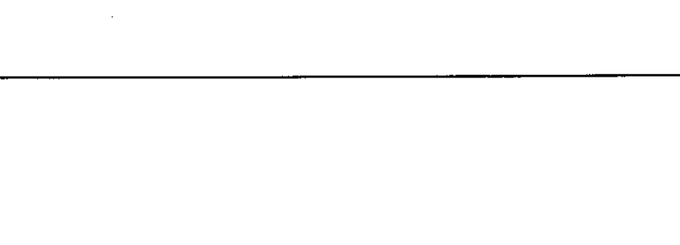
SLAB SETTLEMENT BETWEEN TRANSVERSE ROADWAY JOINTS

* See Note 3, This Sheet.



SLABJACKING PROCEDURE

A. Holes shall be located and drilled in accordance with the Typical Guide For Slabjacking Hole Arrangement or as directed by the engineer in the field. Debris left from drilling shall be removed from holes before pumping.
B. A thin mix shall be developed that will be adequate for penetrating and lubricating the subgrade area. During this step wooden plugs shall not be used and the material shall be pumped only to the extent that the thin mix is visible in other holes. It is important to prevent the thin mix from entering the holes in any great quantity, but should this occur, it is then necessary to pump the thicker mix under the pavement and allow the thin mixture to be forced out the adjacent holes.
C. Allow a short time for the thin mix to settle (approximately ½ hour).
D. Develop a thicker mix similar in consistency to that which is produced from a caulking gun and in accordance with Form 408, Section 681. Do not plug any hole until the mix being forced out that hole is of such a consistency that it would resemble a stiff caulking material.
E. Plug the appropriate holes one at a time when the thicker mix begins to discharge from them.
F. Pumping shall be alternated between the holes generally beginning with the lowest hole in the center of the slab and working outward, or as directed by the engineer in the field.
G. All holes shall be plugged and traffic kept off the raised slab for a minimum of three (3) hours or as directed by the engineer in the field. The wooden pegs may be broken off flush to the pavement if it is necessary to have the road opened to traffic before the required time.
H. The engineer reserves the right to modify the consistency of the mix to achieve the necessary goal of penetrating and lubricating the subgrade area, lifting the slab or filling the voids.



SLAB SETTLEMENT AT TRANSVERSE ROADWAY JOINTS

NOTES

1. All materials and workmanship shall be in accordance with the requirements of Section 681, Form 408.
2. Hole spacing may be varied within the indicated dimensions, but once a pattern is established, it shall be continued over the entire settled area.
3. Holes shall not be drilled on cracks. If a pattern places a hole on a crack, the hole shall be moved a distance of 1' to 2' from the crack. The overall pattern does not have to be changed.
4. Holes shall be drilled outside the settled area to allow for pressure relief during pumping in the holes of the settled area.
5. The contractor is responsible for damage occuring to the pavement slab, shoulders, guard rail, curb, structures, drainage and underground utilities due to his operation.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

CONCRETE PAVEMENT MAINTENANCE

SLABJACKING

Recommended May 6, 1982	Recommended May 6, 1982	Sht. 1 Of 3
Dir., Bureau of Highway Design	Chief Highway Engineer	RC-26

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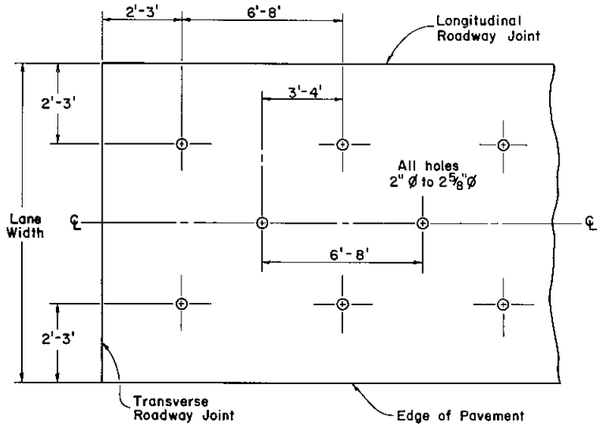
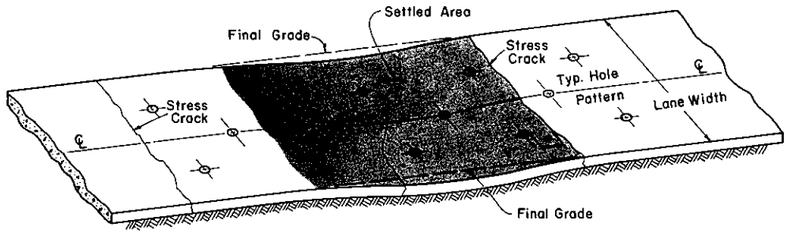
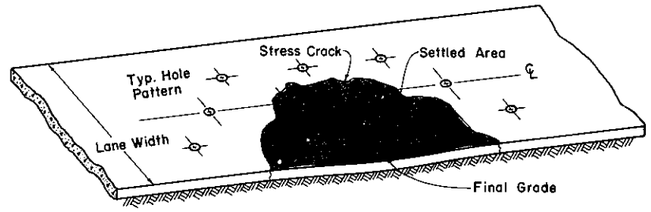


TYPICAL GUIDE FOR SLABJACKING HOLE ARRANGEMENT



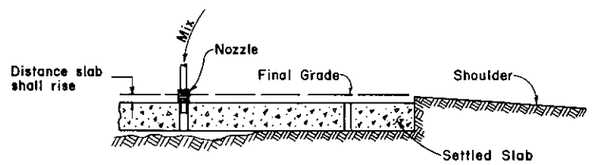
FULL LANE WIDTH SETTLEMENT



EDGE SETTLEMENT

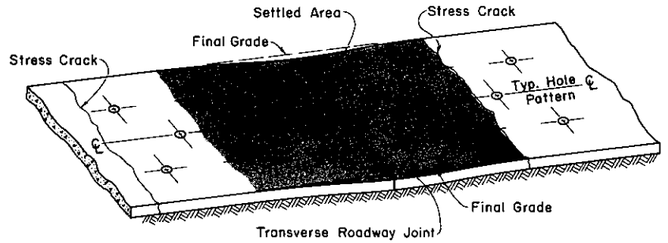
SLAB SETTLEMENT BETWEEN TRANSVERSE ROADWAY JOINTS

✳ See Note 3, this sheet.



SLABJACKING PROCEDURE

A. Holes shall be located and drilled in accordance with the Typical Guide For Slabjacking Hole Arrangement or as directed by the engineer in the field. Debris left from drilling shall be removed from holes before pumping.
B. A thin mix shall be developed that will be adequate for penetrating and lubricating the subgrade area. During this step wooden plugs shall not be used and the material shall be pumped only to the extent that the thin mix is visible in other holes. It is important to prevent the thin mix from entering the holes in any great quantity, but should this occur, it is then necessary to pump the thicker mix under the pavement and allow the thin mixture to be forced out the adjacent holes.
C. Allow a short time for the thin mix to settle (approximately ½ hour).
D. Develop a thicker mix similar in consistency to that which is produced from a caulking gun and in accordance with Form 408, Section 681. Do not plug any hole until the mix being forced out that hole is of such a consistency that it would resemble a stiff caulking material.
E. Plug the appropriate holes one at a time when the thicker mix begins to discharge from them.
F. Pumping shall be alternated between the holes generally beginning with the lowest hole in the center of the slab and working outward, or as directed by the engineer in the field.
G. All holes shall be plugged and traffic kept off the raised slab for a minimum of three (3) hours or as directed by the engineer in the field. The wooden pegs may be broken off flush to the pavement if it is necessary to have the road opened to traffic before the required time.
H. The engineer reserves the right to modify the consistency of the mix to achieve the necessary goal of penetrating and lubricating the subgrade area, lifting the slab or filling the voids.



SLAB SETTLEMENT AT TRANSVERSE ROADWAY JOINTS

NOTES

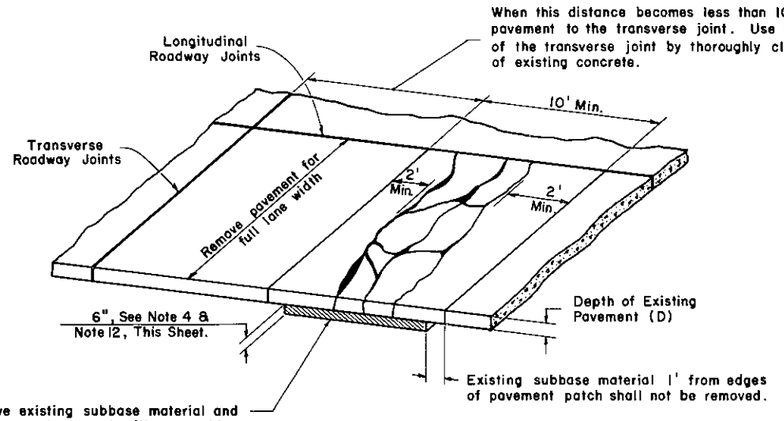
1. All materials and workmanship shall be in accordance with the requirements of Section 681, Form 408.
2. Hole spacing may be varied within the indicated dimensions, but once a pattern is established, it shall be continued over the entire settled area.
3. Holes shall not be drilled on cracks. If a pattern places a hole on a crack, the hole shall be moved a distance of 1' to 2' from the crack. The overall pattern does not have to be changed.
4. Holes shall be drilled outside the settled area to allow for pressure relief during pumping in the holes of the settled area.
5. The contractor is responsible for damage occuring to the pavement slab, shoulders, guard rail, curb, structures, drainage and underground utilities due to his operation.

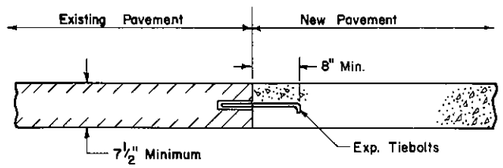
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

CONCRETE PAVEMENT MAINTENANCE
SLABJACKING

Recommended Sept. 8, 1981 B.D. Gamble Dir. Bureau of Highway Design	Approved Sept. 8, 1981 Alfred D. Hoyt Chief Highway Engineer	Sht. 1 Of 3 RC-26

TRACED BY
FINAL BY

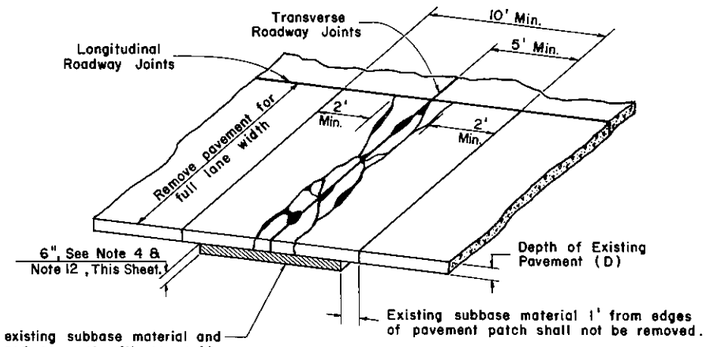


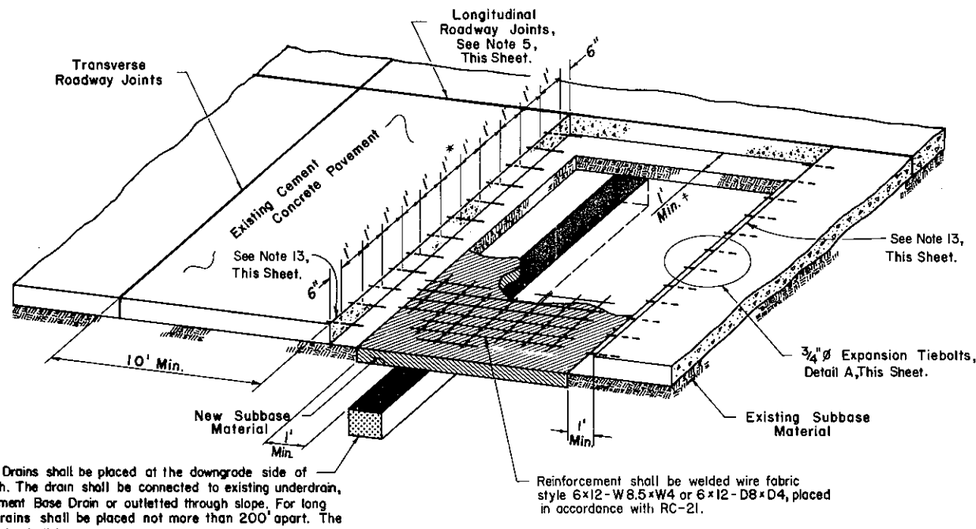


DETAIL A

EXPANSION TIEBOLT

Only Expansion Tiebolts which are supplied by an approved manufacturer, as listed in Bulletin No. 15, will be permitted. The inserted anchor portion shall accommodate a hook bolt of ¾" in diameter. The Expansion Tiebolts shall have a minimum pull-out strength of 15,000 pounds.

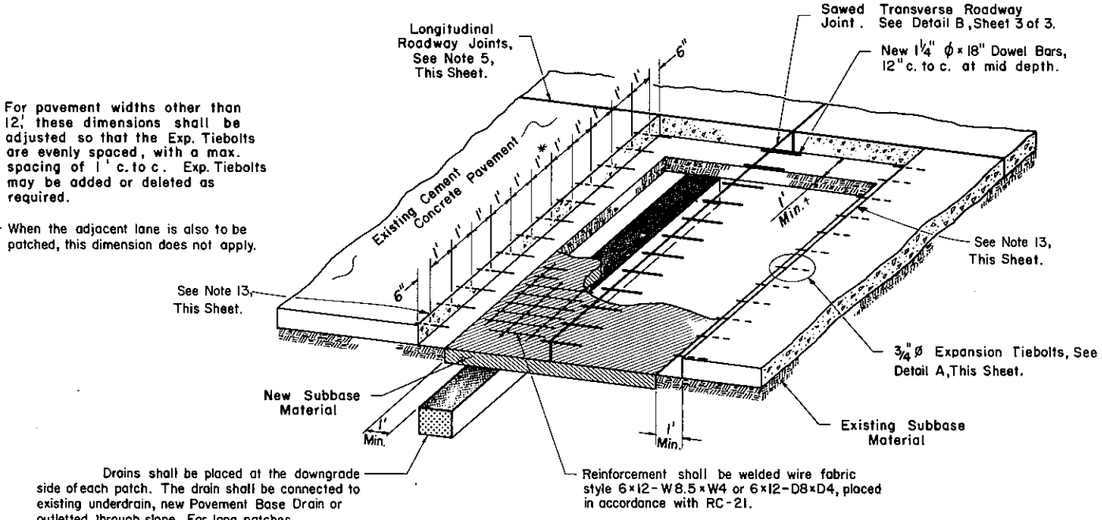




PAVEMENT PATCHING BETWEEN TRANSVERSE ROADWAY JOINTS

* For pavement widths other than 12', these dimensions shall be adjusted so that the Exp. Tiebolts are evenly spaced, with a max. spacing of 1' c. to c. Exp. Tiebolts may be added or deleted as required.

† When the adjacent lane is also to be patched, this dimension does not apply.



PAVEMENT PATCHING AT TRANSVERSE ROADWAY JOINTS

GENERAL NOTES FOR PATCHING

1. The area to be patched shall be outlined normal to the center line of the road.
2. A full depth saw cut shall be made with approved equipment along each side that is not bound by a joint. The face of the existing pavement shall be reasonably vertical for the full depth of the pavement.
3. The existing concrete shall be removed at the end of each working day and there shall be no broken concrete or other debris left along the shoulder or in the ditch.
4. If the material beneath the existing subbase is unsuitable, additional excavation and subbase will be required.
5. When a single lane is to be patched, the face of the longitudinal joint that has not been disturbed shall be thoroughly cleaned before the new concrete is placed against it. Tie bars projecting from the existing lane may be left in place. The edge of the patch next to the longitudinal joint shall be saw cut 3/16" wide and 1" deep and the resulting groove shall be sealed with joint sealing material after the patching is completed.
6. The surface of the patch shall be finished to match the existing pavement cross section, including any existing wheel path ruts. When the patch length exceeds one panel of the existing pavement, the wheel ruts at both ends of the patch shall be tapered to a straight pavement cross slope, within the patch, with a minimum transition length of 10.
7. If a patch extends over the full width of the pavement, a Type L construction joint shall be used.
8. When placing new concrete the subbase shall be conditioned as specified in Section 501.3(g), Form 408. The edge of the old concrete shall be moistened.
9. When the shoulder area adjacent to patch is disturbed for reasons other than the placing of drainage items, it shall be replaced in kind and the cost shall be incidental to the concrete patch item.
10. The contractor is responsible for the removal of any item obstructing his work area and restoring the same to the original condition at no additional expense to the Department.
11. These guidelines for concrete patching are restricted to the replacement of conventionally reinforced and plain cement concrete pavements and do not apply to continuously reinforced concrete pavement.
12. The removal of the pavement, the existing subbase and the unsuitable additional excavation will be paid for as Class 1 Excavation. It will be measured in accordance with Section 203.4(a)2, Form 408, using the three dimensional method. (No cross sections will be required.)
13. A sealant reservoir, ½" wide and ½" deep, shall be constructed by sawing, forming, or tooling. The reservoir shall be sealed with joint sealing material meeting the requirements of Section 705.5(a), Form 408.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

CONCRETE PAVEMENT MAINTENANCE

PLAIN & REINFORCED PATCHING

Recommended May 6, 1982	Recommended May 6, 1982	Sht. 2 Of 3
Dir., Bureau of Highway Design	Chief Highway Engineer	RC-26

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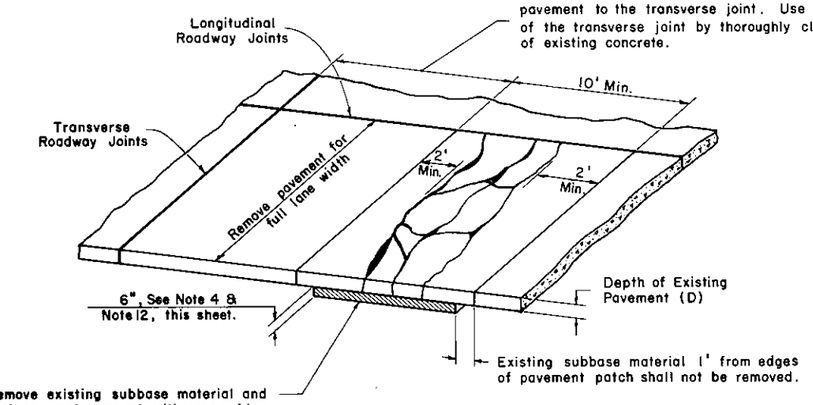
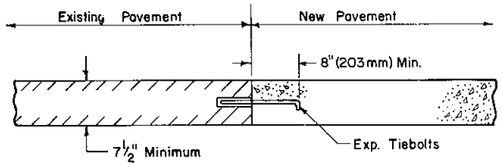
FINAL BY

VOIDED BY CHANGE #1





DETAIL A

EXPANSION TIEBOLT

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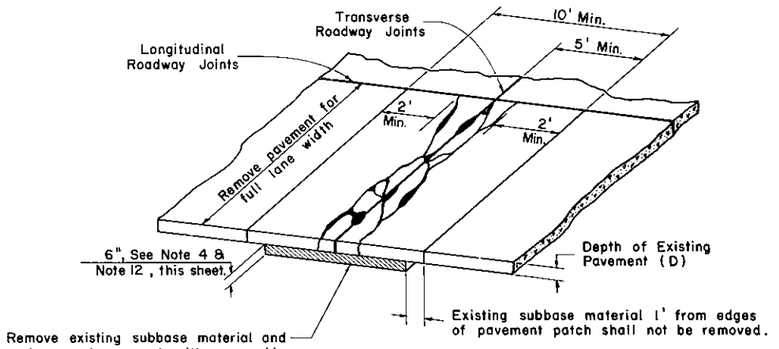
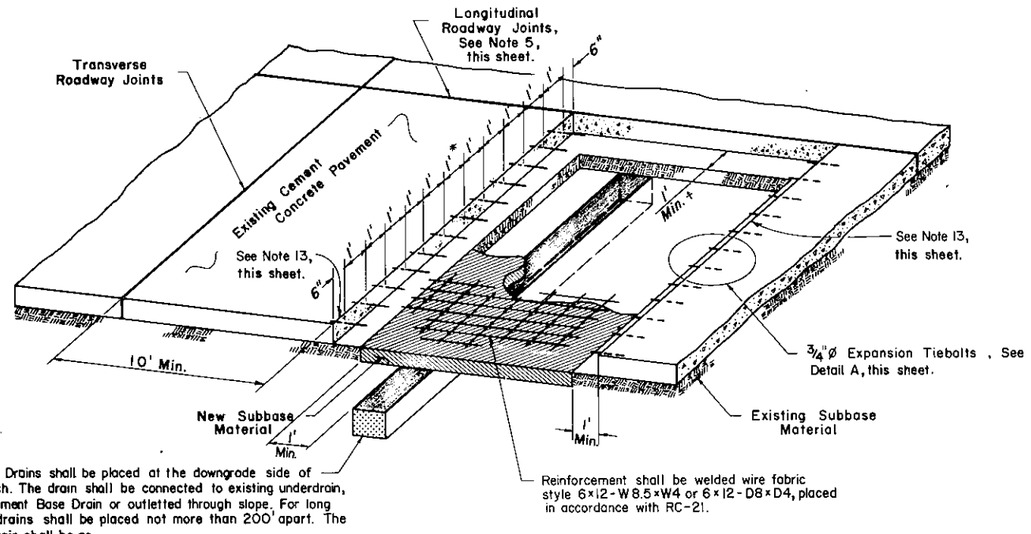
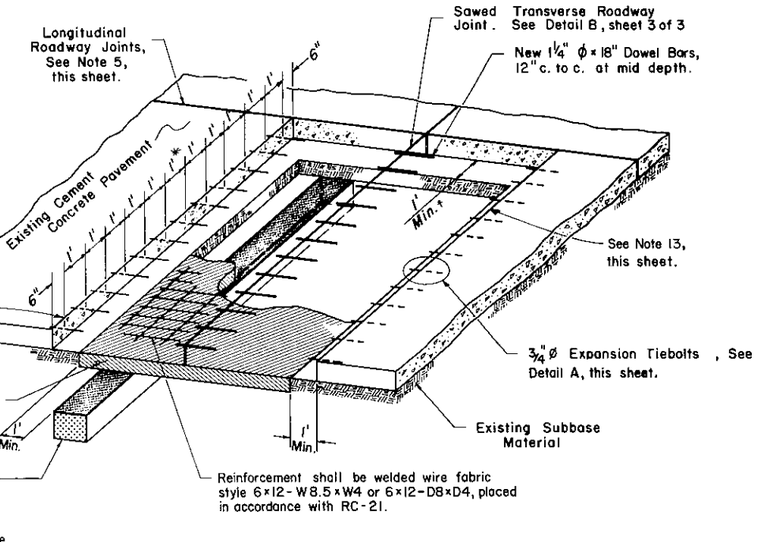




PAVEMENT PATCHING BETWEEN TRANSVERSE ROADWAY JOINTS

* For pavement widths other than 12' these dimensions shall be adjusted so that the Exp. Tiebolts are evenly spaced, with a max. spacing of 1' c. to c. Exp. Tiebolts may be added or deleted as required.

† When the adjacent lane is also to be patched, this dimension does not apply.



PAVEMENT PATCHING AT TRANSVERSE ROADWAY JOINTS

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10. The contractor is responsible for the removal of any item obstructing his work area and restoring the same to the original condition at no additional expense to the Department.
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12. The removal of the pavement, the existing subbase and the unsuitable additional excavation will be paid for as Class 1 Excavation. It will be measured in accordance with Section 203.4(a)2, Form 408, using the three dimensional method. (No cross sections will be required.)
13. A sealant reservoir, ½" wide and ½" deep, shall be constructed by sawing, forming, or tooling. The reservoir shall be sealed with joint sealing material meeting the requirements of Section 705.5(a) Form 408.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

CONCRETE PAVEMENT MAINTENANCE

PLAIN & REINFORCED PATCHING

Recommended Sept. 8, 1981 B.O. Lonskie Dir. Bureau of Highway Design	Approved Sept. 8, 1981 Alfred D. Glyx Chief Highway Engineer	Sht. 2 Of 3 RC-26

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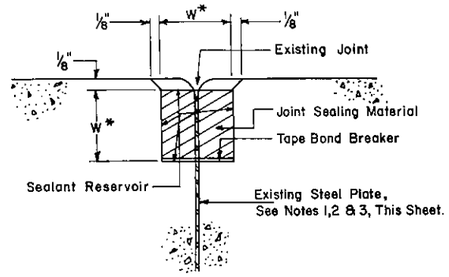
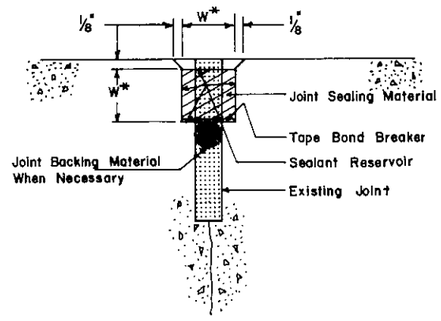
FINAL BY

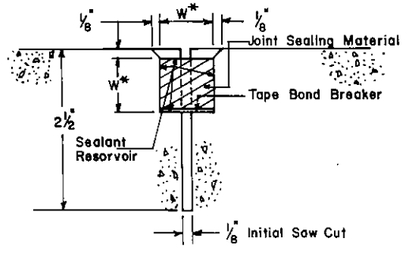


TYPE 2



TYPE 1

JOINT REHABILITATION



DETAIL B

WHEN THE EXISTING JOINT IS REPLACED FULL DEPTH

See Note 5, This Sheet.

*See Note 4, This Sheet.

NOTES

1. The existing steel plate is either 14 Gauge with a lapped top, or a flat plate 1/8" thick.
2. Where an existing joint contains a steel plate, it shall be removed to the bottom of the new sealant reservoir.
3. If the slab is being replaced adjacent to an existing joint, the removal of the steel plate or premolded expansion material below the new saw cut is optional.
4. When the existing joint spacing is less than 50', W shall be 3/4". When the existing joint spacing is 50' or more, W shall be 1".
5. Where the existing pavement has been replaced at a transverse joint, the joint sealant reservoir shall be constructed in two stages. The first stage shall consist of sawing the initial cut to the width and depth indicated in accordance with the applicable requirements of Section 501.3 (j) 1, Form 408. The second stage shall consist of sawing the sealant reservoir to the width and depth indicated. This second stage sawing shall not be performed until the concrete has hardened sufficiently to permit sawing without damage by blade action to the concrete adjacent to the joint. No raveling is permitted.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

CONCRETE PAVEMENT MAINTENANCE

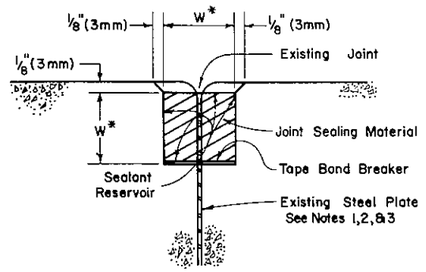
JOINT REHABILITATION & CONCRETE JOINT SPALL REPAIR

Remove Change #2

Recommended May 6, 1982 Louis M. O'Brien Director, Bureau of Highway Design	Recommended May 6, 1982 Alfred T. Lyng Chief Highway Engineer	Sht. 3 Of 3 RC-26

TRACED BY
FINAL BY

VOIDED BY CHANGE #1



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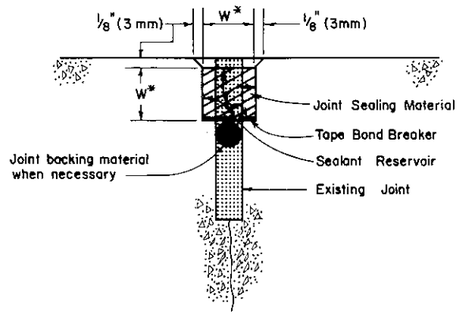
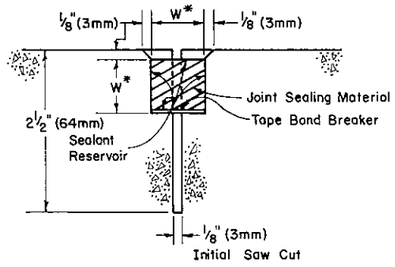


TYPE 1

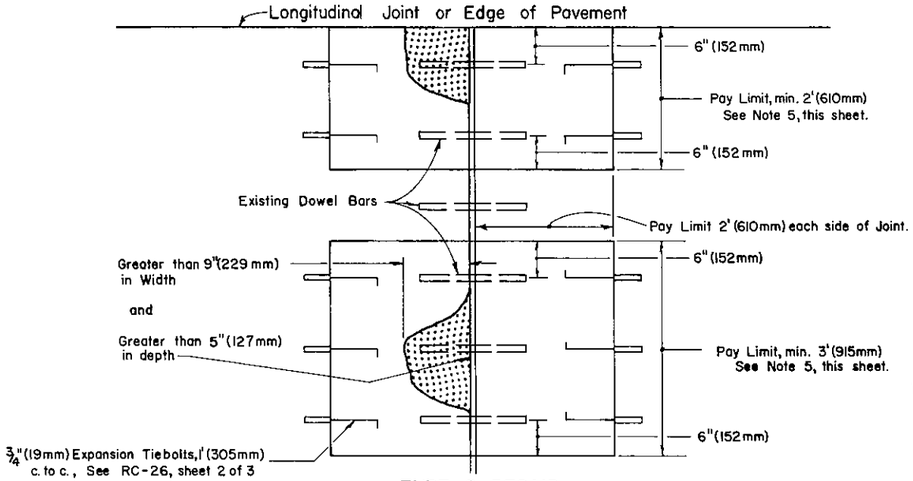
JOINT REHABILITATION



DETAIL B

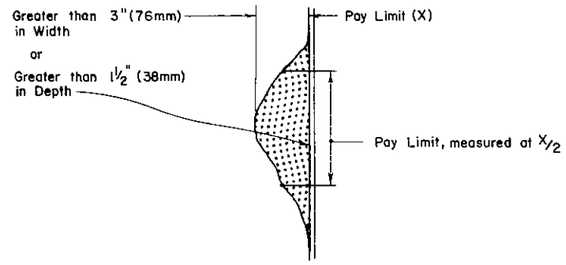
WHEN THE EXISTING JOINT IS REPLACED FULL DEPTH

See Note 6

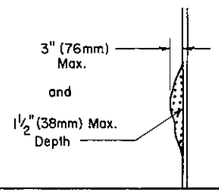


TYPE 2 REPAIR

See Note 7

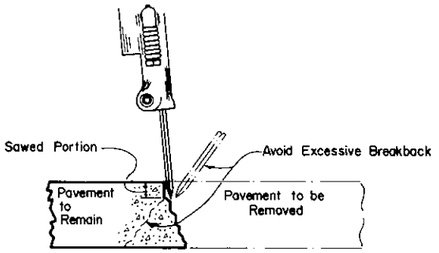


TYPE 1 REPAIR



NO REPAIR REQUIRED

CONCRETE JOINT SPALL REPAIR



PAVEMENT REMOVAL FOR TYPE 2 REPAIR

NOTES

1. The existing steel plate is either 14 Ga. with a lapped top, or a flat plate 1/8" (3mm) thick.
2. Where an existing joint contains a steel plate it shall be removed to the bottom of the new sealant reservoir.
3. If the slab is being replaced adjacent to an existing joint, the removal of the steel plate or premolded expansion material below the new saw cut is optional.
4. When the existing joint spacing is less than 50' (15.240m), W shall be 3/4" (19mm). When the existing joint spacing is 50' (15.240m) or more, W shall be 1" (25mm).
5. Patch Limits for Type 2 Repair to be midpoint between existing dowel bars which are 12" (305mm) apart.
6. Where the existing pavement has been replaced at a transverse joint, the joint sealant reservoir shall be constructed in two stages. The first stage shall consist of sawing the initial cut to the width and depth indicated in accordance with the applicable requirements of Section 501.3(j)1. The second stage shall consist of sawing the sealant reservoir to the width and depth indicated. This second stage sawing shall not be performed until the concrete has hardened sufficiently to permit sawing without damage by blade action to the concrete adjacent to the joint. No raveling is permitted.
7. If more than 60% of a lane width requires a Type 2 Concrete Joint Spall Repair, the entire joint shall be replaced in accordance with RC-26 Sheet 2 of 3 and paid for as Pavement Patching.

*See Note 4

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

CONCRETE PAVEMENT MAINTENANCE

JOINT REHABILITATION & CONCRETE JOINT SPALL REPAIR

Recommended Sept. 8, 1981	Approved Sept. 8, 1981	Sht. 3 Of 3
B.O. Bowser	Alfred T. Eyth	RC-26
Dir. Bureau of Highway Design	Chief Highway Engineer	

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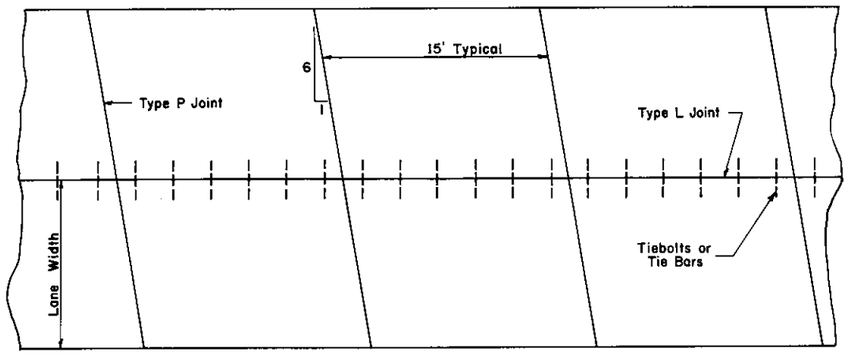
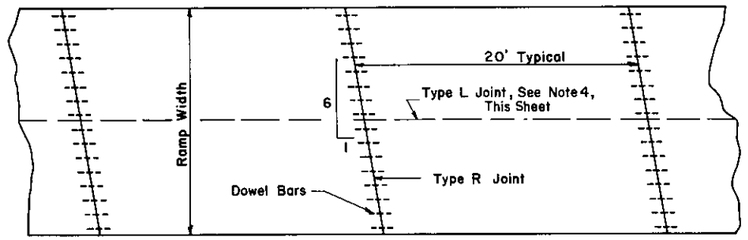
FINAL BY



PLAN

ROADWAY

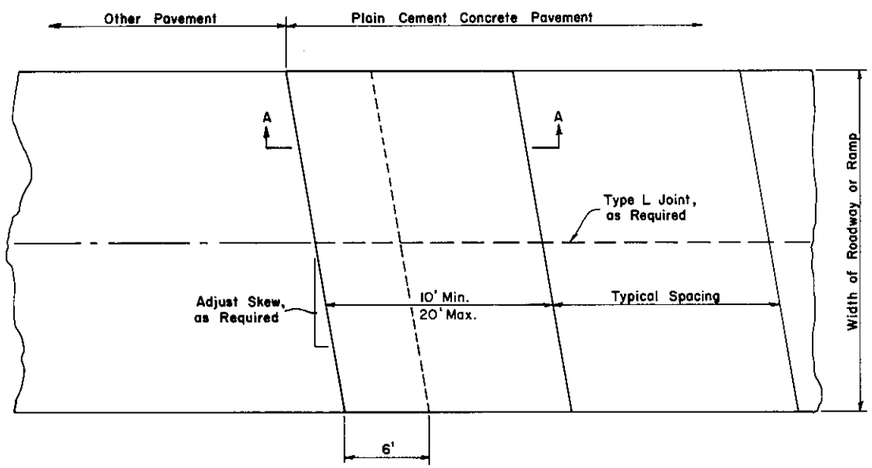


PLAN

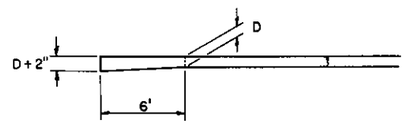
RAMPS

NOTES

1. Construction joints, for P.C.C. Pavements constructed on subbase, shall be skewed and shall be either uniform depth with load transfer dowel bars or butted with thickened slabs as shown in the Terminal Slab detail. Construction joints, for P.C.C. Pavements constructed on a stabilized base, shall be butted and skewed.
2. For joint details, see RC-20.
3. All transverse joints shall be constructed on a 6:1 counter-clockwise skew. On curves, the skew will be measured from a perpendicular to a tangent on the long radius side of the curve.
4. When ramp width exceeds 14 feet, a Type L Joint is required at mid-point.

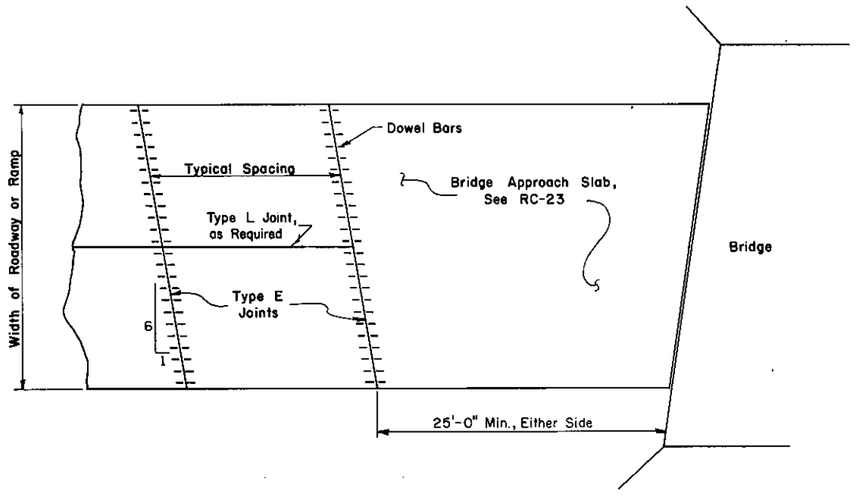


PLAN



SECTION A-A

TERMINAL SLAB



BRIDGE APPROACHES

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

PLAIN CEMENT CONCRETE PAVEMENT

Recommended May 6, 1982 Dir., Bureau of Highway Design	Recommended May 6, 1982 Chief Highway Engineer	Sht. 1 Of 2 RC-27

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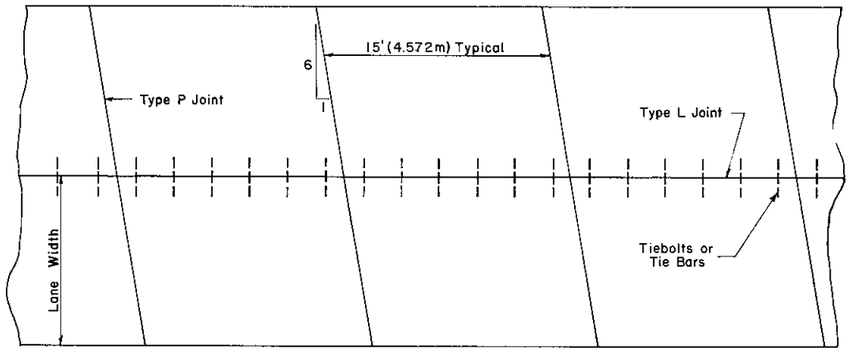
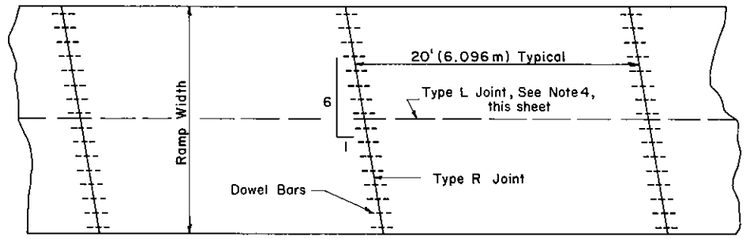


PLAN

PAVEMENT FOR ~~CLASS 3, 4, AND 5 HIGHWAYS~~ COLLECTORS AND LOCAL ROADS



PLAN

RAMPS

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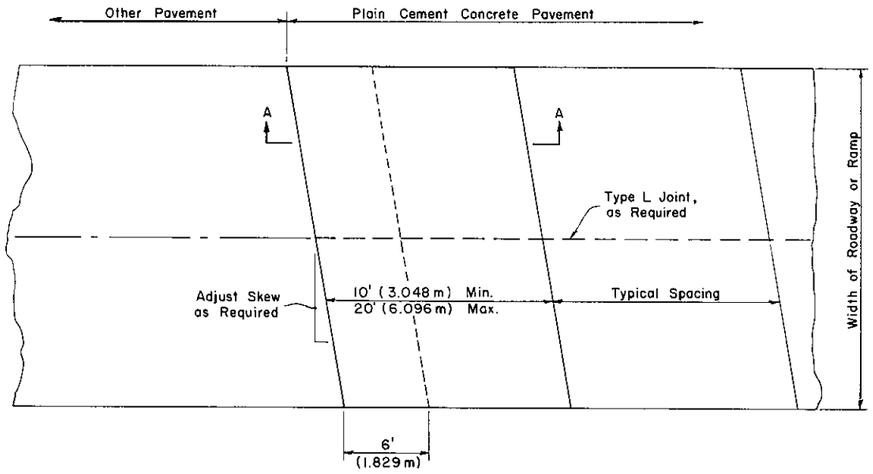
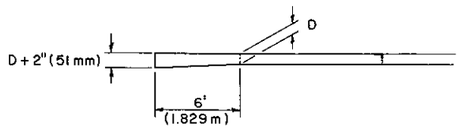
1. Construction joints, for P.C.C. Pavements constructed on subbase, shall be skewed and shall be either uniform depth with load transfer dowel bars or butted with thickened slabs as shown in the Terminal Slab detail. Construction joints, for P.C.C. Pavements constructed on a stabilized base, shall be butted and skewed.
2. For joint details, see RC-20.
3. All transverse joints shall be constructed on a 6:1 counter-clockwise skew. On curves, the skew will be measured from a perpendicular to a tangent on the long radius side of the curve.
4. When ramp width exceeds 14' (4.267m) a Type L Joint is required at mid point.

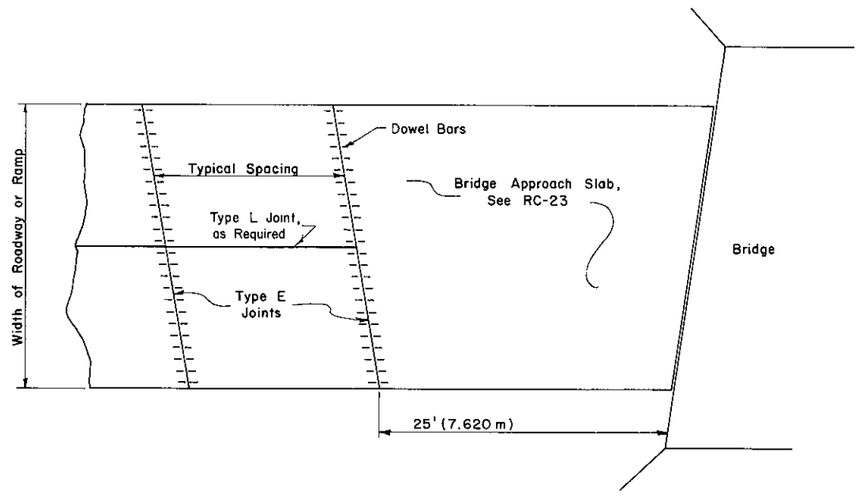


PLAN



SECTION A-A

TERMINAL SLAB



BRIDGE APPROACHES

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

PLAIN CEMENT CONCRETE PAVEMENT

Recommended May 31, 1979
L. D. Cowie
Director, Bureau of Design

Approved May 31, 1979
David E. Sloan
Chief Hwy. Engr.

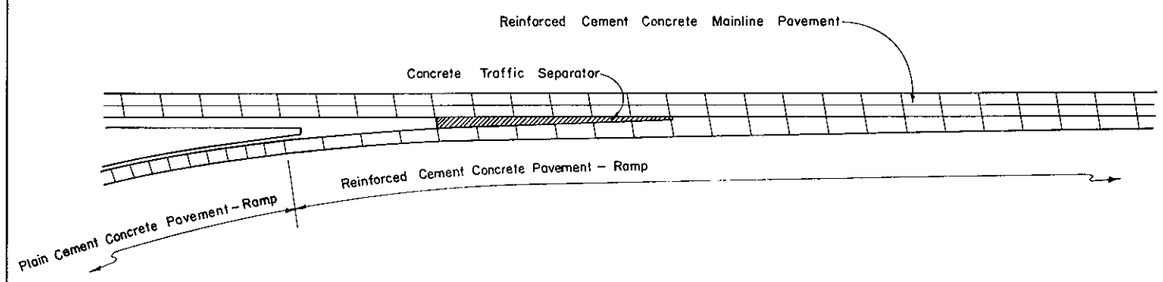
Sht. 1 Of 2

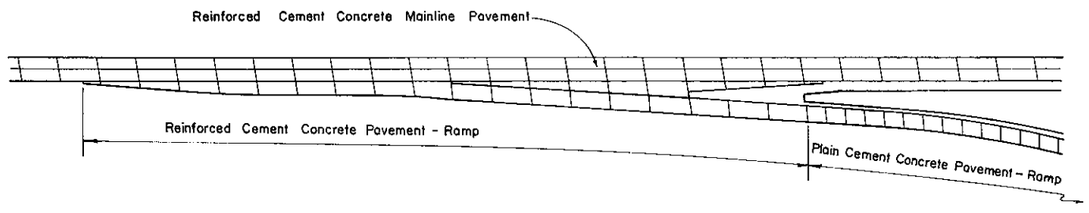
RC-27

TRACED BY
FINAL BY

VOIDED BY CHANGE #1

RAMP CONNECTIONS WITH R.C.C. MAINLINE PAVEMENT

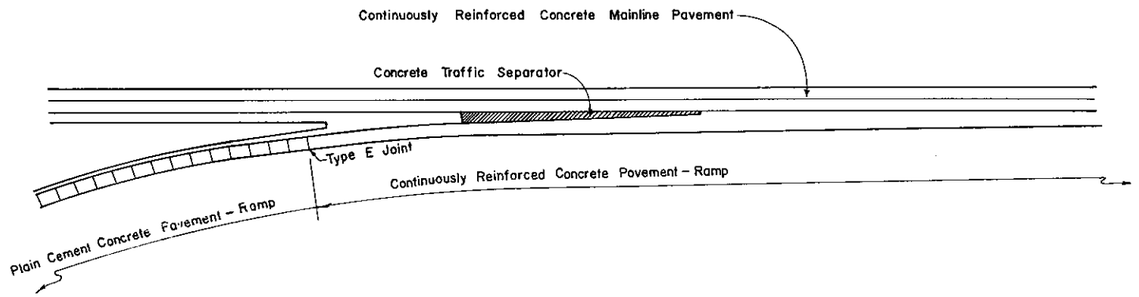


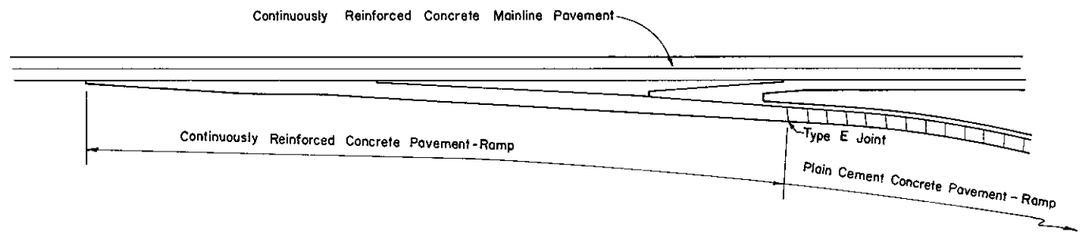


Notes: Actual joint locations to be determined in the field.

The change of pavement type on ramps shall occur at the first joint beyond the shoulder gore.

RAMP CONNECTIONS WITH C.R.C. MAINLINE PAVEMENT





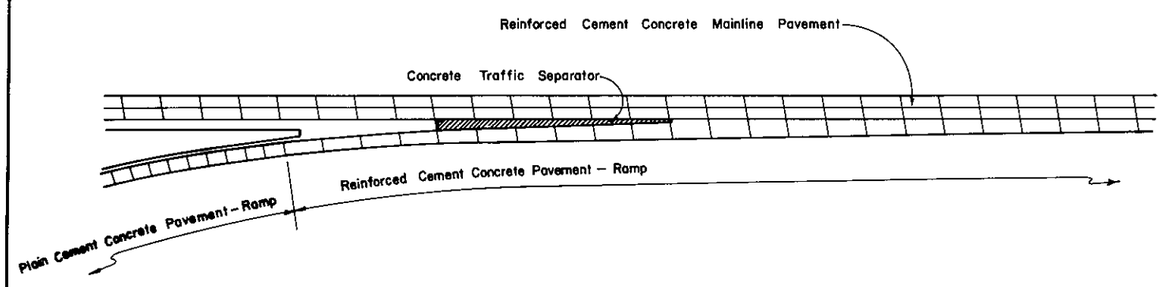
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

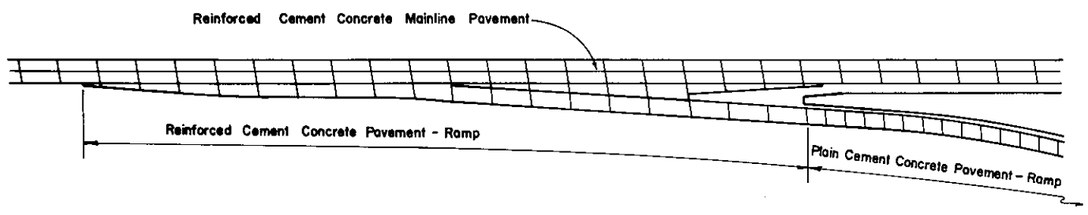
PLAIN CEMENT CONCRETE PAVEMENT
RAMPS

Recommended May 31, 1979 B.D. Swank Director, Bureau of Design	Approved May 31, 1979 David Gilmore Chief Hwy. Engr.	Sht. 2 Of 2 RC-27

TRACED BY
FINAL BY

RAMP CONNECTIONS WITH R.C.C. MAINLINE PAVEMENT

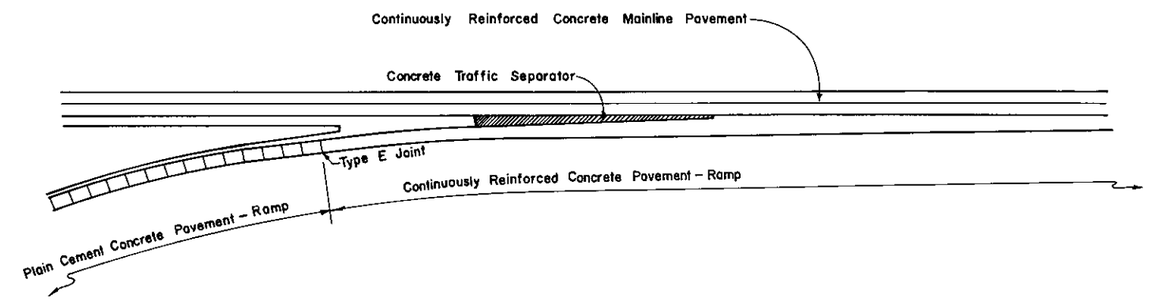


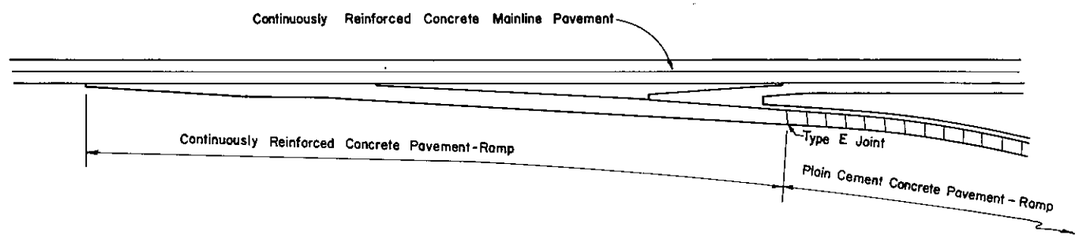


NOTES

1. Actual joint locations to be determined in the field.
2. The change of pavement type on ramps shall occur at the first joint beyond the shoulder gore.

RAMP CONNECTIONS WITH C.R.C. MAINLINE PAVEMENT



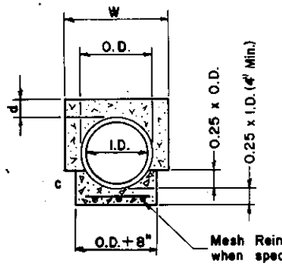


Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

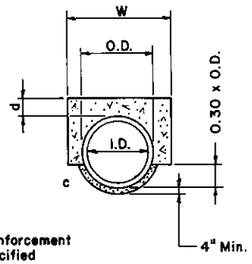
PLAIN CEMENT CONCRETE PAVEMENT
RAMPS

Recommended May 6, 1982 Louis G. O'Brien Dir., Bureau of Highway Design	Recommended May 6, 1982 Alfred L. Tyng Chief Highway Engineer	Sht. 2 Of 2 RC-27

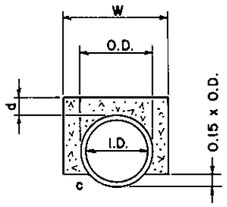
TRACED BY
FINAL BY



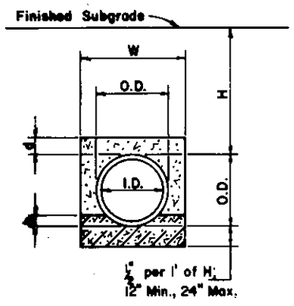
CLASS A



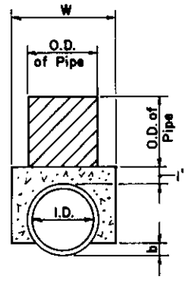
CLASS B



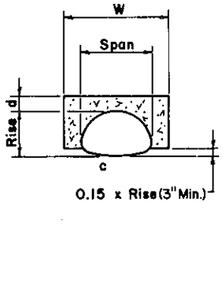
CLASS C



Trench Thru Rock or Hard Shale



Imperfect Trench



Class C Bedding for Pipe-Arch

COARSE AGGREGATE FOR PIPE TRENCH BACKFILL.
CEMENT CONCRETE
FINE AGGREGATE FOR CLASS B BEDDING
SELECTED FINE COMPRESSIBLE MATERIAL or when directed COARSE AGGREGATE
LOOSE, HIGHLY COMPRESSIBLE EARTH or other APPROVED MATERIAL

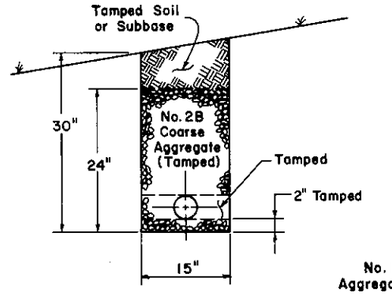
I.D. — Nominal inside diameter of pipe.
O.D. — Outside diameter of pipe barrel or shell.
H.D. — (Hub Diameter) — Outside diameter of pipe at bell or band.
W — 1.0 ft. + H.D. for Combination Storm Sewer and Underdrain.
W — 2.0 ft. + H.D. for pipes or pipe-arches not exceeding 48" I.D. or Span, respectively.
W — 2.5 ft. + H.D. for pipes or pipe-arches exceeding 48" I.D. or Span, respectively.
b — Varies in conformance with class of bedding applicable to pipe installation.
c — When unstable material under the pipe has been removed, it shall be replaced with suitable material compacted to a satisfactory density, and the bed shaped as specified in Section 601.3, Form 408
d — 1.0 ft. minimum, where practicable.
H — Height of fill over top of pipe.

Note: The use of Coarse Aggregate for pipe backfill will be based upon the location and type of pipe installation. The material and method of backfill shall be in accordance with Section 601.3(d), Form 408 and it will be used for all pipes carrying surface drainage under the roadway in cut sections for the full length of the pipe, or within the limits bounded by the toes of slopes in embankment sections except under the following conditions:

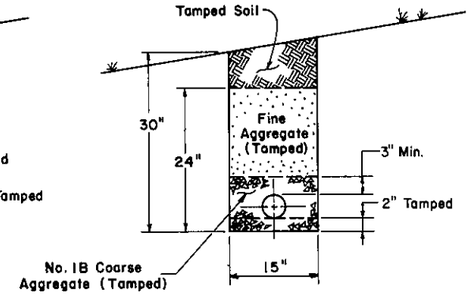
(1) Pipes located in medians.
(2) Pipes located under swales or ditch lines.
(3) Slope pipes in cut or fill.
(4) Pipes under drives to private properties.
(5) Pipes located in graded sections of interchange area.
(6) Storm sewer outside shoulder area.

For calculating quantities of coarse aggregate, deduct volume occupied by pipe.

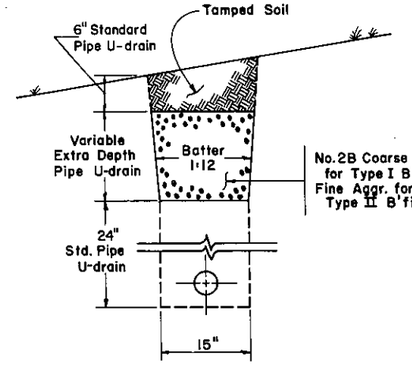
BEDDING & BACKFILL FOR PIPE CULVERTS & METAL PIPE-ARCH CULVERTS



TYPE I BACKFILL

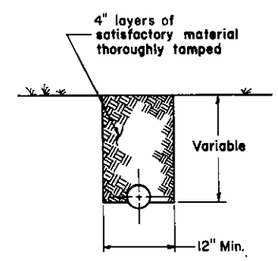


TYPE II BACKFILL



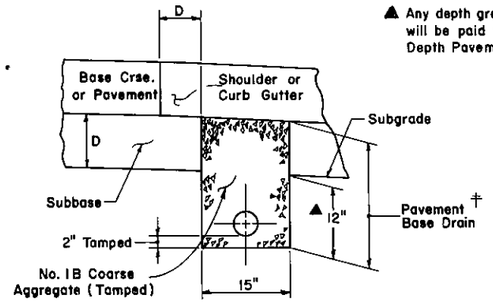
EXTRA DEPTH

PIPE UNDERDRAIN



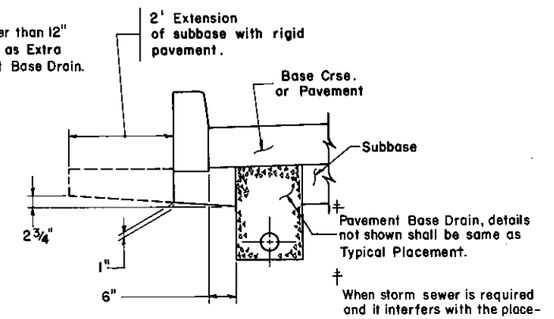
Excavation over 36" in depth and for a maximum width of 24" is payable as Class 4 Excavation. Subsurface Drain Outlets shall be used for Pipe Underdrain and Pavement Base Drain.

SUBSURFACE DRAIN OUTLETS



TYPICAL PLACEMENT

▲ Any depth greater than 12" will be paid for as Extra Depth Pavement Base Drain.

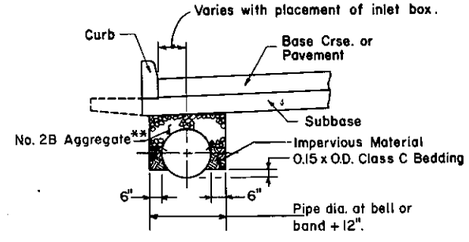


† When storm sewer is required and it interfers with the placement of Pav't. Base Drain, eliminate the Pav't. Base Drain and use Comb. S. S. and U-Drain.

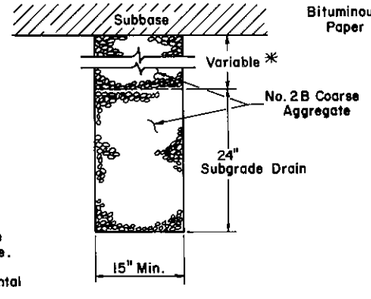
PLACEMENT AT CURB SECTION

PAVEMENT BASE DRAIN

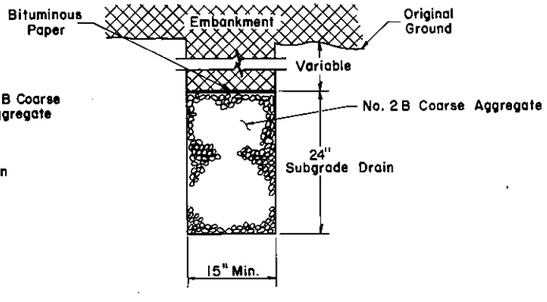
** No. 2B Aggregate tamped in 6" layers, starting at the lowest rows of perforations or start of the open joint. Groups of perforations or the open joint (1/3 pipe circumference) shall be placed symmetrically about the vertical center line.



COMBINATION STORM SEWER AND UNDERDRAIN



TREATMENT UNDER SUBBASE



TREATMENT UNDER EMBANKMENT

* This dimension varies to achieve and maintain the necessary subgrade slope. The additional aggregate will be considered incidental to the subgrade drain pay item.

SUBGRADE DRAIN

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

SUBSURFACE DRAINS

Recommended May 6, 1982
Dir., Bureau of Highway Design

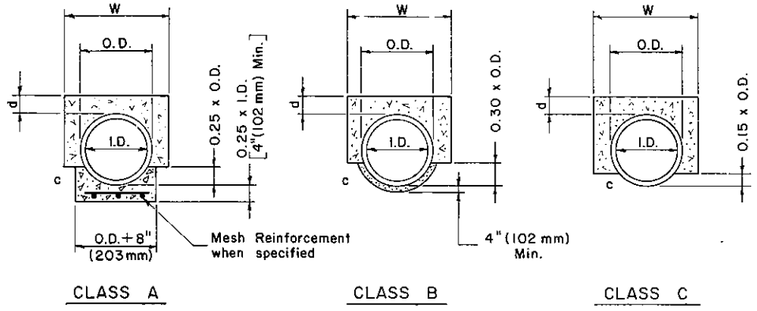
Recommended May 6, 1982
Chief Highway Engineer

Sht. 1 Of 1

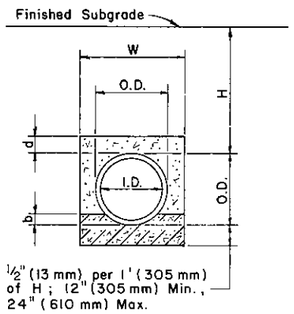
RC-30

TRACED BY
FINAL BY

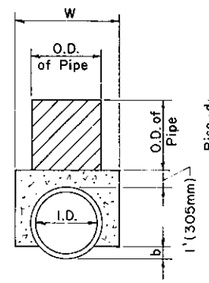
VOIDED BY CHANGE #1



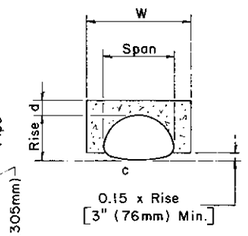
CLASS A | CLASS B | CLASS C



Trench Thru Rock or Hard Shale



Imperfect Trench



Class C Bedding for Pipe-Arch

COARSE AGGREGATE FOR PIPE TRENCH BACKFILL.
CEMENT CONCRETE
FINE AGGREGATE FOR CLASS B BEDDING
SELECTED FINE COMPRESSIBLE MATERIAL or when directed COARSE AGGREGATE
LOOSE, HIGHLY COMPRESSIBLE EARTH or other APPROVED MATERIAL

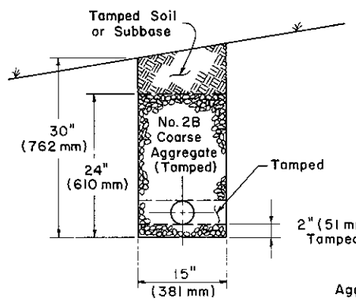
I.D. — Nominal inside diameter of pipe.
O.D. — Outside diameter of pipe barrel or shell.
H.D. — (Hub Diameter) — Outside diameter of pipe at bell or band.
W — 1.0 ft. (305 mm) + H.D. for Combination Storm Sewer and Underdrain.
W — 2.0 ft. (610 mm) + H.D. for pipes or pipe-arches not exceeding 48"(1220 mm) I.D or Span, respectively.
W — 2.5 ft. (762 mm) + H.D. for pipes or pipe-arches exceeding 48"(1220 mm) I.D. or Span, respectively.
b — Varies in conformance with class of bedding applicable to pipe installation.
c — When unstable material under the pipe has been removed, it shall be replaced with suitable material compacted to a satisfactory density, and the bed shaped as specified in Section 601.3.
d — 1.0 ft. (305 mm) minimum, where practicable.
H — Height of fill over top of pipe.

Note: The use of Coarse Aggregate for pipe backfill will be based upon the location and type of pipe installation. The material and method of backfill shall be in accordance with Section 601.3(d) and it will be used for all pipes carrying surface drainage under the roadway in cut sections for the full length of the pipe, or within the limits bounded by the toes of slopes in embankment sections except under the following conditions:

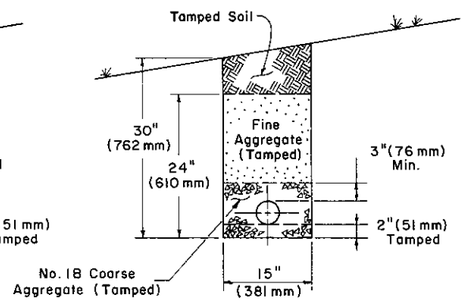
(1) Pipes located in medians.
(2) Pipes located under swales or ditch lines.
(3) Slope pipes in cut or fill.
(4) Pipes under drives to private properties.
(5) Pipes located in graded sections of interchange area.
(6) Storm sewer outside shoulder area.

For calculating quantities of coarse aggregate, deduct volume occupied by pipe.

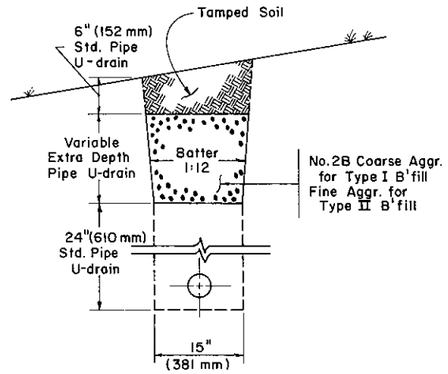
BEDDING & BACKFILL FOR PIPE CULVERTS & METAL PIPE-ARCH CULVERTS



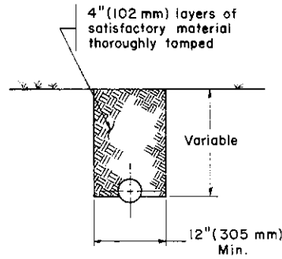
TYPE I BACKFILL



TYPE II BACKFILL



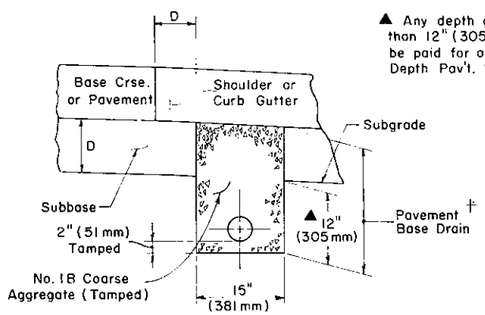
EXTRA DEPTH



Excavation over 36"(914 mm) in depth and for a maximum width of 24"(610 mm) is payable as Class 4 Excavation. Subsurface Drain Outlets shall be used for Pipe Underdrain and Pavement Base Drain.

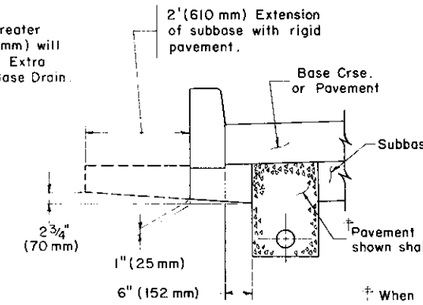
PIPE UNDERDRAIN

SUBSURFACE DRAIN OUTLETS



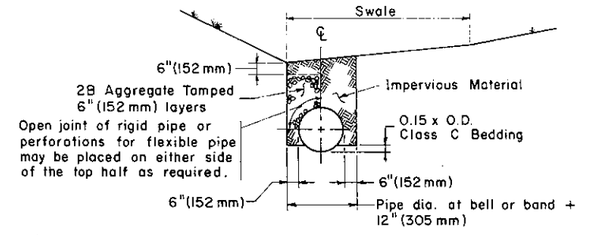
▲ Any depth greater than 12"(305 mm) will be paid for as Extra Depth Pav't. Base Drain.

TYPICAL PLACEMENT



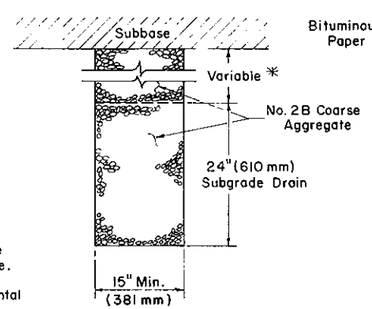
PLACEMENT AT CURB SECTION

† When storm sewer is required and it interferes with the placement of Pav't. Base Drain, eliminate the Pav't. Base Drain and use Comb. S.S. and U-Drain.



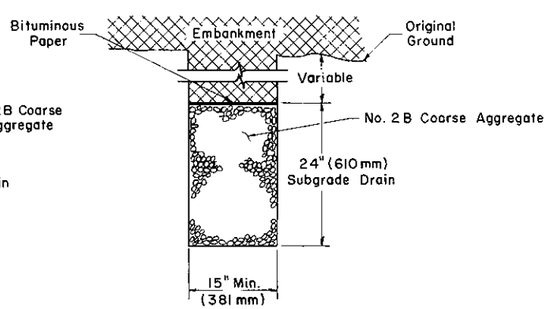
PLACEMENT IN SWALE

PAVEMENT BASE DRAIN



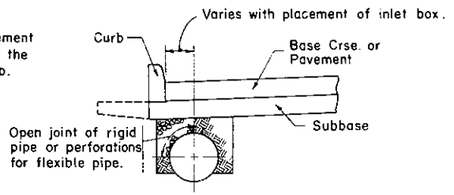
TREATMENT UNDER SUBBASE

✳ This dimension varies to achieve and maintain the necessary subgrade slope. The additional aggregate will be considered incidental to the subgrade drain pay item.



TREATMENT UNDER EMBANKMENT

SUBGRADE DRAIN



PLACEMENT AT CURB SECTION
Details not shown shall be same as Placement in Swale.

COMBINATION STORM SEWER AND UNDERDRAIN

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

SUBSURFACE DRAINS

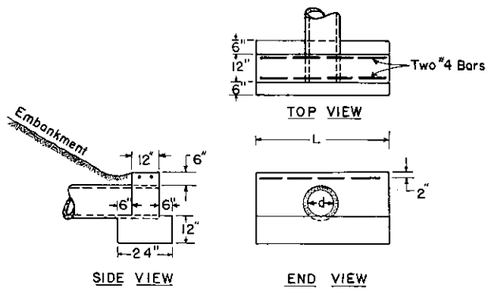
Recommended May 1, 1978
B.D. Gutshall
Director, Bureau of Design

Approved May 1, 1978
J. M. Sebastian
Deputy Chief Hwy. Engr.

Sht 1 Of 1
RC-30

TRACED BY
FINAL BY

Pipe d	L
18" & 21"	5'
24" & 27"	7'
30" & 33"	9'



TYPE D ENDWALL

2:1 EMBANKMENT SLOPES														
PIPE ϕ	Skew ∢ = 90° to 60° θ = 30°			Skew ∢ = 55° θ = 35°			Skew ∢ = 50° θ = 40°			Skew ∢ = 45° θ = 45°				
d	L	ℓ	W1	L	ℓ	W1	L	ℓ	W1	L	ℓ	W1	W2	A
in.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	in.
36	5.8	0	4.6	6.0	.33	4.9	6.2	.5	5.2	6.5	.67	5.7	4.6	12
42	6.3	0	5.8	6.6	.33	6.1	6.9	.5	6.5	7.3	.67	7.1	5.8	12
48	6.9	0	6.9	7.2	.33	7.3	7.5	.5	7.8	8.0	.67	8.5	6.9	12
54	7.5	0	8.0	7.8	.33	8.5	8.2	.5	9.1	8.7	.67	9.9	8.0	12
60	8.1	0	9.2	8.4	.33	9.8	8.8	.5	10.4	9.4	.67	11.3	9.2	15
72	9.2	0	11.5	9.6	.33	12.2	10.1	.5	13.0	10.8	.67	14.1	11.5	15

2:1 EMBANKMENT SLOPES														
PIPE ϕ	Skew ∢ = 40° θ = 50°			Skew ∢ = 30° θ = 60°			Skew ∢ = 20° θ = 70°			Skew ∢ = 10° θ = 80°				
d	L	ℓ	W1	L	ℓ	W1	L	ℓ	W1	L	ℓ	W1	W2	A
in.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	in.
36	7.0	.75	6.2	8.3	1.33	8.0	11.1	1.75	11.7	19.6	5.0	23.0	4.6	12
42	7.8	.75	7.8	9.3	1.33	10.0	12.5	1.75	14.6	22.5	5.0	28.8	5.8	12
48	8.5	.75	9.4	10.3	1.33	12.0	14.0	1.75	17.5	25.3	5.0	34.6	6.9	12
54	9.3	.75	10.9	11.3	1.33	14.0	15.5	1.75	20.5	28.2	5.0	40.3	8.0	12
60	10.1	.75	12.5	12.3	1.33	16.0	16.9	1.75	23.4	31.1	5.0	46.0	9.2	15
72	11.7	.75	15.6	14.3	1.33	20.0	19.8	1.75	29.2	36.9	5.0	57.6	11.5	15

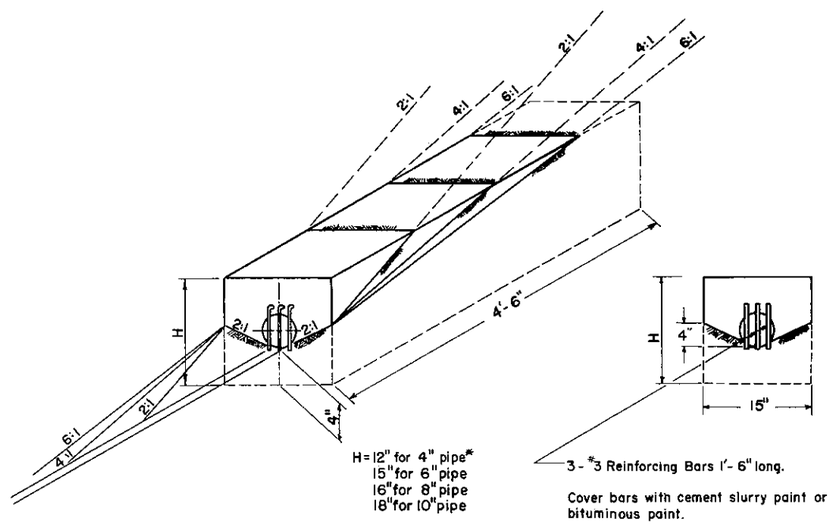
$SD = \frac{d}{\cos.\theta} = \frac{d}{\sin \text{Skew } \measuredangle}$

$L = SD + 2.3'$

W_1 for 2:1 Slope $= \frac{2d-2'}{\cos.\theta}$

W for variable slope when X = horizontal dimension of the slope designation.

$W = \frac{X}{\cos.\theta}(d - 0.5 - \frac{1.0}{X})$



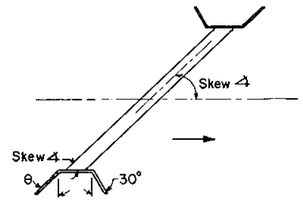
H = 12" for 4" pipe*
15" for 6" pipe
16" for 8" pipe
18" for 10" pipe

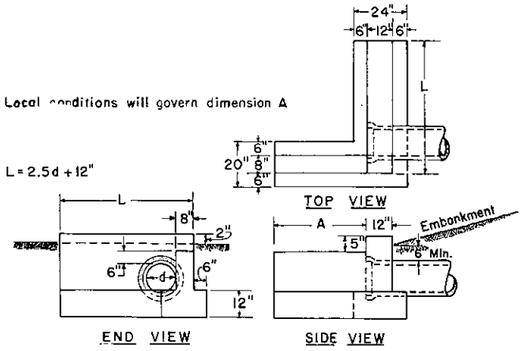
3 - #3 Reinforcing Bars 1'- 6" long.

Cover bars with cement slurry paint or bituminous paint.

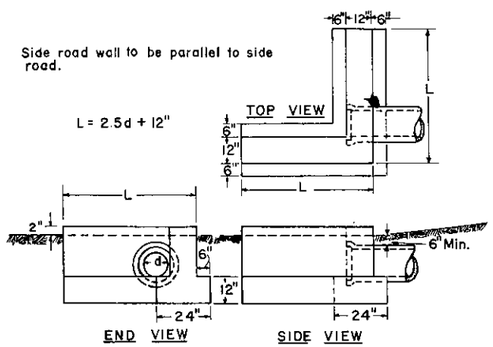
SUBSURFACE DRAIN OUTLET ENDWALL

*Includes $4\frac{5}{8}$" Semi-circular

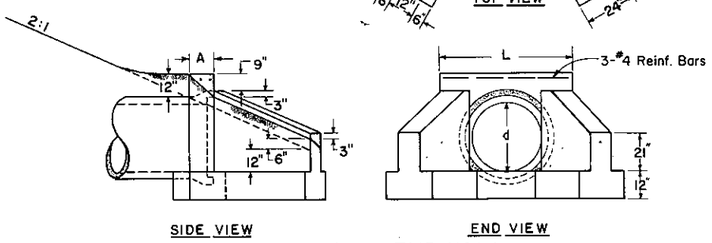




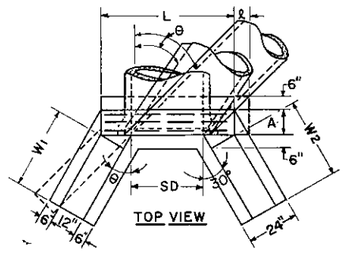
TYPE D-E ENDWALL



TYPE E-S ENDWALL



TYPE D-W ENDWALL



NOTE:
All exposed edges shall be chamfered (I) one inch.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

ENDWALLS

Recommended May 31, 1979
B.D. Lemkie
Director, Bureau of Design

Approved May 31 1979
Dennis Allinger
Chief Hwy. Engr.

Sht. 1 Of 1

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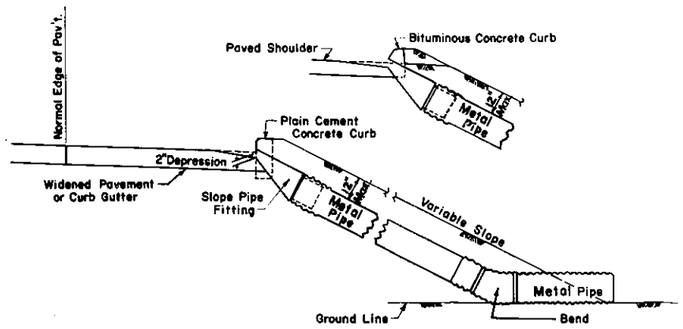
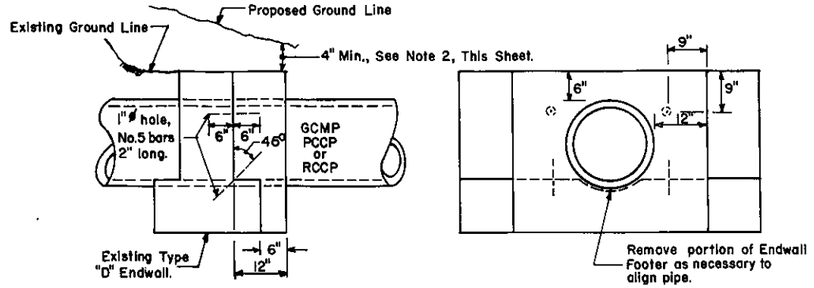


ADJACENT TO STRUCTURE AND/OR PAVED SHOULDER

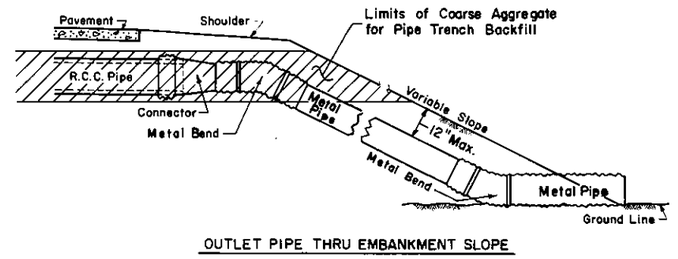


SIDE VIEW

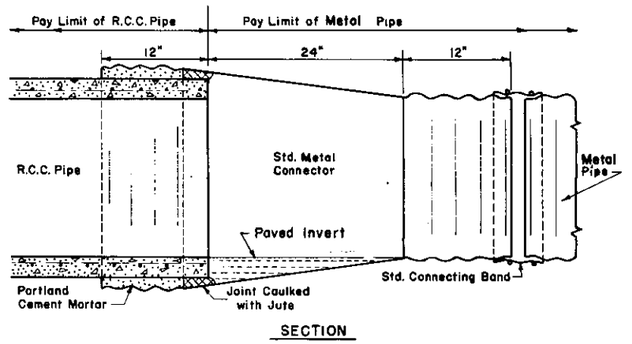
END VIEW

CONCRETE COLLAR FOR PIPE EXTENSION

(For Pipes up to and including 33"ϕ, See Note 1, This Sheet).

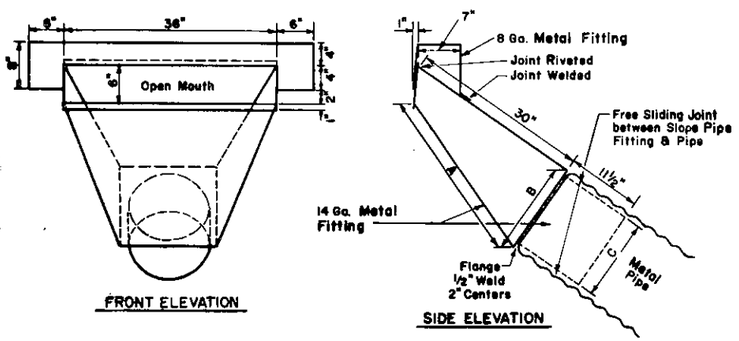


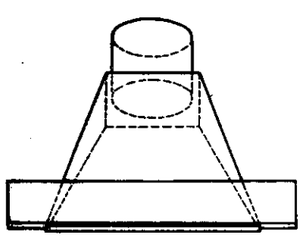
OUTLET PIPE THRU EMBANKMENT SLOPE



SECTION

METAL PIPE CONNECTOR



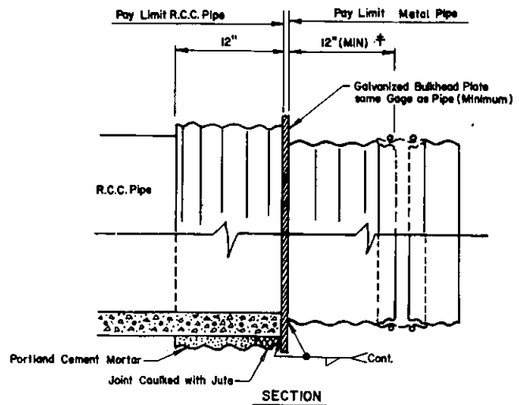


PLAN

Nominal Diameter of Pipe*	Dimensions (Inches) for 2:1 Slopes		
	A	B	C
12"	28 5/16	13	11
15"	29 13/16	16	14
18"	31 5/16	19	17

* NOTE: Slope pipes draining only shoulder areas in embankments, other than those adjacent to structures, shall be restricted to 12" in diameter (Minimum).

SLOPE PIPE FITTING – TYPE A



SECTION

ALTERNATE METAL PIPE CONNECTOR

† Adjust Length to obtain even 2ft. Lengths of Connecting Pipe.

NOTES

1. For other types of endwalls and for pipes larger than 33"ϕ, special collar designs are to be shown on the drawings.
2. Portions of existing endwall may need to be removed to maintain 4" ground cover.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

SLOPE PIPE FITTINGS AND CONNECTORS

Recommended May 6, 1982
Dir., Bureau of Highway Design

Recommended May 6, 1982
Alfred L. Tyree
Chief Highway Engineer

Sht. 1 Of 1

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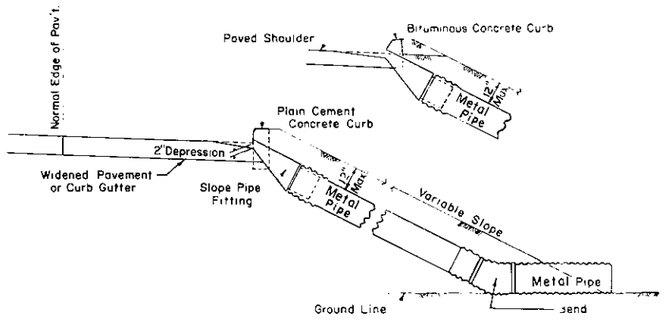
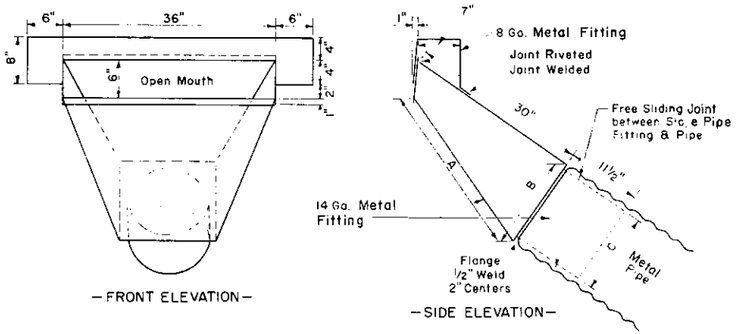
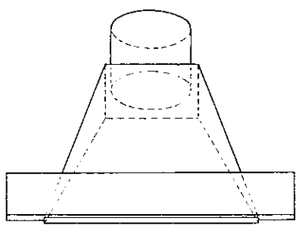
VOIDED BY CHANGE #1



ADJACENT TO STRUCTURE AND/OR PAVED SHOULDER



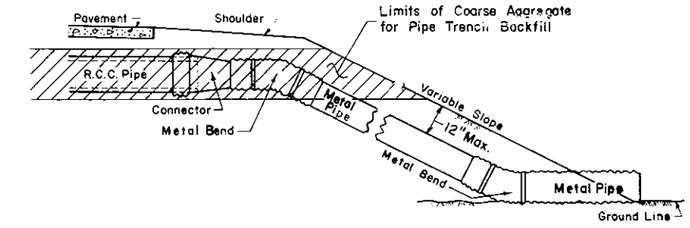


—PLAN—

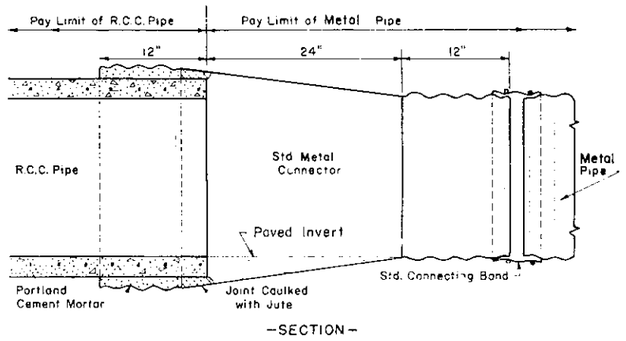
Nominal Diameter of Pipe*	Dimensions (Inches) for 2:1 Slopes		
	A	B	C
12"	$28\frac{15}{16}$	13	11
15"	$29\frac{13}{16}$	16	14
18"	$31\frac{5}{16}$	19	17

* NOTE: Slope pipes draining only shoulder areas in embankments, other than those adjacent to structures, shall be restricted to 12" in diameter (Minimum)

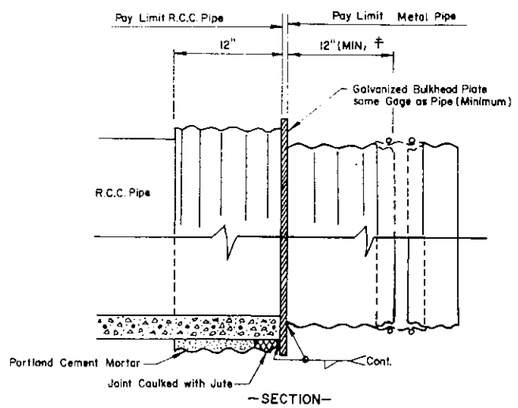
SLOPE PIPE FITTING – TYPE A



OUTLET PIPE THRU EMBANKMENT SLOPE



METAL PIPE CONNECTOR



ALTERNATE METAL PIPE CONNECTOR

† Adjust Length to obtain even 2 ft. Lengths of Connecting Pipe.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

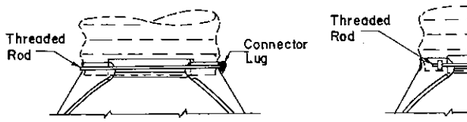
SLOPE PIPE FITTINGS AND CONNECTORS

Recommended Nov. 15, 1977
B.D. Rambie
Director, Bureau of Design

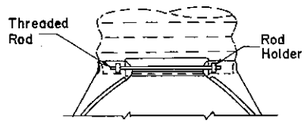
Approved Nov. 15, 1977
J. M. Sebastian
Deputy Chief Hwy. Engr.

Sht. 1 Of 1

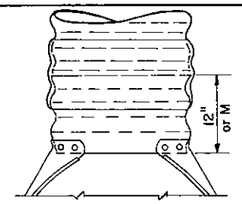
RC-32



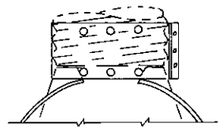
TYPE-1 CONNECTION
Sizes: 18"-24" Circular Pipe



TYPE-2 CONNECTION
Sizes: 30"-36" Circular Pipe
& 18"x11" to 58"x36" Pipe-Arch

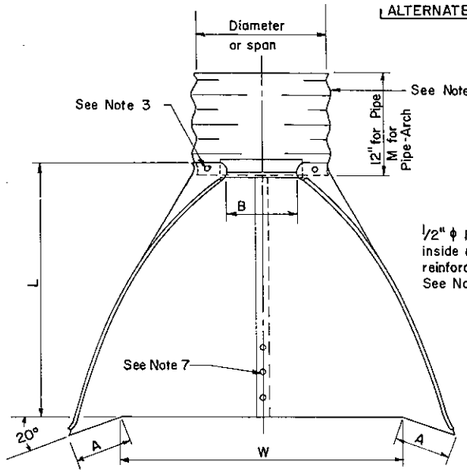


TYPE-3 CONNECTION
Sizes: 42" & Greater Circular Pipe
& 65"x40" to 85"x54" Pipe-Arch

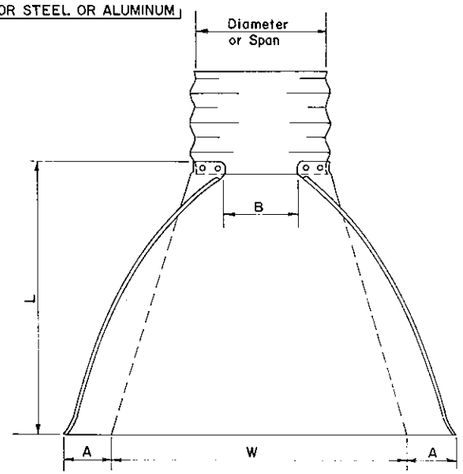


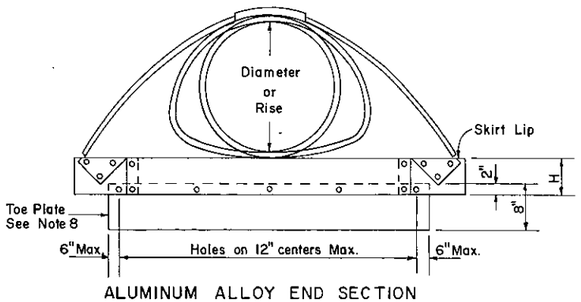
TYPE-D CONNECTION
Sizes: 18"-36" Circular Pipe
& 18"x11" to 58"x36" Pipe Arch

ALTERNATE TYPE CONNECTIONS FOR STEEL OR ALUMINUM

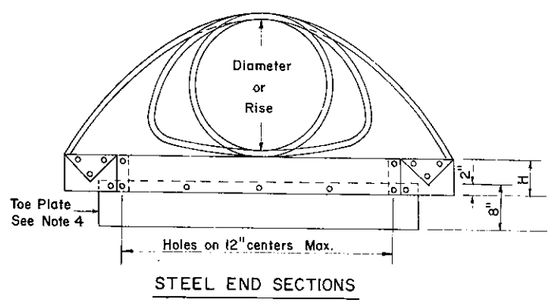


1/2" ϕ Rod approx. 18" Lg. inside rolled edge to reinforce corner. See Note 10

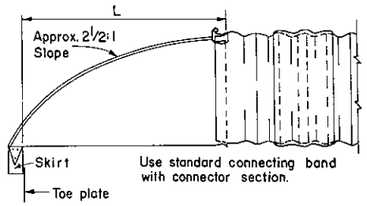




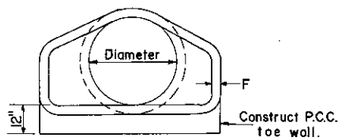
ALUMINUM ALLOY END SECTION



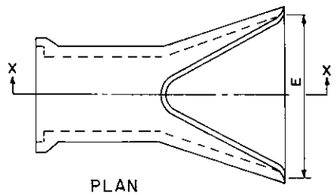
STEEL END SECTIONS



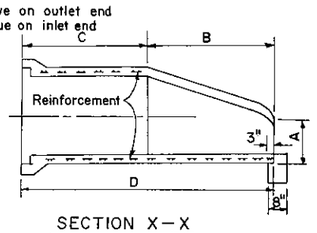
SIDE VIEW OF TYPE-3 CONNECTION



END VIEW



PLAN



SECTION X-X

NOTES FOR STEEL END SECTIONS

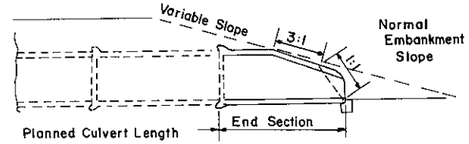
1. All 3 pc. bodies to have 12 Ga. sides and 10 Ga. center panels. Width of center panels to be greater than 20% of the pipes periphery. Multiple panel bodies to have top seams which are to be tightly joined by 3/8" ϕ galvanized rivets or bolts.
2. Reinforced edges to be supplemented with galvanized stiffner angles for the 60" thru 84" circular pipe, 79"x49" and 85"x54" pipe arch sizes. The angles will be 2"x2"x1/4" for 60" thru 72" circular pipe, 79"x49" and 85"x54" pipe arch sizes and 2 1/2"x2 1/2"x1/4" for 78" and 84" circular pipe. The angles to be attached by 3/8" ϕ galvanized nut and bolts.
3. Angle reinforcement will be placed under the center panel seams on the 79"x49" and 85"x54" pipe arch sizes.
4. Galvanized toe plates to be provided on all end sections.
5. The Type D connection shall be used to connect end sections to pipe which have other than annular corrugations. Other designs will be acceptable provided no leakage results from the connection.

NOTES FOR ALUMINUM ALLOY END SECTION

1. Skirt shall be made from aluminum alloy 3004-O, clad 5% each side with alloy 7072.
2. Corner plate and top plate shall be the same material and gage as skirt.
3. Rivets shall be aluminum alloy 6053-T4.
4. Threaded rods shall be aluminum alloy 6061-T6.
5. Connector lugs, bolts, and nuts shall be hot-dipped galvanized steel.
6. Skirt for pipe sizes 18" to 24" incl. and spans 18" to 36" incl. for pipe arch shall be from one (1) sheet.
7. Skirt for pipe sizes 30" to 48" incl. and spans 43" to 58" incl. for pipe arch shall be from two (2) sheets. Skirts for pipe arch with spans of 65" and 72" shall be made from three (3) sheets. Provide 2" lap joint fastened with 3/8" ϕ rivets on center line spaced 6" c-c.
8. Toe plate shall be from the same material and gage as skirt. Locate punched holes to match holes in skirt. Provide 3/8" bolts and nuts for assembly.

Pipe-Arch span size	Length Toe Plate	Pipe size	Length Toe Plate
18"- 43"	W+10"	18"-30"	W+10"
50"- 72"	W+18"	36"-48"	W+22"

9. Connector section, when specified, shall be corrugated aluminum alloy pipe.
10. Reinforcement for edge of skirt shall be aluminum alloy 6063-F.



SLOPE DETAIL

CONCRETE END SECTION

CONCRETE END SECTION DIMENSIONS						
Diam"	A"	B'-"	C'-"	D'-"	E'-"	F"
18"	9"	2'-3"	3'-10"	6'-1"	3'-0"	2 1/2"
21	9	2-11	3-2	6'-1	3-6	2 3/4
24	9 1/2	3-7 1/2	2-6	6-1 1/2	4-0	3
27	10 1/2	4-0	2-1 1/2	6-1 1/2	4-6	3 1/4
30	12	4-6	1-7 3/4	6-1 3/4	5-0	3 1/2
33	13 1/2	4-10 1/2	3-3 1/4	8-1 3/4	5-6	3 3/4
36	15	5-3	2-10 3/4	8-1 3/4	6-0	4
42	21	5-3	2-11	8-2	6-6	4 1/2
48	24	6-0	2-2	8-2	7-0	5
54	27	5-5	2-11	8-4	7-6	5 1/2

GENERAL NOTES

1. End section shall be of the same material as the pipe or pipe arch culvert to which it is attached. No coating is required
2. End sections for aluminum alloy or steel pipe, with a diameter larger than 54", used on the inlet end of a pipe culvert, shall be anchored. Details of the anchor shall be shown on the drawings.

DIMENSIONS OF END SECTIONS FOR ALUMINUM ALLOY PIPE

Pipe Diam. in Inches	Gage	Dimensions - Inches A ±1"	B Max.	H ±1"	L ±1 1/2"	W ±2"
18	16	7	9	6	31	36
21	16	8 1/4	11	6	36	42
24	14	9 1/2	12	6	42	48
30	14	12	15	7 1/2	52 1/2	60
36	12	14	18	9	63	72
42	12	16	21	10 1/2	73 1/2	84
48	12	18	27	12	84	90

DIMENSIONS OF END SECTIONS FOR ALUMINUM ALLOY PIPE-ARCH

Pipe Arch in Inches Span	Rise	Gage	Dimensions - Inches A ±1"	B Max.	H ±1"	L ±1 1/2"	W ±2"	M
18	11	16	4 1/2	9	6	19	30	12
22	13	16	5 1/4	10	6	23	36	12
25	16	16	6 1/4	11 1/2	6	28	42	12
29	18	14	7	14	6	31 1/2	48	12
36	22	14	8 3/4	16	6	38 1/2	60	12
43	27	12	10 3/4	17 1/2	7 5/8	47	75	12
50	31	12	12 1/4	20	9 1/8	54	85	12
58	36	12	14	26	10 5/8	63	96	12
65	40	12	15 3/4	23	10 5/8	70	112	24
72	44	10	17 1/4	24	12 1/8	77	128	24

DIMENSIONS OF END SECTIONS FOR GALVANIZED STEEL PIPE

Pipe Diam. in Inches	Gage	Dimensions - Inches A ±1"	B Max.	H ±1"	L ±1 1/2"	W ±2"
18	16	8	10	6	31	36
21	16	9	12	6	36	42
24	16	10	13	6	41	48
30	14	12	16	8	51	60
36	14	14	19	9	60	72
42	12	16	22	11	69	84
48	12	18	27	12	78	90
54	12	18	30	12	84	102
60	12	18	33	12	87	114
66	12	18	36	12	87	120
72	12	18	39	12	87	126
78	12	18	42	12	87	132
84	12	18	45	12	87	138

DIMENSIONS OF END SECTIONS FOR GALVANIZED STEEL PIPE-ARCH

Pipe Arch in Inches Span	Rise	Gage	Dimensions - Inches A ±1"	B Max.	H ±1"	L ±1 1/2"	W ±2"
18	11	16	7	9	6	19	30
22	13	16	7	10	6	23	36
25	16	16	8	12	6	28	42
29	18	16	9	14	6	32	48
36	22	14	10	16	6	39	60
43	27	14	12	18	8	46	75
50	31	12	13	21	9	53	85
58	36	12	18	26	12	63	90
65	40	12	18	30	12	70	102
72	44	12	18	33	12	77	114
79	49	12	18	36	12	77	126
85	54	12	18	39	12	77	138

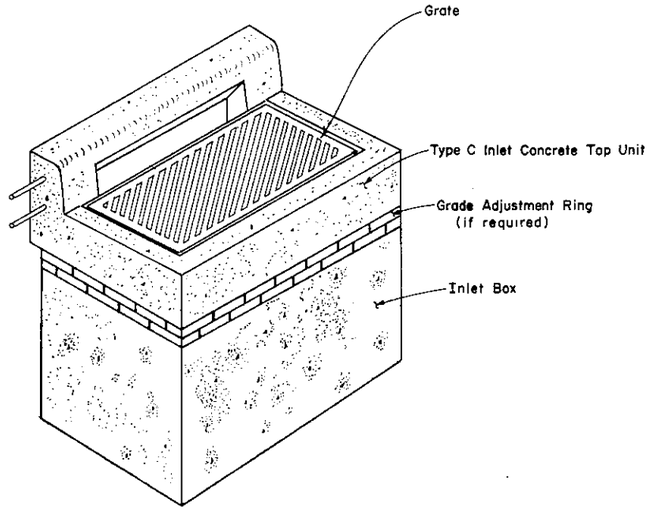
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

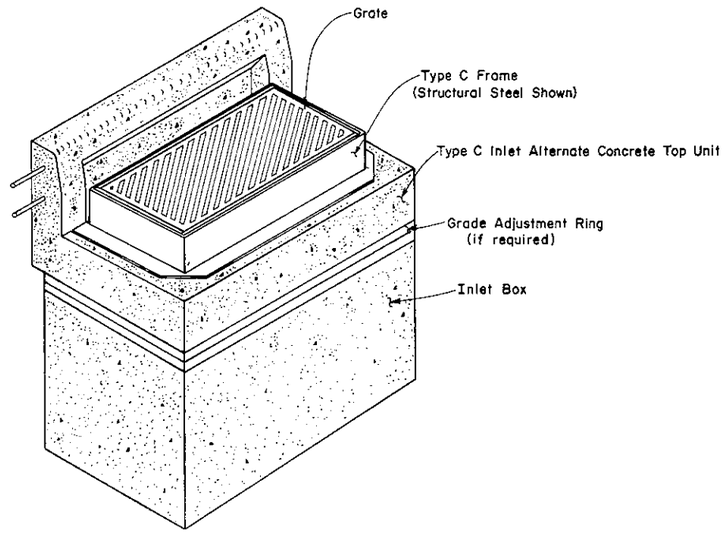
END SECTIONS FOR PIPE CULVERTS

Recommended Nov. 15, 1977
B.D. Rourke
Director, Bureau of Design

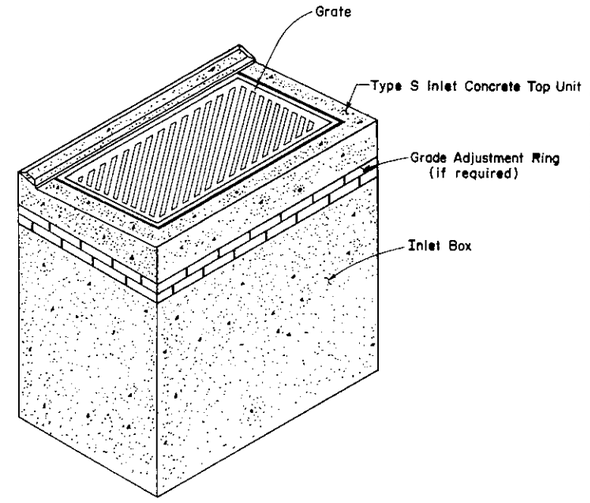
Approved Nov. 15, 1977
J. M. Sebastian
Deputy Chief Hwy. Engr.

Sht. 1 Of 1
RC-33





TYPE C INLET



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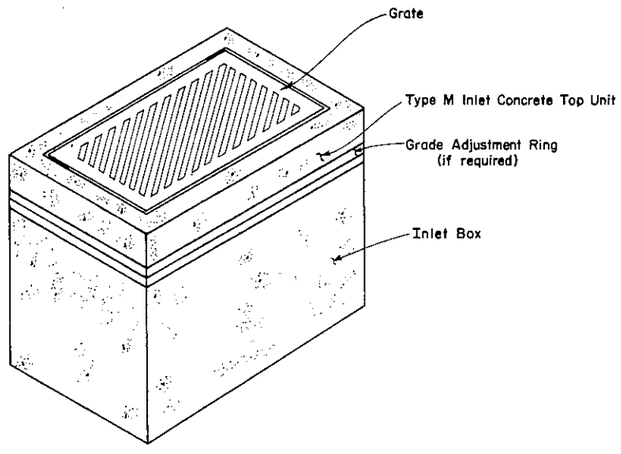

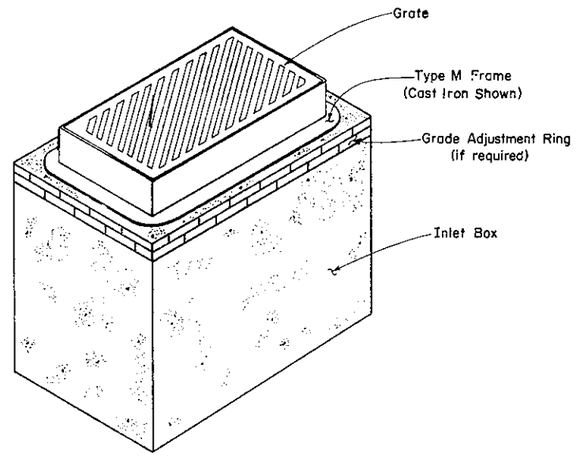

TYPE M INLET

NOTES:

1. This drawing is intended to depict the various components required in a complete inlet. For the details of the various items see the following sheets:
   - Sheet 2 - Concrete Top Units
   - Sheet 3 - Grates
   - Sheet 4 - Frames
   - Sheet 5 - Inlet Boxes
2. Each type of Inlet shown is suited for a particular situation.
   a. Type C Inlet is to be designated for installation in non-mountable curbs.
   b. Type M Inlet is designated for installation in median areas and mountable curbs.
   c. Type S Inlet is designated for installation in shoulder swale areas.
3. The selection of components to achieve a specified inlet type is the contractors responsibility.
4. Pipes will be located as required.
5. Weep holes shall be installed as required by Section 605, Form 408.
6. Grade Adjustment Rings may be of masonry or precast concrete construction.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

INLETS
INLET ASSEMBLIES

Recommended Sept. 8, 1981	Approved Sept. 8, 1981	Sht. 1 Of 6
B. D. Tomasic Dir. Bureau of Highway Design	Chief Highway Engineer	RC-34

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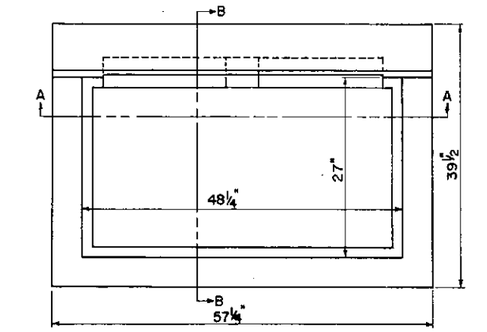
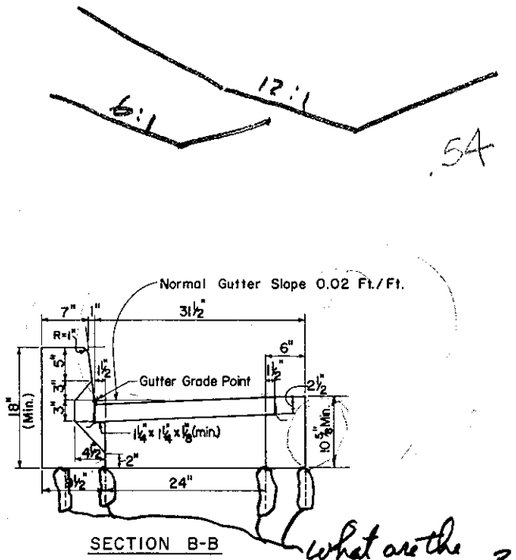


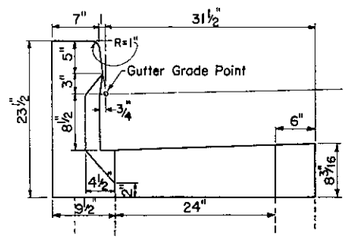
SECTION A-A



SECTION B-B

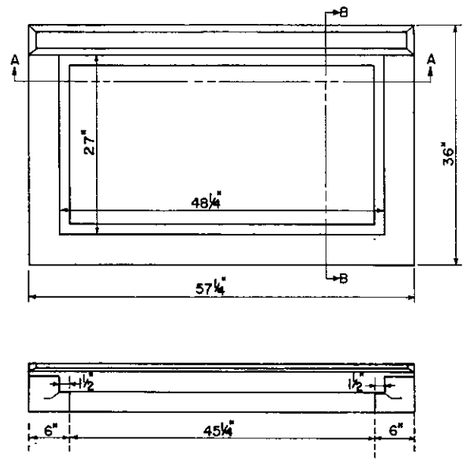
TYPE C

SECTION A-A

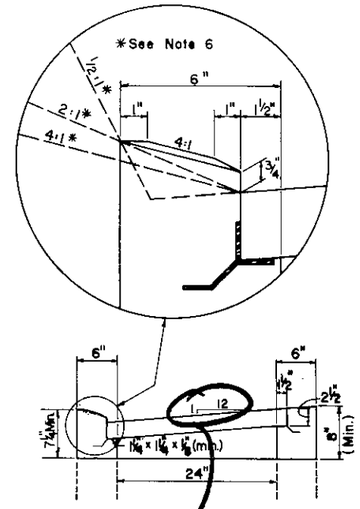


SECTION B-B

TYPE C ALTERNATE

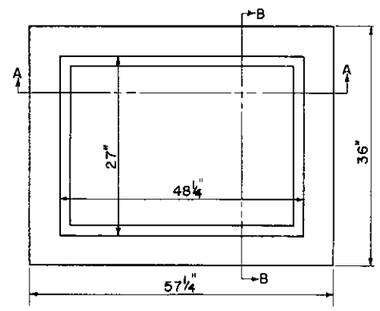


SECTION A-A

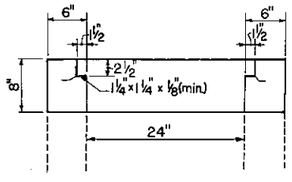


SECTION B-B

TYPE S



SECTION A-A



SECTION B-B

TYPE M

NOTES:

1. All Inlet Tops that are Cast-In-Place shall conform to the shape and dimensions as shown on the standard and, at the option of the contractor, may be monolithic with the Inlet Box.
2. Concrete Top Units which seat the grate directly within the unit shall utilize 1¼ x 1¼ angles embedded in the concrete as a bearing area for the grate.
3. This standard depicts the shape and dimensions required for uniformity and compatability. It is not intended to show the details required for manufacturing and handling precast units. Only those items which are supplied by an approved manufacturer as listed in Bulletin No. 15 will be permitted. Any manufacturer desiring to be listed in Bulletin No. 15 for these units shall submit a 22" x 36" (559 mm x 914 mm) reproducible shop drawing to the Materials and Testing Division, Bureau of Contract Quality Control for approval. The shop drawings must show all details including dimensions, tolerances, handling reinforcement, and any manufacturing drafts.
4. Whenever an inlet is required within a Mountable Curb Section, a Type M Inlet will be located adjacent to the back edge of the curb and will be flush with the pavement surface. See RC-65 for installation details.
5. Type C Inlet Concrete Top Units shall be dowelled with 2 - #8 X 1'-0" dowell bars and ¼" premolded expansion joint filler when connecting adjacent curb sections.
6. The placement of the Type S Inlet relative to the gutter invert is dependent on the rate of back slope. Back slopes greater than 2:1 shall have the inlet located where the back slope line intersects the back, top, outside corner of the inlet. Back slopes less than 2:1 shall have the inlet located where the back slope line intersects the edge of the inlet grate.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

INLETS
CONCRETE TOP UNITS

Recommended Sept. 8, 1981	Approved Sept. 8, 1981	Sht. 2 Of 6
S. D. Rambo	Alfred L. Clapp	RC-34
Dir. Bureau of Highway Design	Chief Highway Engineer	

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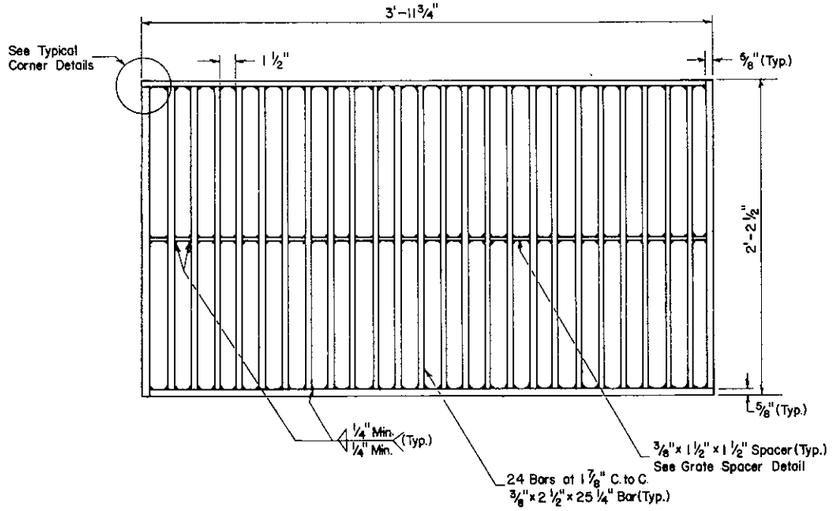
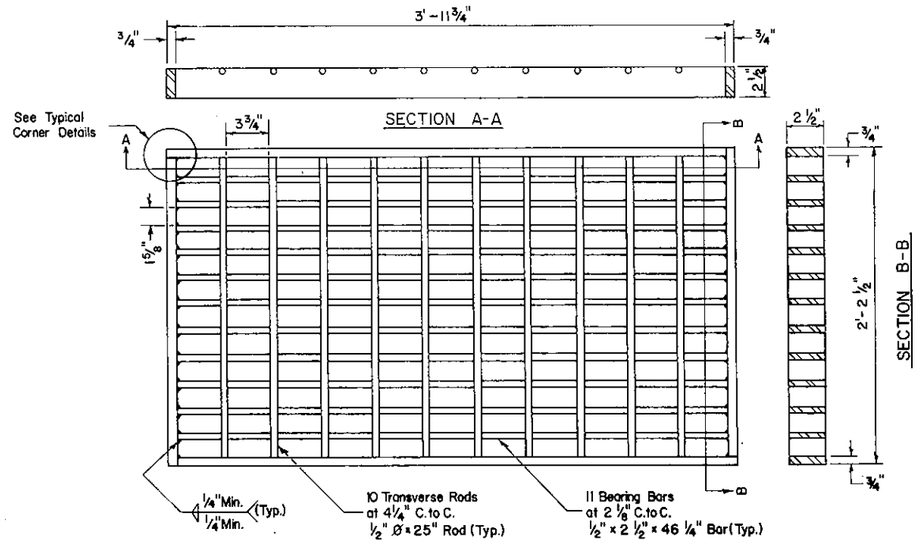


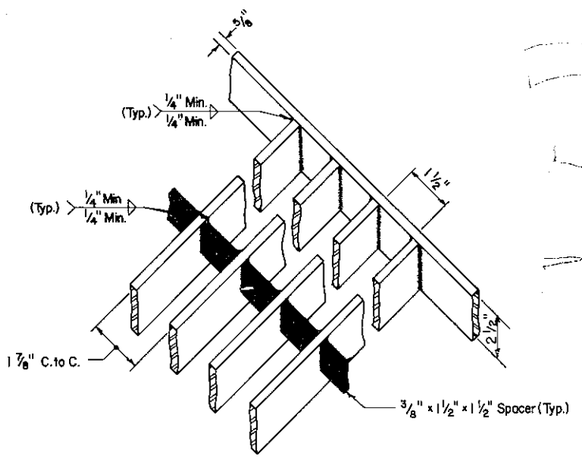
STRUCTURAL STEEL GRATE



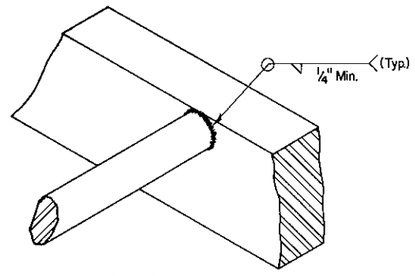
STRUCTURAL STEEL GRATE BICYCLE SAFE

NOTES

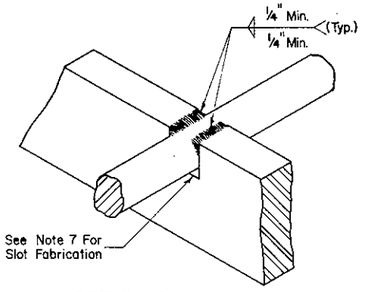
1. Grates shall be ductile or malleable cast iron or structural grade steel. Grates manufactured from Gray Cast Iron shall be submitted for approval.
2. All welding required for the fabrication of structural steel grates shall be accomplished in accordance with Section 1053.21, Form 409 Specifications. Welding shops fabricating structural steel grates will not be required to be American Institute of Steel Construction (AISC) certified.
3. This Standard depicts the dimensions required for uniformity and interchangeability. It is not intended to show the various details required for fabrication or manufacturing. Only those items supplied by an approved manufacturer, as listed in Bulletin No. 15, will be permitted. Any manufacturer desiring to be listed in Bulletin No. 15 for these units shall submit a 22" x 36" reproducible shop drawing to the Bureau of Contract Quality Control, Materials & Testing Division. The shop drawing must show all details including dimensions, tolerances, welding symbols, casting fillets, etc.
4. All transverse rods shall comply with the requirements of Form 408 Specifications, Section 709.1(a)2. All transverse rods shall be flush with the grate surface.
5. All structural steel grates shall comply with the quality requirements of Form 408 Specifications, Section 714.1.
6. Bicycle-safe structural steel grates shall be specified only for installation in areas 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 may be submitted for approval. Modifications or deviations from the Standards will require the submission of a shop drawing, as specified in Note 3, and will conform to the dimensional requirements for proper installation with the current concrete top units.
7. All slots shall be fabricated by burning, drilling, shearing, or punching. The bottom of all burned or drilled slots shall conform to the shape of the rod.
8. All structural steel grates shall be installed with the grate spacers located flush along the top surface of the grate.



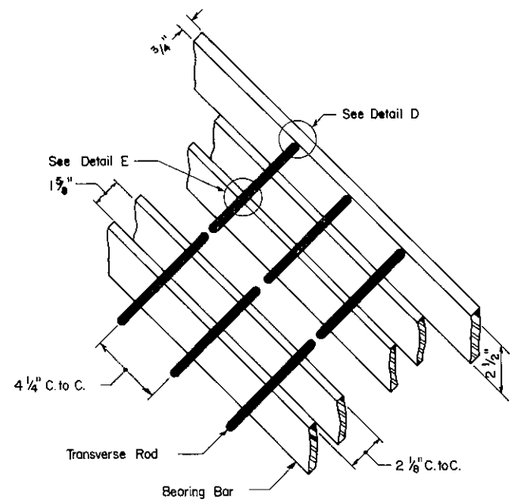
GRATE SPACER DETAIL



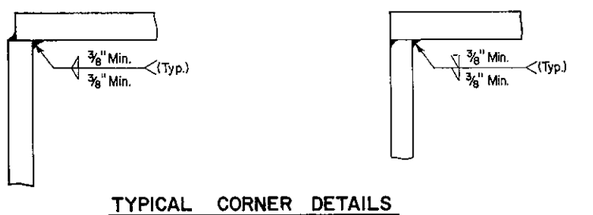
DETAIL D



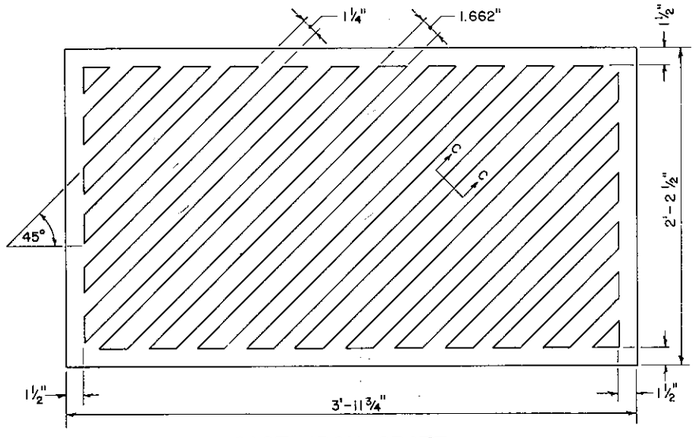
DETAIL E



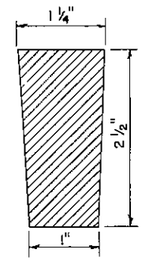
BAR & ROD SPACING DETAIL



TYPICAL CORNER DETAILS



CAST IRON GRATE



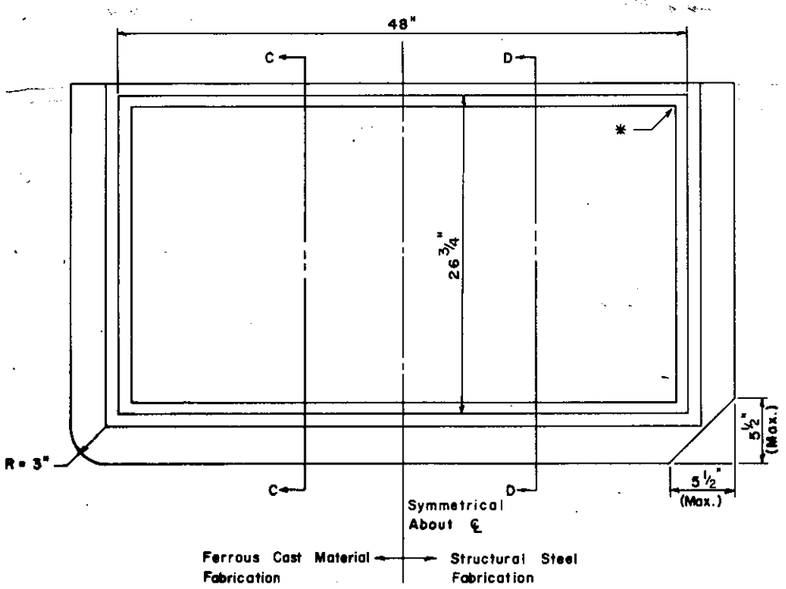
SECTION C-C

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DESIGN

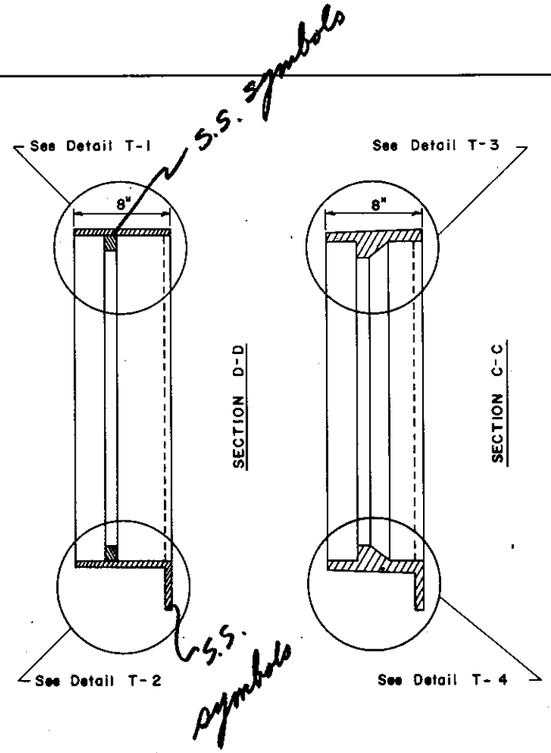
INLETS
GRATES

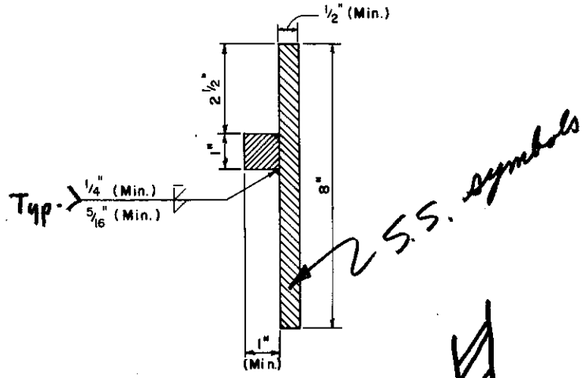
Recommended Sept. 8, 1981	Approved Sept. 8, 1981	Sht. 3 Of 6
B. D. Rowatt	Alfred D. Hayes	RC-34
Dir. Bureau of Highway Design	Chief Highway Engineer	

TRACED BY
FINAL BY

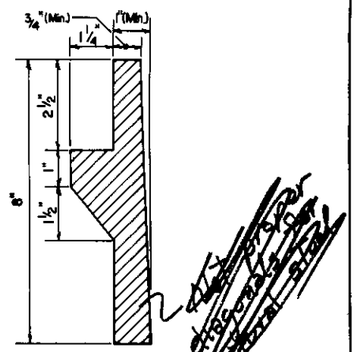


TYPE C FRAME

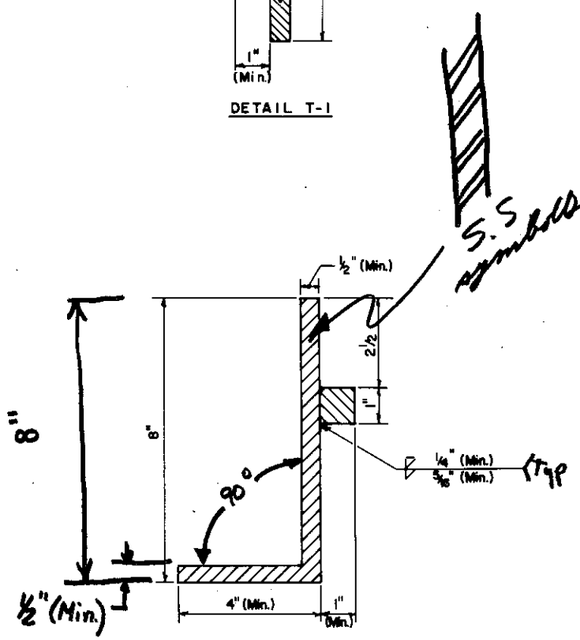




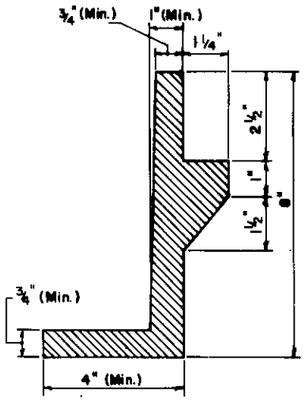
DETAIL T-1



DETAIL T-3

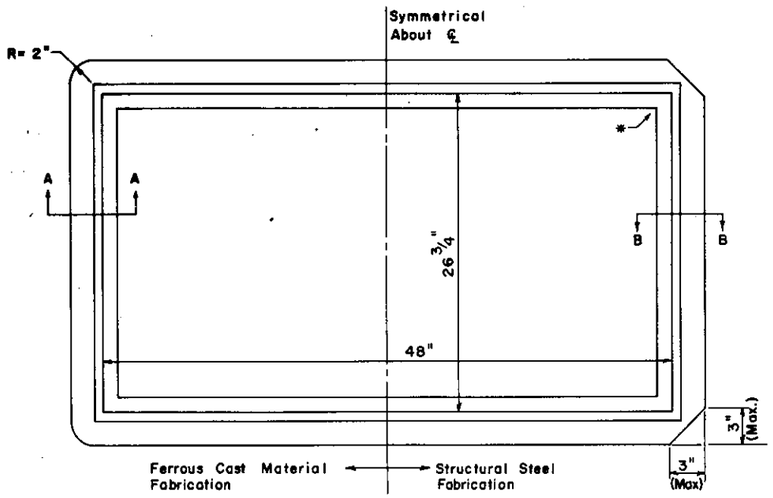


DETAIL T-2

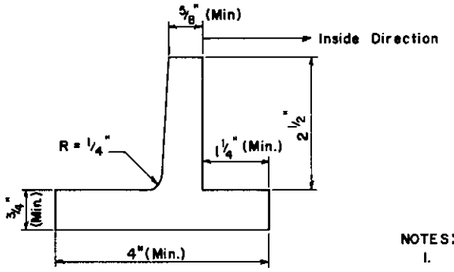


DETAIL T-4

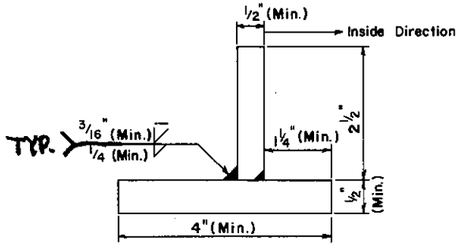
* Corner configuration details are fabricators responsibility & shall be approved.



TYPE M FRAME



SECTION A-A



SECTION B-B

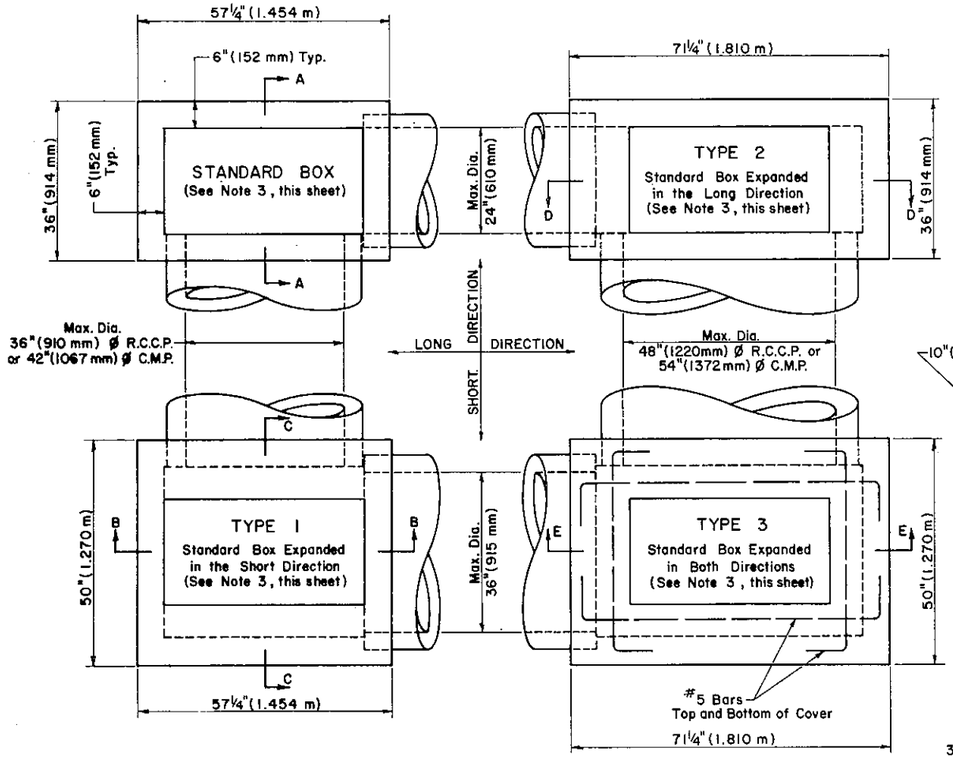
NOTES:

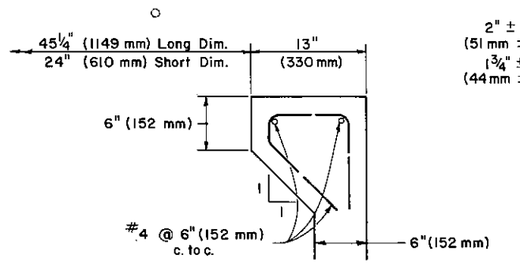
1. Frames shall be either gray, ductile or malleable cast iron or structural grade steel.
2. All welding required for the fabrication of structural steel grates shall be accomplished in accordance with Section 1053.21, Form 409 Specifications.
3. This standard depicts the dimensions required for uniformity and interchangeability. It is not intended to show the various details required for fabrication or manufacturing. Only those items which are supplied by an approved manufacturer as listed in Bulletin No. 15 will be permitted. Any manufacturer desiring to be listed in Bulletin No. 15 for these units shall submit a 22" x 36" (~~559mm x 914 mm~~) reproducible shop drawing to the Materials and Testing Division, Bureau of Contract Quality Control for approval. The shop drawing must show all details including dimensions, tolerances, welding symbols, casting fillets, etc.
4. Welding shops fabricating structural steel inlet frames will not be required to be American Institute of Steel Construction (AISC) certified.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

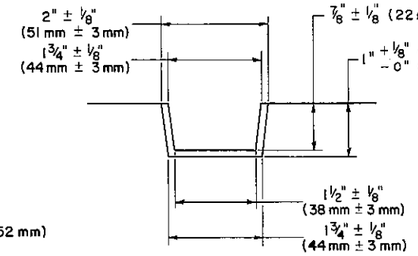
INLETS
FRAMES

Recommended Sept. 8, 1981	Approved Sept. 8, 1981	Sht. 4 Of 6
B.D. Rumble	Alfred L. Hoyt	RC-34
Dir. Bureau of Highway Design	Chief Highway Engineer	





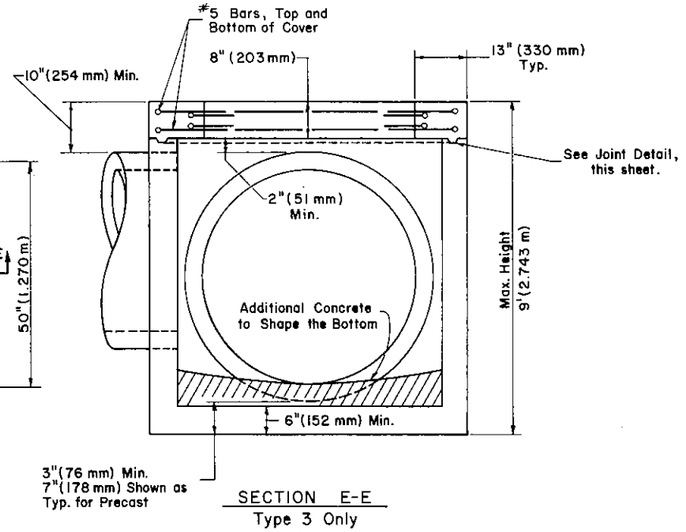
EXPANDED WALL DETAIL



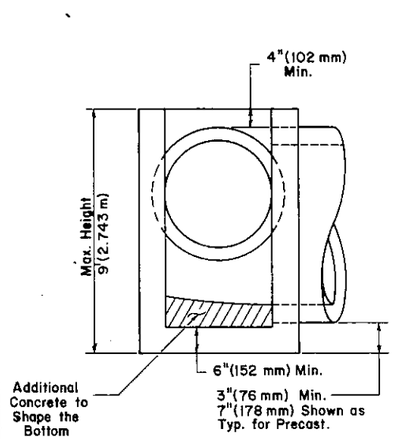
JOINT DETAIL

NOTES

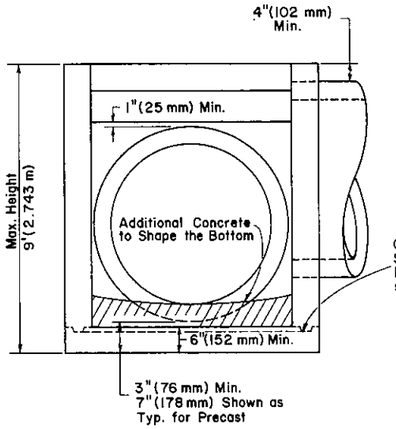
1. Materials and construction shall comply with the requirements of Specifications Form 408, Section 605 for Cast-in-Place, and Section 713.2 for Precast Cement Concrete Units.
2. Precast Concrete Inlet Boxes may be used in lieu of Cast-in-Place Boxes shown. If precast inlet boxes are used, only items supplied by an approved manufacturer as listed in Bulletin No. 15 will be permitted. (See Note 9)
3. All inlet boxes shall have the 24" x 45¼" (610 mm x 1149 mm) standard opening to accommodate the standard top components.
4. Typical inlet walls shall be 6" (152 mm) unless otherwise indicated for concrete construction and 8" (203 mm) for brick construction.
5. Inlets that exceed the maximum depth as shown shall require a special design.
6. Pipe block-outs extending into the base shall not be permitted when the base is not monolithic with the inlet walls.
7. Pipe or pipes shall be located as required, with the inlet bottom shaped to channel the flow toward the outlet pipe.
8. Precast Boxes shall be placed on a properly prepared base as shown.
9. Any manufacturer desiring to be listed in Bulletin No. 15 for these units shall submit a 22" x 36" (559 mm x 914 mm) reproducible shop drawing to the Materials and Testing Division, Bureau of Contract Quality Control. The shop drawing must show all details including dimensions, tolerances, handling reinforcement, and any manufacturing drafts.
10. Inlets that exceed 5' (1.524m) in depth shall be constructed with steps similar to the manholes.



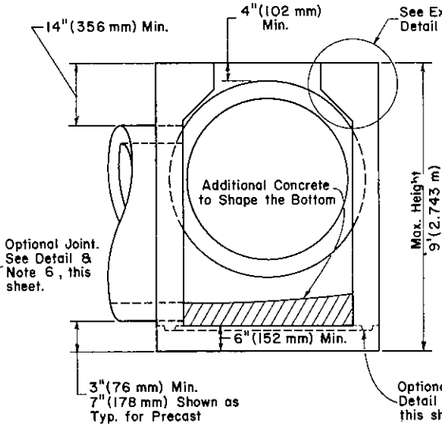
SECTION E-E
Type 3 Only
For larger diameter pipes a special design is required.



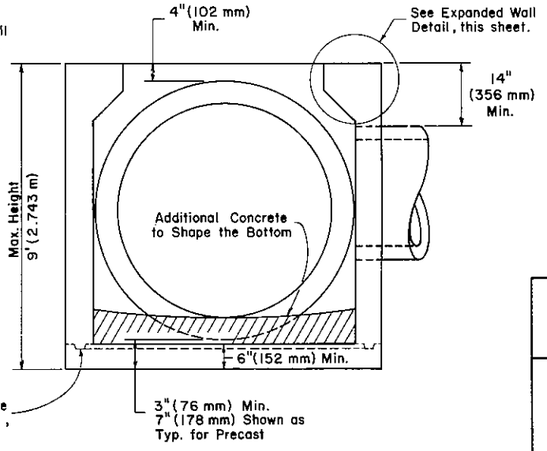
SECTION A-A



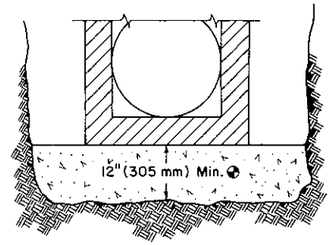
SECTION B-B



SECTION C-C
For Pipe Diameters larger than 36" (915 mm) in this wall use Modified Type I Inlet Box, RC-34, sheet 6 of 6.



SECTION D-D
For Pipe Diameters larger than 48" (1220 mm) R.C.C.P. or 54" (1372 mm) C.M.P. in this wall use Modified Type II Inlet Box, RC-34, sheet 6 of 6.



PRECAST INLET BOX
BASE PREPARATION DETAIL

Material shall meet the requirements of Form 408, Section 350.2 and be placed in 4" (102 mm) layers, thoroughly compacted to a density satisfactory to the engineer, and shall be incidental to the inlet pay item.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

INLETS
INLET BOXES

Recommended Sept. 8, 1981	Approved Sept. 8, 1981	Sht. 5 Of 6
B. D. Rowatsic	Alfred D. Clyde	RC-34
Dir. Bureau of Highway Design	Chief Highway Engineer	

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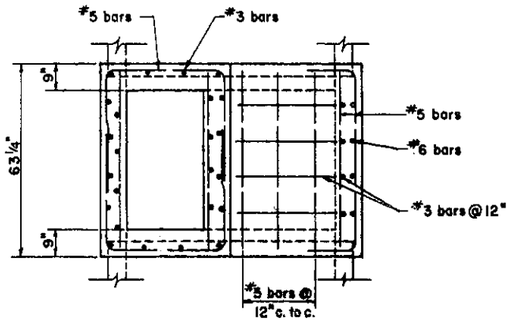
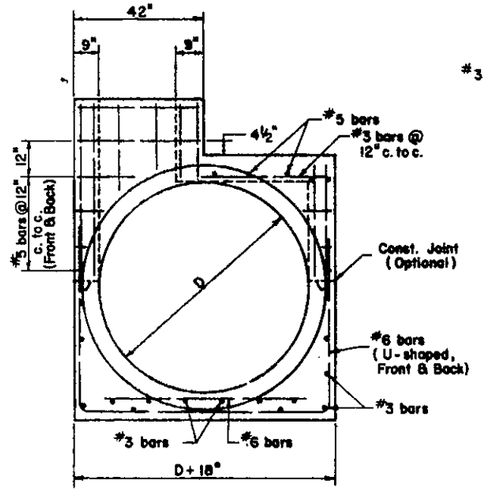
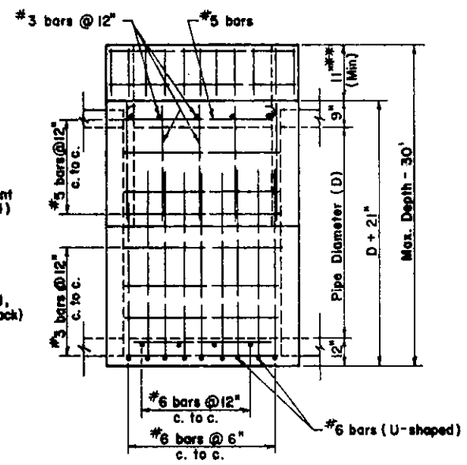
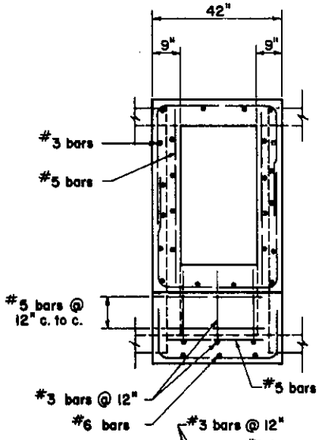
FINAL BY

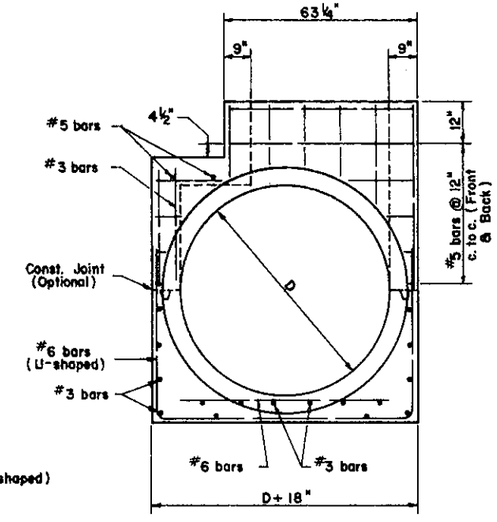




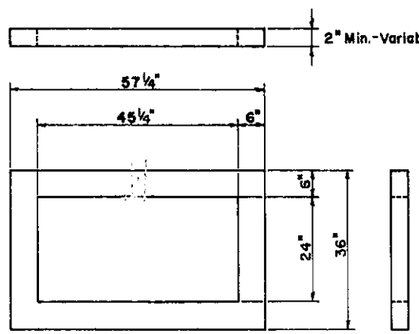


INLET BOX MODIFIED TYPE I





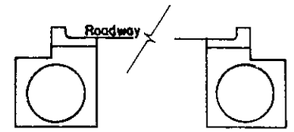
INLET BOX MODIFIED TYPE II



GRADE ADJUSTMENT RING (PRECAST)

NOTES

1. Material and construction shall comply with the requirements of Specifications Form 408, Section 605 for Cast-in-Place, and Section 713.2 for Precast Cement Concrete Units.
2. Inlets that exceed the maximum depth as shown shall require a special detail and design for the inlet walls and base.
3. When a situation can not be satisfied by the inlet boxes shown, special details and design shall be provided.
4. For orientation of the Type C Inlet with Modified Type I Inlet Box, the typical installation details are shown below. Any varation shall be shown on the construction drawings by special details.

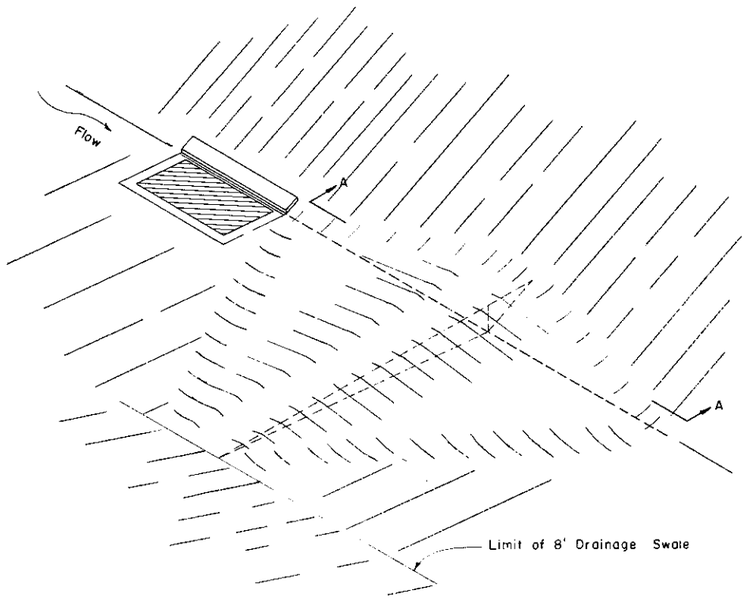


5. When the top unit and either a Type I or Type II Modified Inlet Boxes are constructed monolithically (no construction joint), a minimum depth of 20" shall be measured from the top surface of the top unit to the inside top of the pipe.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

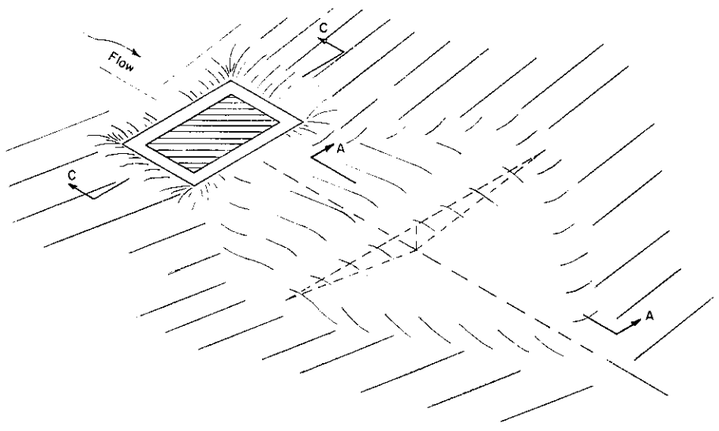
INLETS
MODIFIED INLET BOXES

Recommended Sept. 8, 1981	Approved Sept. 8, 1981	Sht. 6 Of 6
B.D. Barnhart	Alfred L. Tyler	RC-34
Dir. Bureau of Highway Design	Chief Highway Engineer	



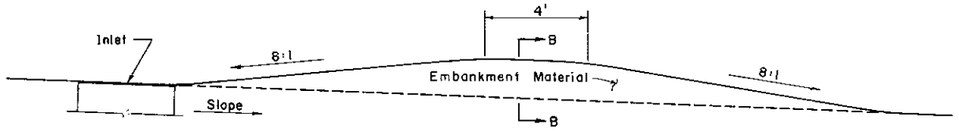
SWALE INSTALLATION

DRAINAGE DIKE

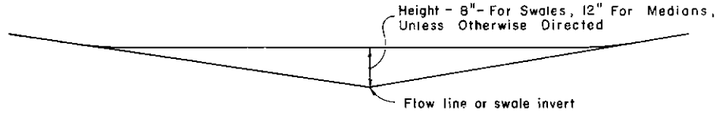


MEDIAN INSTALLATION

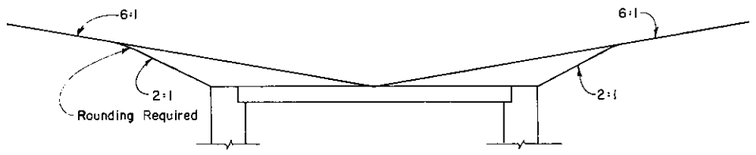
DRAINAGE DIKE



SECTION A-A



SECTION B-B



SECTION C-C

NOTES

1. The drainage dike shall not be constructed to a height to cause flooding of the subbase.
2. Construction of the drainage dike shall be considered incidental to the Class I Excavation.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

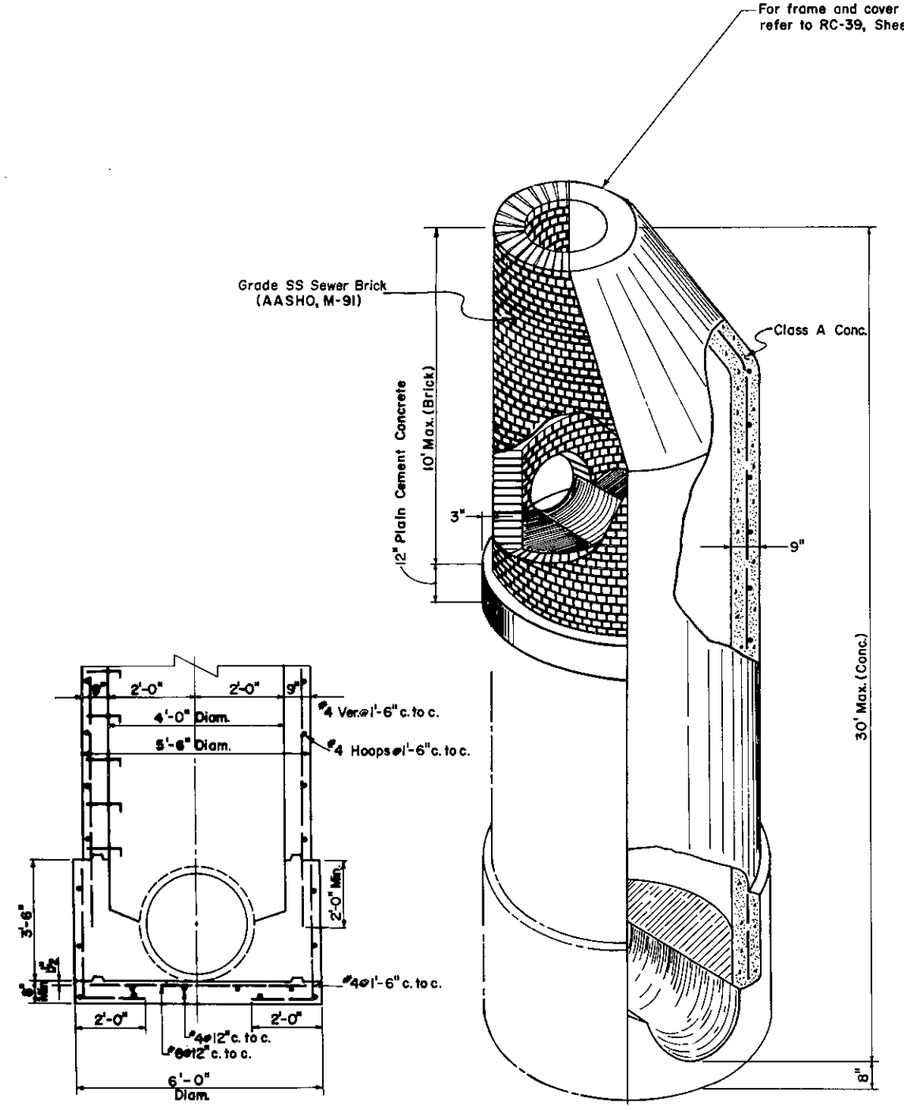
DRAINAGE DIKE

Recommended Jan. 31, 1977
B.D. Gamble
Director, Bureau of Design

Approved Jan. 31, 1977
James B. Wilson
Deputy Chief Hwy. Engr.

Sht. 1 Of 1

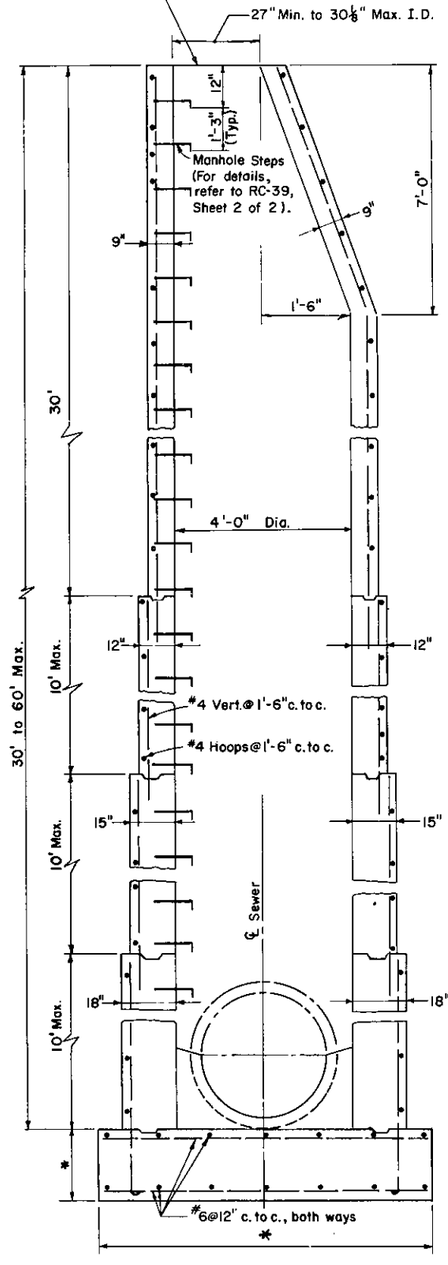
RC-35



FOUNDATION DETAIL FOR CONCRETE MANHOLE, TYPE A

TYPE A

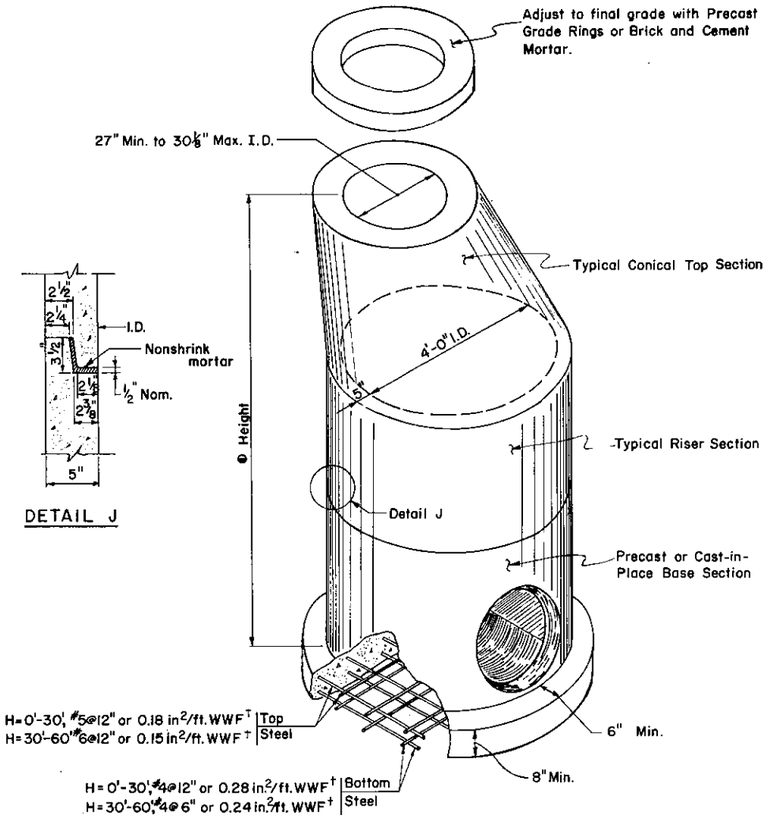
(IN - PLACE CONSTRUCTION)



*For base dia. and thickness, see table on Sheet 2 of 2, RC-39.

TYPE B

(IN - PLACE CONSTRUCTION)



DETAIL J

PRECAST

◐ Precast Manholes shall meet the requirements of Section 713.2(c) of Form 408, and may be substituted for Types A and B Manholes.

† Welded wire fabric shall conform to the requirements of Section 709.3 of Form 408.

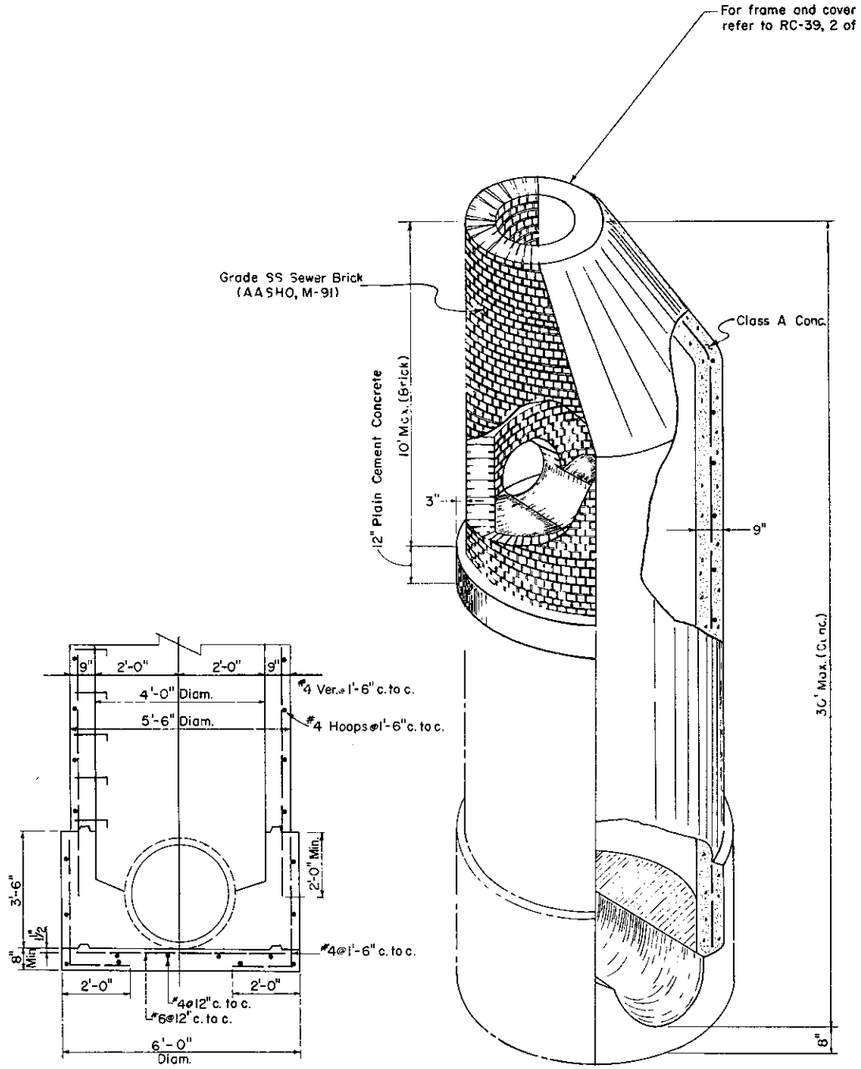
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

STANDARD MANHOLES

Recommended May 1982	Recommended May 6, 1982	Sht. 1 Of 2
Dir., Bureau of Highway Design	Chief Highway Engineer	RC-39

TRACED BY
CHECKED BY

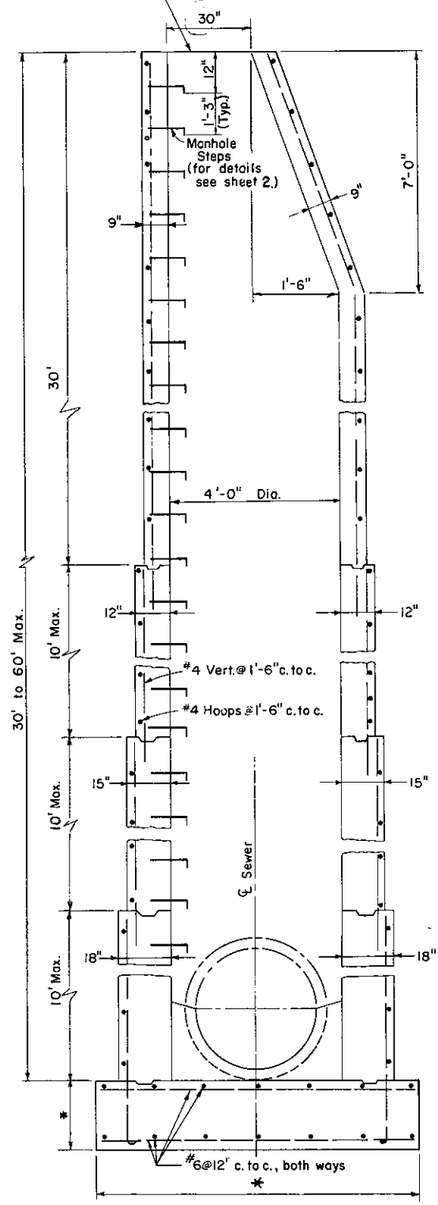
VOIDED BY CHANGE #1



FOUNDATION DETAIL FOR CONCRETE MANHOLE, TYPE A

TYPE A

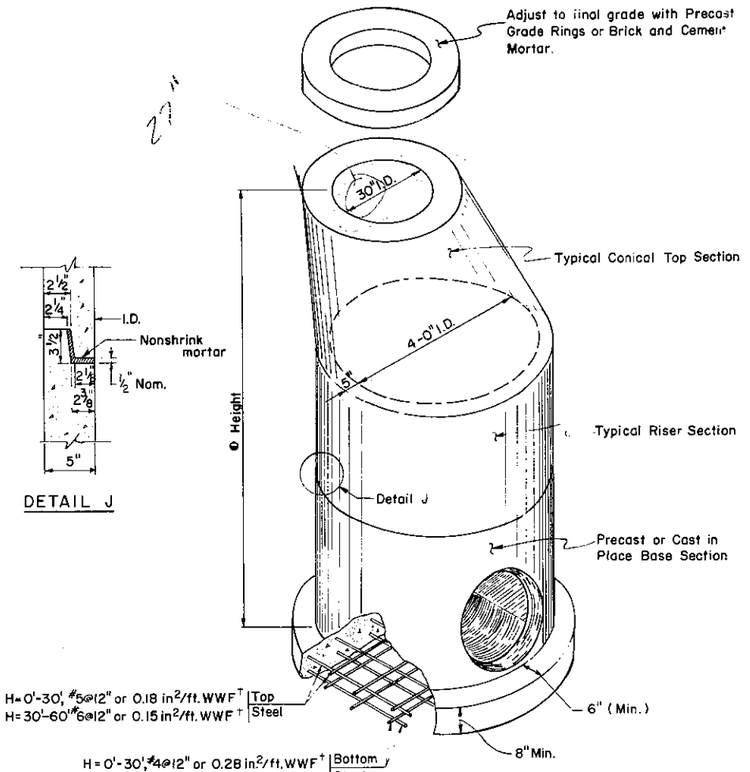
(IN PLACE CONSTRUCTION)



TYPE B

(IN PLACE CONSTRUCTION)

*For base dia. and thickness see table on sheet 2 of 2 RC.-39.



DETAIL J

H = 0'-30', #5 @ 12" or 0.18 in²/ft. WWF† | Top Steel
H = 30'-60', #6 @ 12" or 0.15 in²/ft. WWF† | Top Steel

H = 0'-30', #4 @ 12" or 0.28 in²/ft. WWF† | Bottom Steel
H = 30'-60', #4 @ 6" or 0.24 in²/ft. WWF† | Bottom Steel

PRECAST

● Precast Manholes shall meet the requirements of Section 713.2(c) of Form 408, and may be substituted for Types A and B Manholes.

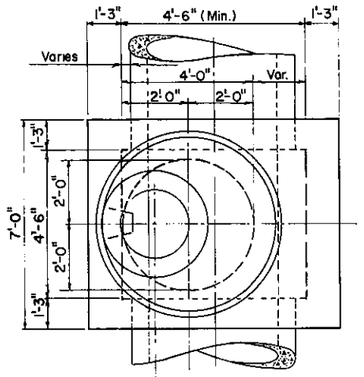
† Welded wire fabric shall conform to the requirements of Section 709.3 of Form 408.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

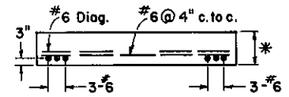
STANDARD MANHOLES

Recommended Jan. 31, 1977	Approved Jan. 31, 1977	Sht. 1 Of 2.
L.O. Gaudio, Director, Bureau of Design	James B. Wilson, Deputy Chief Hwy. Engr.	RC-39

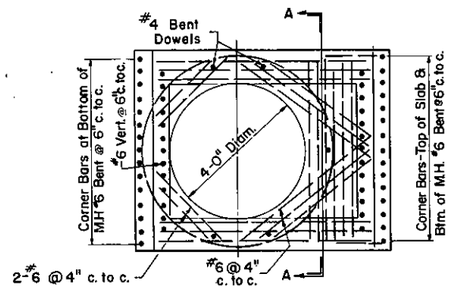
TRACED BY
FINAL BY



PLAN



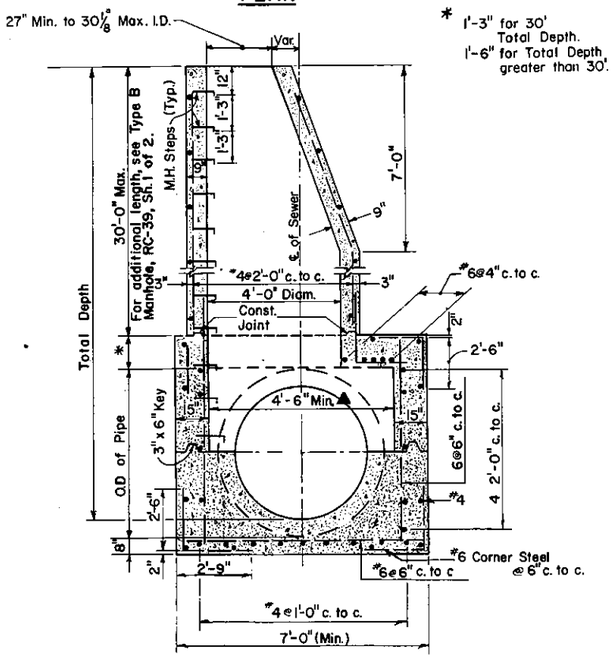
SECTION A-A



PLAN OF SLAB OVER PIPE

(Indicating Placing of Bars)

* 1'-3" for 30" Total Depth.
1'-6" for Total Depth greater than 30".



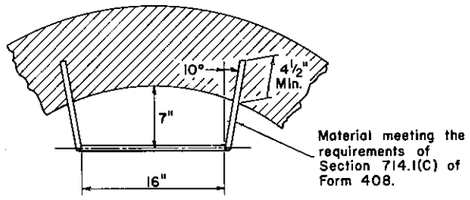
SECTION

MODIFIED MANHOLE ●

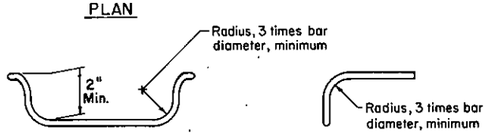
(For pipes 36" Dia. and greater)

▲ For pipe dia. greater than 54" increase the box size to keep the walls of the manhole box section flush with the inside dia. of the pipe. Maintain the required wall thickness of 15" for the manhole box section.

Alternate designs for adapting larger pipes shall be submitted for approval.



PLAN



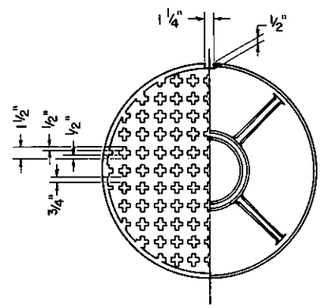
ELEVATION SIDE

MANHOLE STEPS

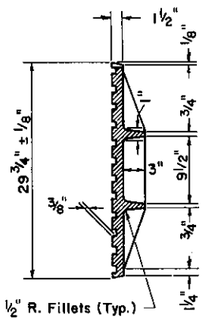
Alternate shapes, as approved by the engineer, may also be used.

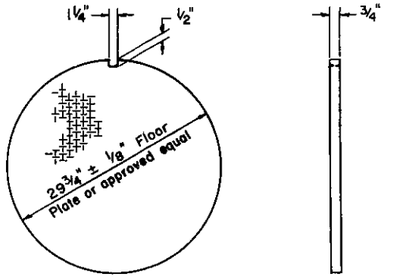
TABLE OF BASE SLAB DIMENSIONS					
Maximum Diam. of Pipe	Type of Manhole	Depth from Top of Manhole to Invert of Pipe	As Designed **		
			Tons per Sq. ft.	Minimum width of Base	Min. thickness of Base below the bottom of the pipe
30"	A	Max. 10'-0"	0.65	6'-6"	0'-8"
30"	A	Max. 20'-0"	0.82	7'-0"	0'-8"
30"	A	Max. 30'-0"	1.12	7'-0"Dia.	0'-8"
30"	B	Max. 40'-0"	1.38	7'-6"Dia.	1'-0"
30"	B	Max. 50'-0"	1.50	8'-6"Dia.	1'-6"
30"	B	Max. 60'-0"	1.55	9'-6"Dia.	2'-0"
	●Mod.	Max. 40'-0"	1.05	7'-0"x7'-0"	

** A safe bearing capacity of 1.50 t/ft.^{2} is assumed to determine the base size. When the subsoil is extremely poor, the contractor shall proceed with the construction only after the engineer specifies an adequate base design.

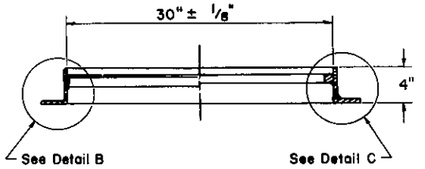


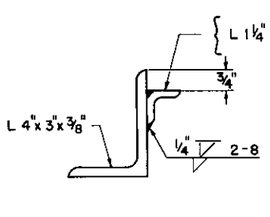
CAST IRON COVER



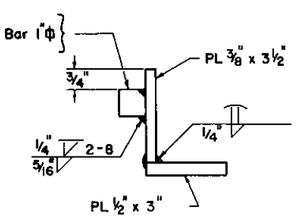


STRUCTURAL STEEL COVER





DETAIL B

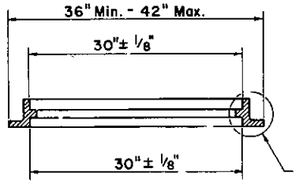


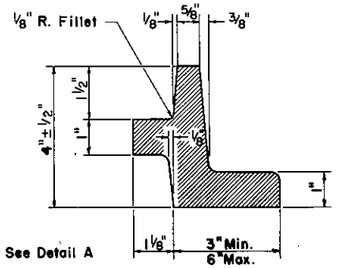
DETAIL C

STRUCTURAL STEEL FRAME

NOTES

1. Only frames and covers which are supplied by an approved manufacturer, as listed in Bulletin No. 15, will be permitted.





DETAIL A

CAST IRON FRAME

All rounds and fillets to be 1/4" R. unless otherwise noted.

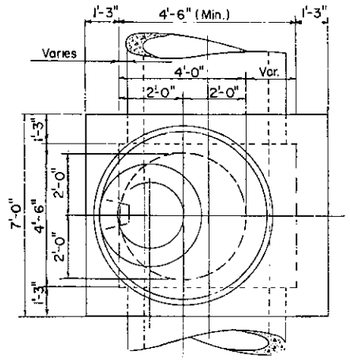
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

STANDARD MANHOLES

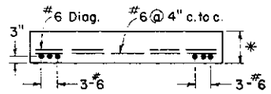
Recommended May 6, 1982	Recommended May 6, 1982	Sht. 2 Of 2
Louis J. O'Brien	Alfred D. Clark	RC-39
Dir., Bureau of Highway Design	Chief Highway Engineer	

DRAWN BY
CHKD. BY

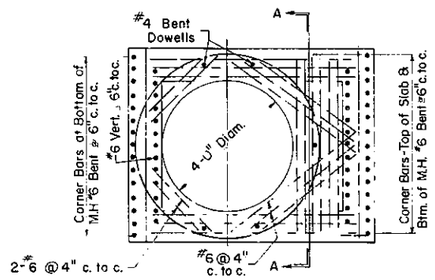
VOIDED BY CHANGE #1



PLAN



SECTION A-A



PLAN OF SLAB OVER PIPE

(Indicating Placing of Bars)

* 1'-3" for 30' Total Depth.
1'-6" for Total Depth greater than 30'.

TABLE OF BASE SLAB DIMENSIONS					
Maximum Diam. of Pipe	Type of Manhole	Depth from Top of Manhole to Invert of Pipe	As Designed ** Tons per Sq. ft.	Minimum width of Base	Min. thickness of Base below the bottom of the pipe
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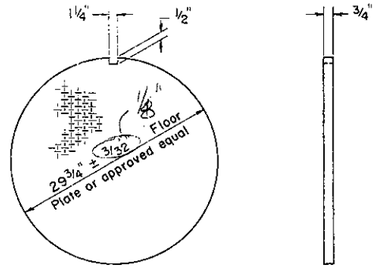
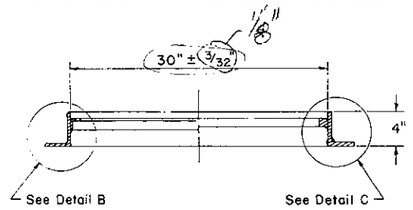
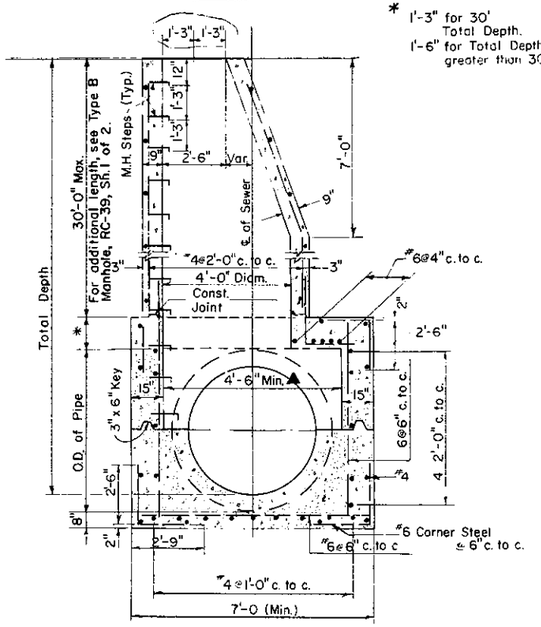
30"	A	Max. 20'-0"	0.82	7'-0"	0'-8"
30"	A	Max. 30'-0"	1.12	7'-0" Dia.	0'-8"
30"	B	Max. 40'-0"	1.38	7'-6" Dia.	1'-0"
30"	B	Max. 50'-0"	1.50	8'-6" Dia.	1'-6"
30"	B	Max. 60'-0"	1.55	9'-6" Dia	2'-0"
	Mod.	Max. 40'-0"	1.05	7'-0" x 7'-0"	

** A safe bearing capacity of 1.50 t/ft.² is assumed to determine the base size. When the subsoil is extremely poor, the contractor shall proceed with the construction only after the engineer specifies an adequate base design.



STRUCTURAL STEEL COVER





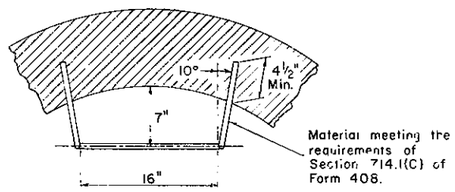
SECTION

MODIFIED MANHOLE ●

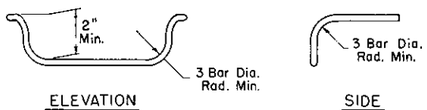
(For pipes 36" Dia. and greater)

▲ For pipe dia. greater than 54" increase the box size to keep the walls of the manhole box section flush with the inside dia. of the pipe. Maintain the required wall thickness of 15" for the manhole box section.

Alternate designs for adapting larger pipes shall be submitted for approval.



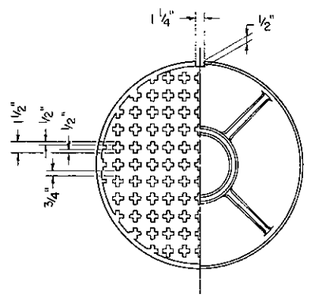
PLAN

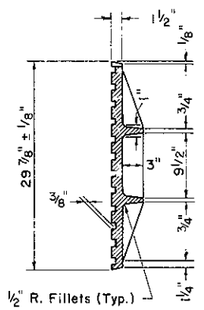


ELEVATION SIDE

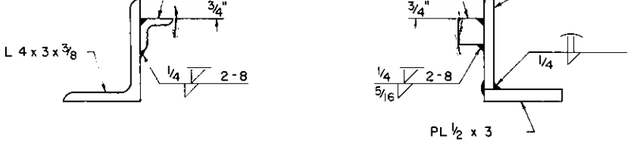
MANHOLE STEPS

Alternate shapes, as approved by the engineer, may also be used.





CAST IRON COVER

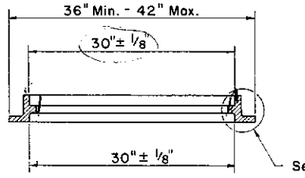


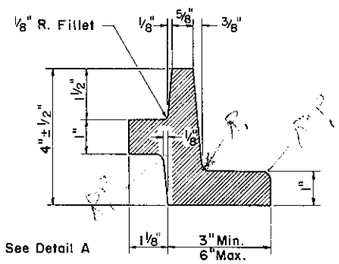
DETAIL B DETAIL C

STRUCTURAL STEEL FRAME

NOTES

1. Only frames and covers which are supplied by an approved manufacturer as listed in Bulletin No. 15 will be permitted.





DETAIL A

CAST IRON FRAME

All rounds and fillets to be ¼" R. unless otherwise noted.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

STANDARD MANHOLES

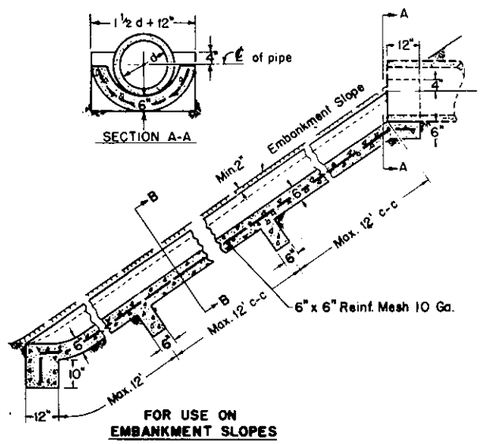
Recommended Jan. 31, 1977
B.O. Cunkle
Director, Bureau of Design

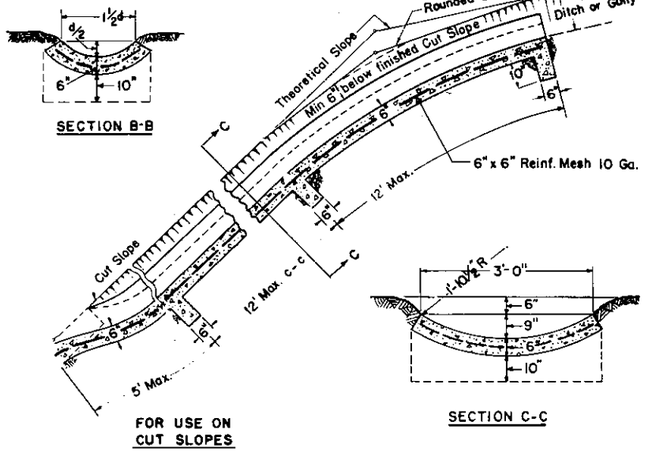
Approved Jan. 31, 1977
James B. Williams
Deputy Chief Hwy. Engr.

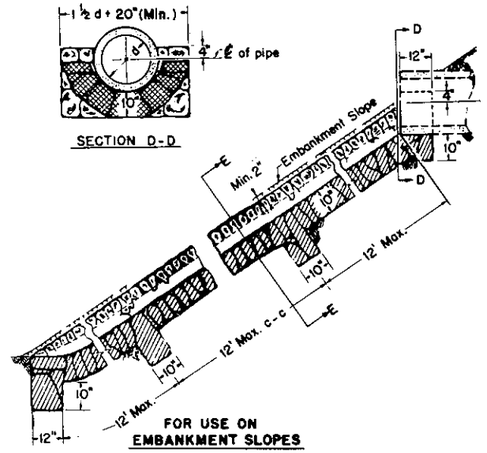
Sht. 2 Of 2

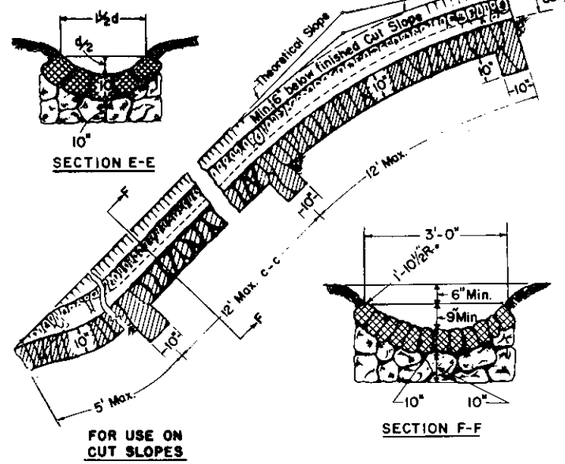
RC-39

TRACED BY
FINAL BY



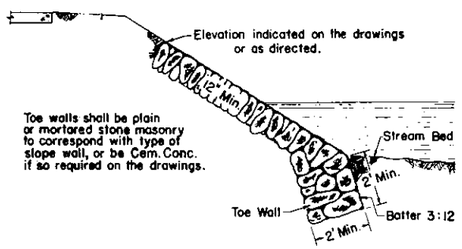




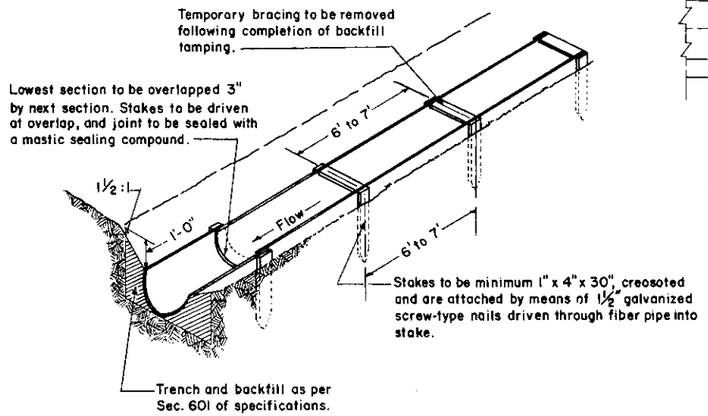


MORTARED STONE SPILLWAYS

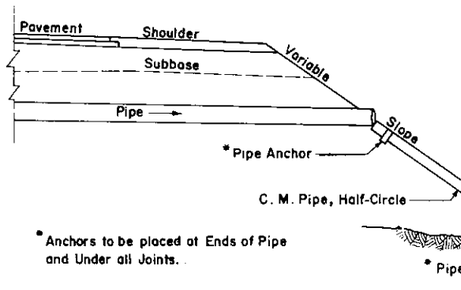
CEMENT CONCRETE SPILLWAYS



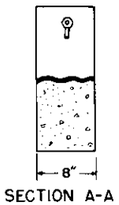
PLAIN AND MORTARED
STONE SLOPE WALL

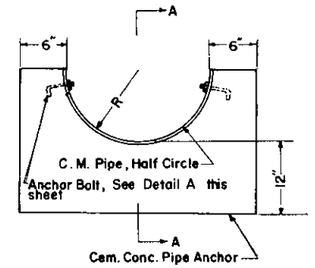


INSTALLATION OF HALF SECTION BITUMINIZED
FIBER PIPE



SKETCH OF HALF CIRCLE PIPE IN FILL SLOPE

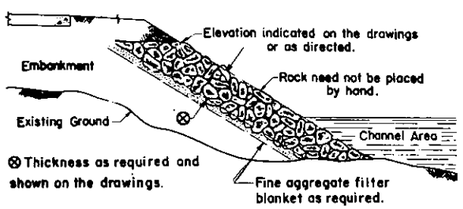




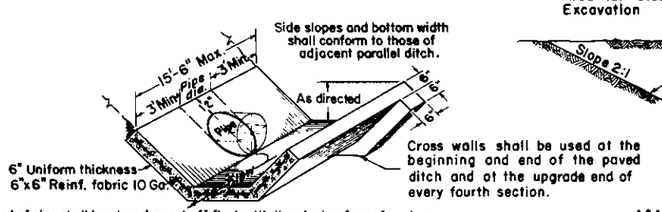
DETAIL OF PIPE ANCHOR

NOTES

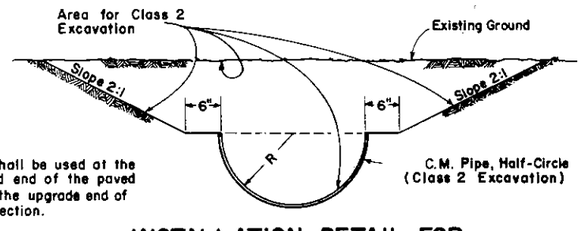
1. All items shall conform to the requirements of Form 408.



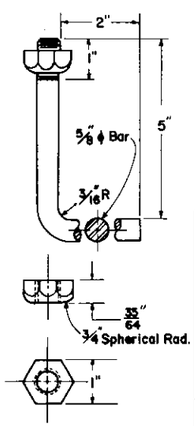
ROCK EMBANKMENT
FOR SLOPE PROTECTION



CEMENT CONCRETE PAVING for STREAM BEDS
(PAVED PARALLEL DITCH)



INSTALLATION DETAIL FOR
HALF-CIRCLE PIPE



DETAIL A - ANCHOR BOLT

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

SLOPE PROTECTION

Recommended Nov. 15, 1977
R. A. Reynolds
Director, Bureau of Design

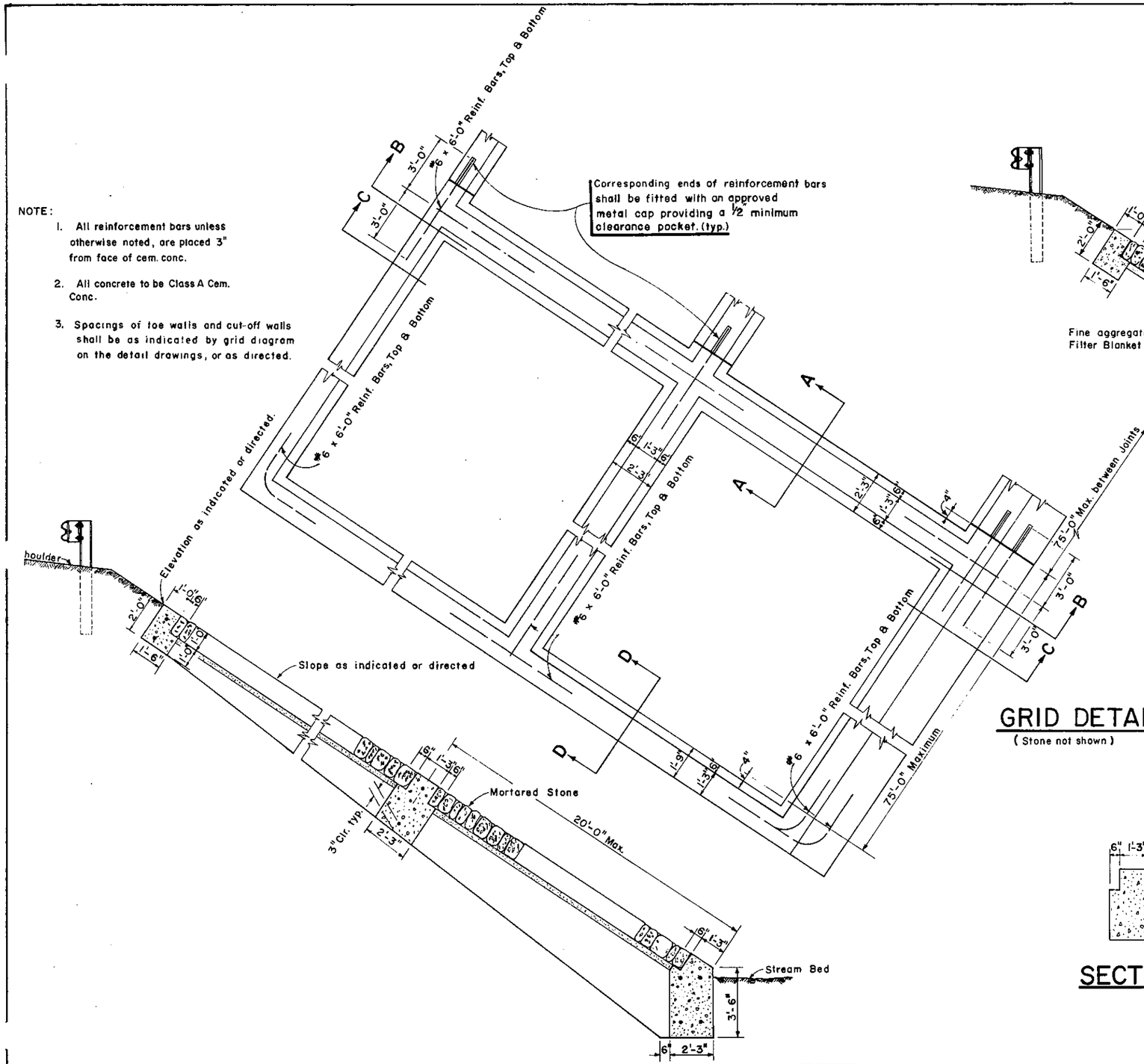
Approved Nov. 15, 1977
J. F. Sebastian
Deputy Chief Hwy. Engr.

Sht. 1 Of 1

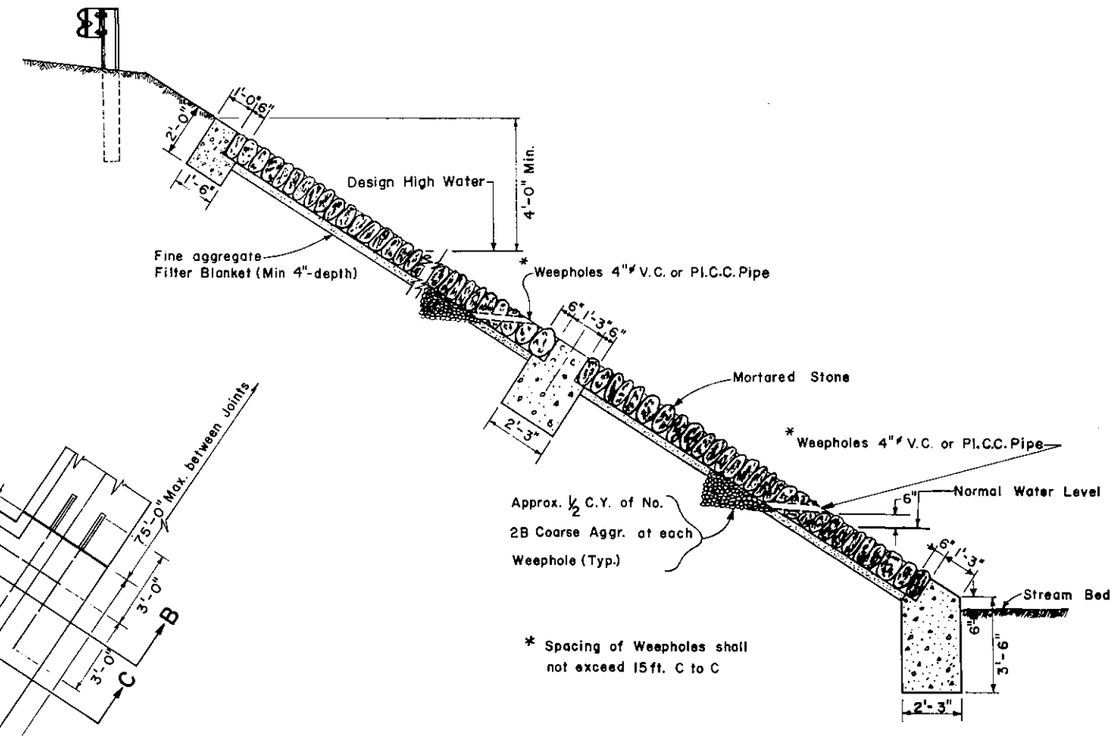
RC-40

NOTE:

1. All reinforcement bars unless otherwise noted, are placed 3" from face of cem. conc.
2. All concrete to be Class A Cem. Conc.
3. Spacings of toe walls and cut-off walls shall be as indicated by grid diagram on the detail drawings, or as directed.

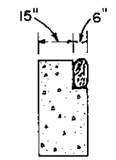


GRID DETAIL
(Stone not shown)



* Spacing of Weepholes shall not exceed 15 ft. C to C

SECTION C-C



SECTION D-D

SECTION A-A

SECTION B-B THRU COMPLETED WALL

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

SPECIAL MORTARED STONE SLOPE WALL

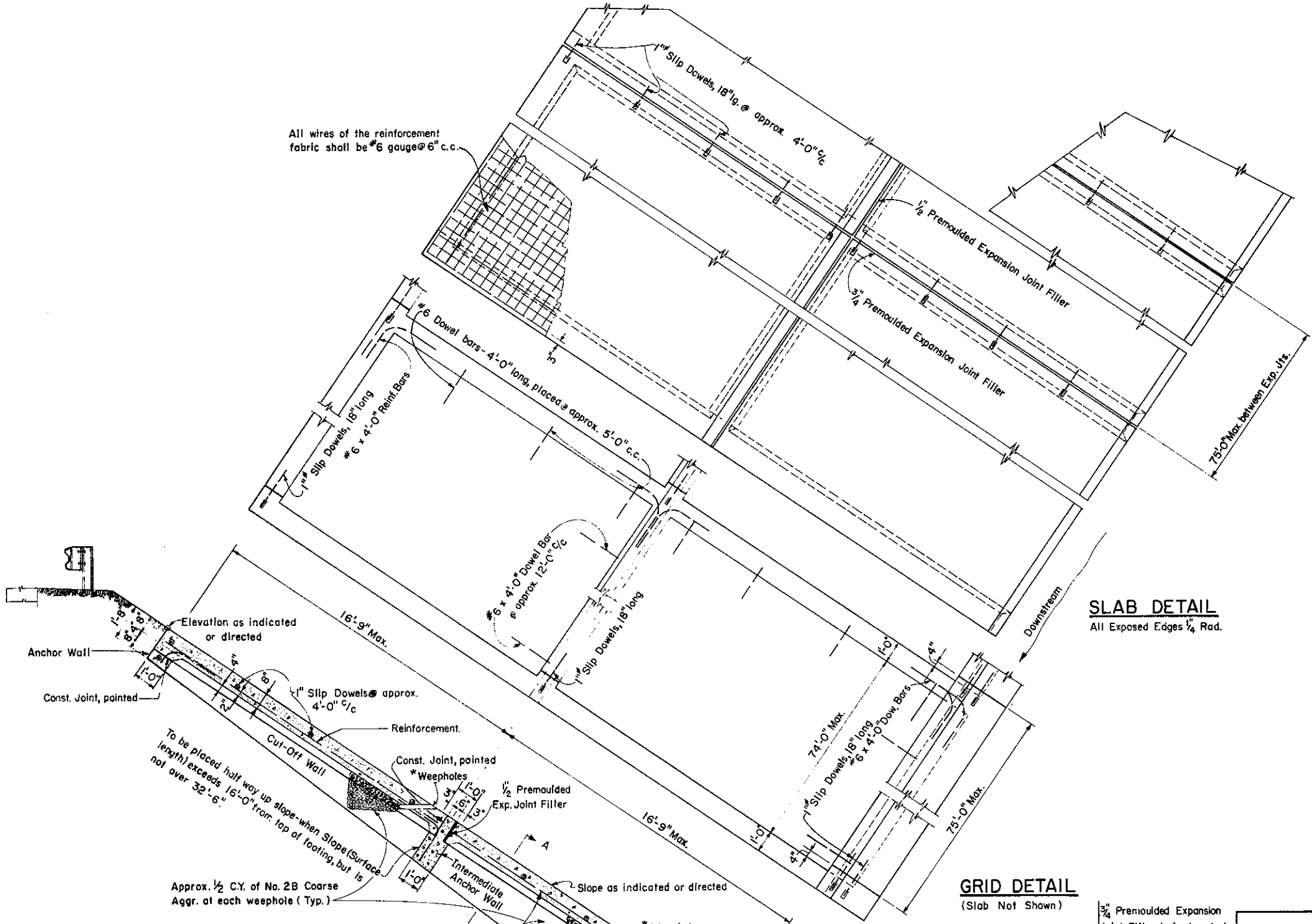
Recommended May 31, 1979
Director, Bureau of Design

Approved May 31, 1979
Chief Hwy. Engr.

Sht. 1 of 1

RC-41

FORM 4237 REV. 7-69



SLAB DETAIL

All Exposed Edges 1/4 Rad.

GRID DETAIL

(Slab Not Shown)

SLIP DOWEL BAR DETAIL

SECTION THRU COMPLETED WALL

SECTION A-A

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

REINFORCED CEMENT CONCRETE SLOPE WALL

Recommended June 1, 1976
B.D. Rowlins
Director, Bureau of Design

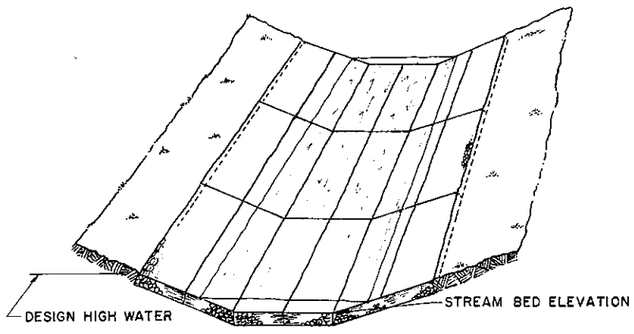
Approved June 1, 1976
Deputy Chief Hwy. Engr.

Sht. 1 Of 1

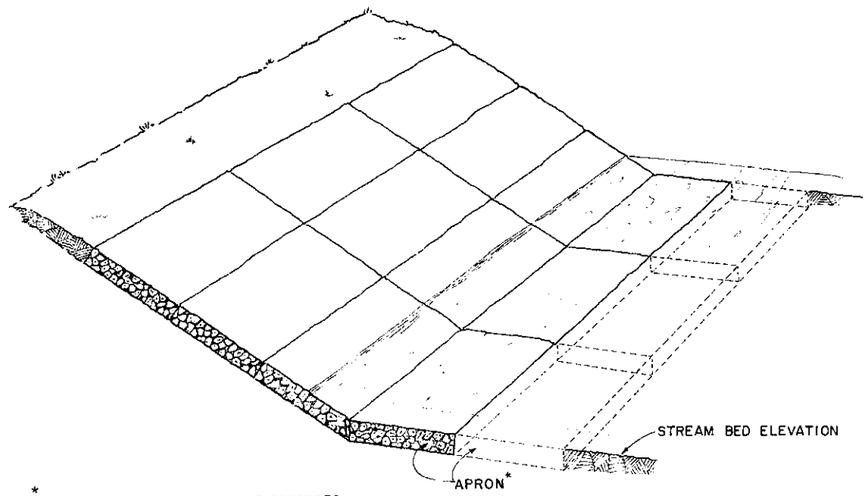
RC-42

TRACED BY
CHKD BY

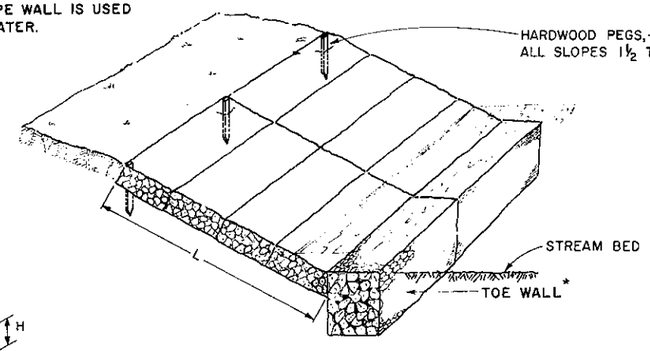
FORM 4237 REV. 7-69

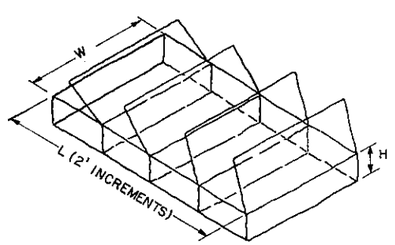


CHANNEL LINING



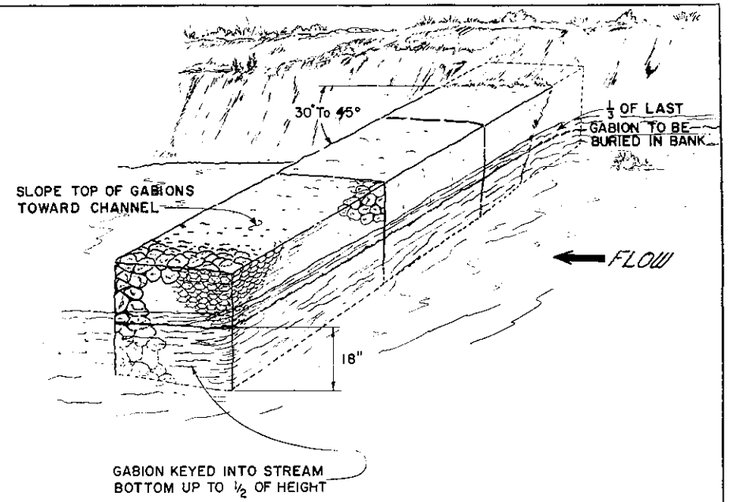
* APRON OR TOE WALL WILL BE REQUIRED WHERE THE SLOPE WALL IS USED ADJACENT TO WATER.





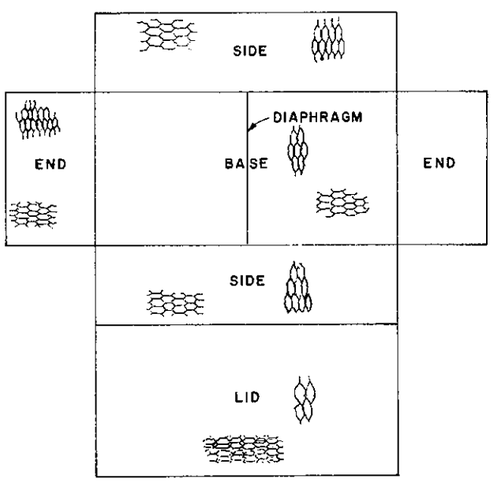
MATTRESS TYPE

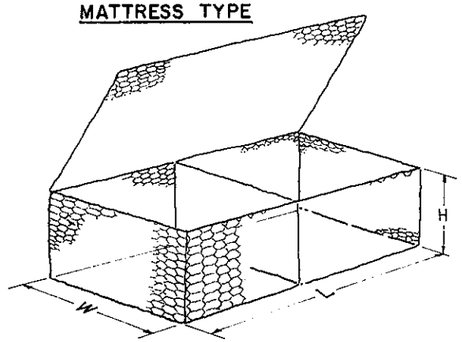
SLOPE WALLS



CHANNEL DEFLECTOR

- Type A Gabions shall consist of wire baskets filled by hand placement of coarse aggregate at least along the exposed faces for a uniform appearance.
- Type B Gabions shall consists of wire baskets filled completely with small power equipment or by hand.
- Corrosion Resistant Type A and B Gabions shall be the same as Type A and B Gabions except that the basket wire shall be sheathed in polyvinyl chloride plastic.





WIRE MESH BASKETS

GABIONS		
W	H	L
3'-3"	3'-3"	6'-6"
3'-3"	3'-3"	9'-9"
3'-3"	3'-3"	13'-1"
3'-3"	1'-8"	6'-6"
3'-3"	1'-8"	9'-9"
3'-3"	1'-8"	13'-1"
3'-3"	1'-0"	6'-6"
3'-3"	1'-0"	9'-9"
3'-3"	1'-0"	13'-1"
GABION (MATTRESS)		
6'-6"	9"	8'-0"
6'-6"	9"	10'-0"
6'-6"	9"	12'-0"
6'-6"	10" *	8'-0"
6'-6"	10" *	10'-0"
6'-6"	10" *	12'-0"

* 9" For Corrosion Resistant

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

GABIONS

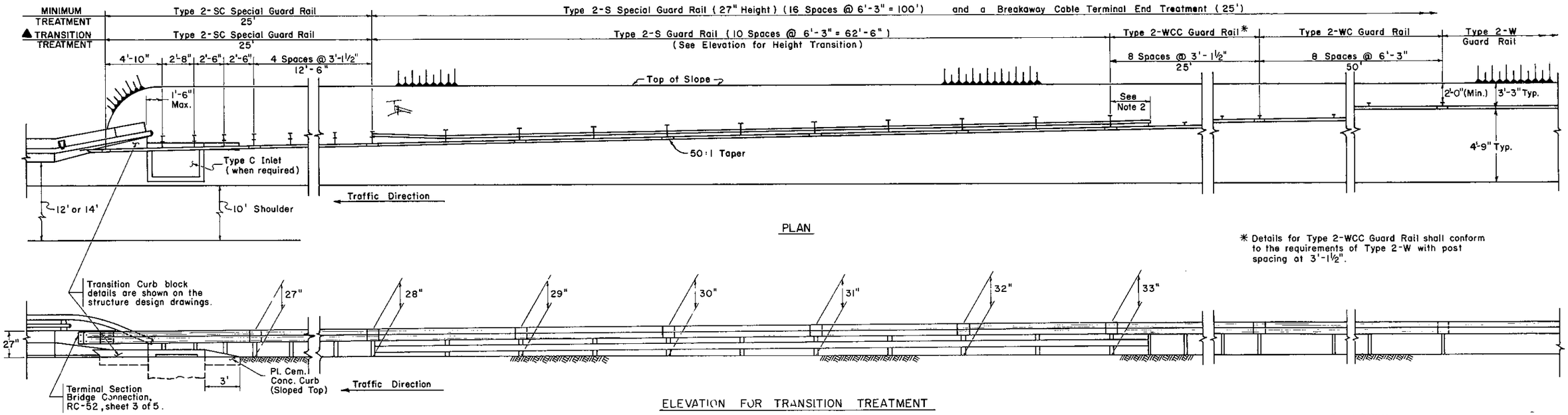
Recommended May 31, 1979
B.D. Cumbie
Director, Bureau of Design

Approved May 31, 1979
David L. Sims
Chief Hwy Engr.

Sht. 1 Of 1

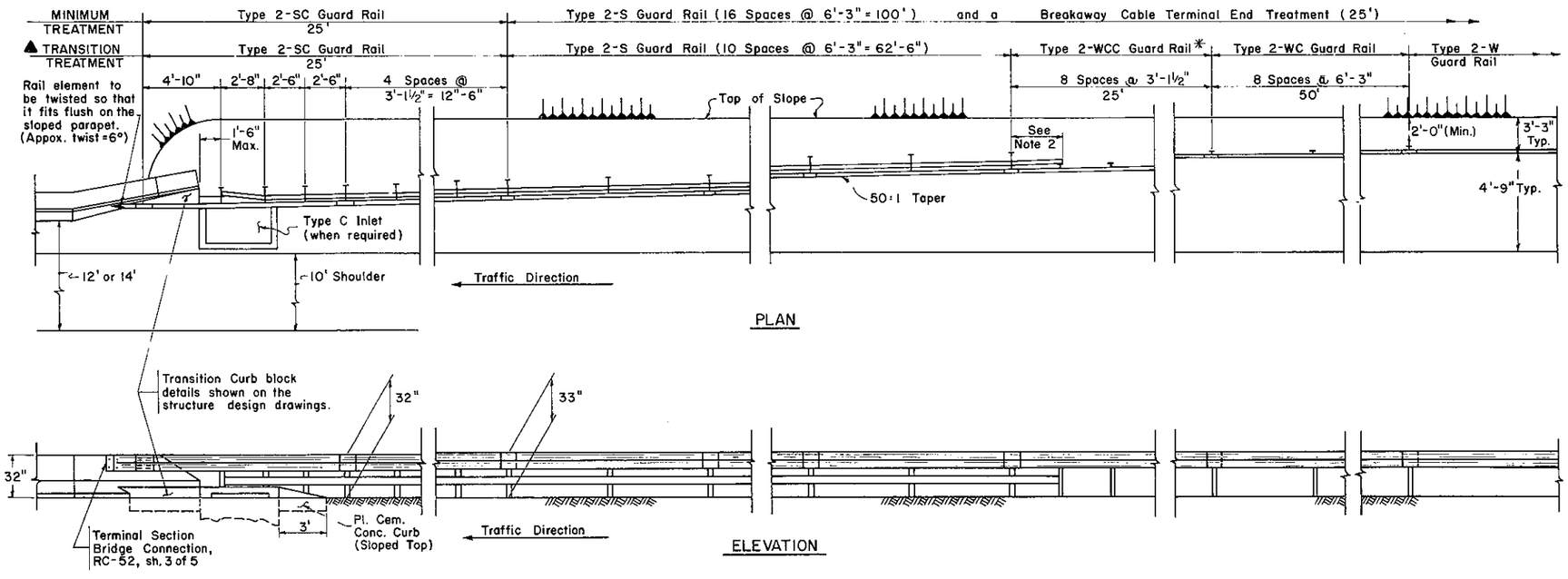
RC-43

TRACED
FINAL

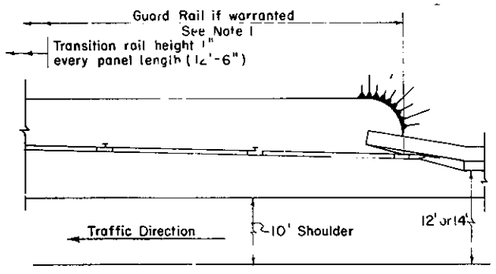


▲ Use the necessary portion of the guard rail types and lengths as indicated for transitioning from the approaching guard rail to the structure.

APPROACH END GUARD RAIL TRANSITION AT SLOPED CURB PARAPET
(27" Height)



APPROACH END GUARD RAIL TRANSITION AT SLOPED PARAPET
(32" Height)



TRAILING END GUARD RAIL AT STRUCTURE PARAPET FOR DIVIDED HIGHWAY WHERE REQUIRED
(See Note 1)

NOTES

1. Approach End Guard Rail Treatment should be provided at both the Approach and Trailing Ends of Structure Parapets on two lane facilities with two way traffic. On four lane divided highways guard rail is not required on trailing ends of parapets unless warranted by other obstructions.
2. This length of the Rubbing Rail is not to be included as part of the Type 2-WCC Guard Rail and should be incidental to the Type 2-S Guard Rail pay item.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

GUARD RAIL TRANSITION AT END OF STRUCTURES

Recommended May 1, 1978
B.O. Rowsher
Director, Bureau of Design

Approved May 1, 1978
James H. DeLuliis
Deputy Chief Hwy. Engr.

Sht. 1 Of 1
RC-50

TRACED BY
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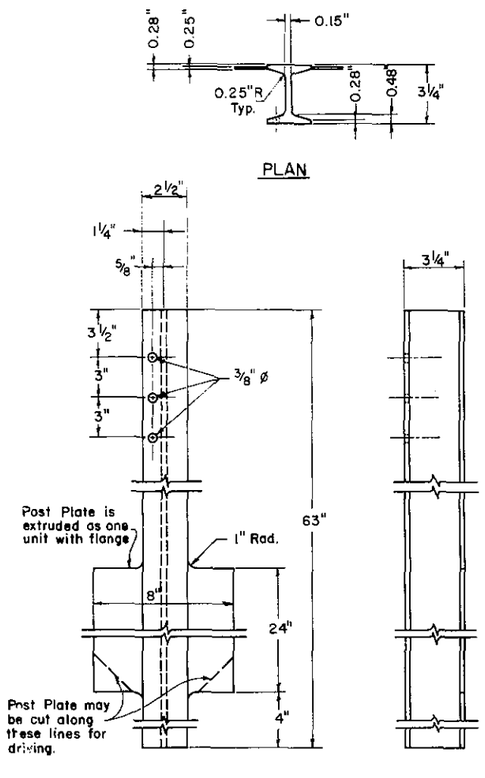
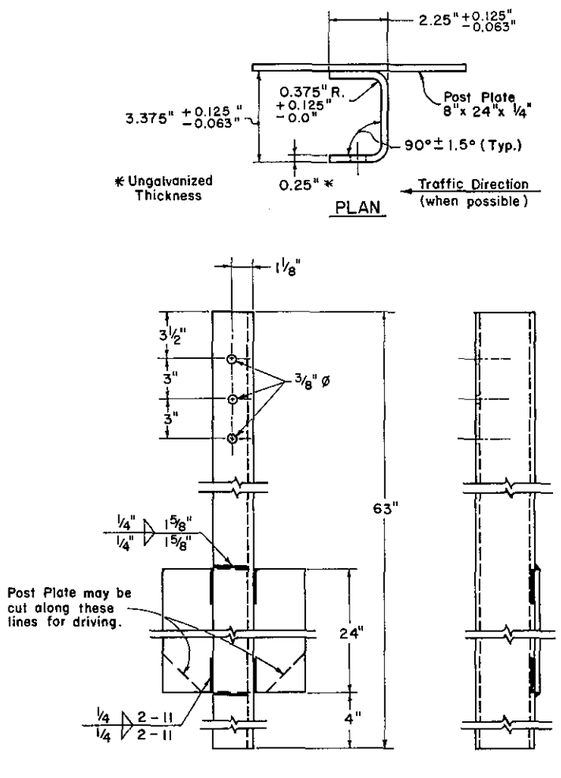
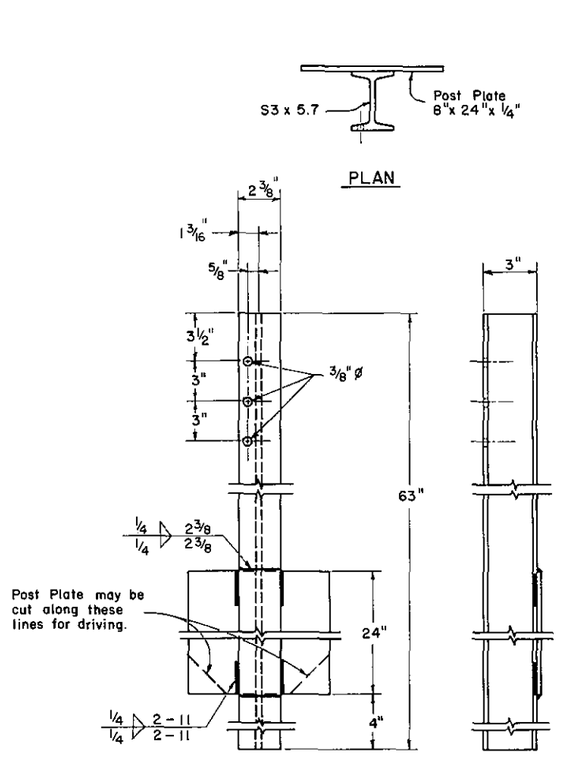
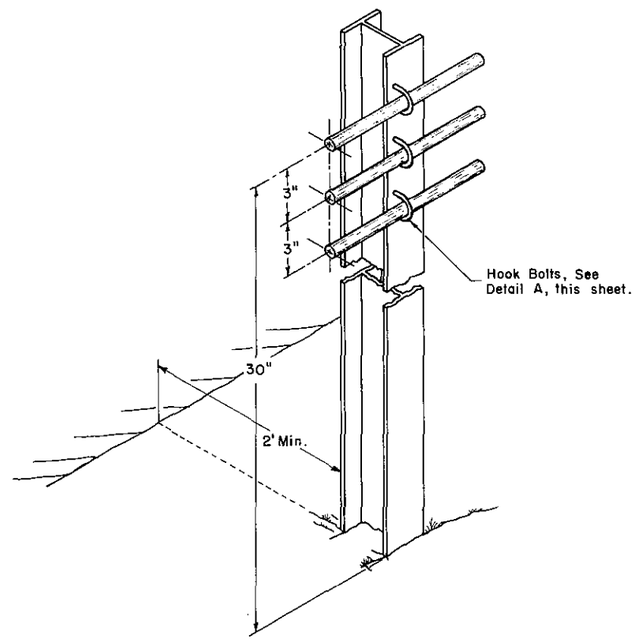


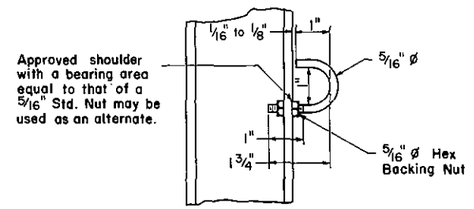




TYPE I-W GUARD RAIL POSTS



TYPICAL INSTALLATION



DETAIL A
5/16" HOOK BOLT

NOTES

1. All materials shall conform to the requirements of Form 408.
2. The 3⅜" x 2¼" cold formed channel post, S3 x 5.7 post and aluminum alloy post may be bid as alternatives for Type I Weak Post Guard Rail System. However, mixing of different posts will not be acceptable within a project.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

TYPE I WEAK POST GUARD RAIL

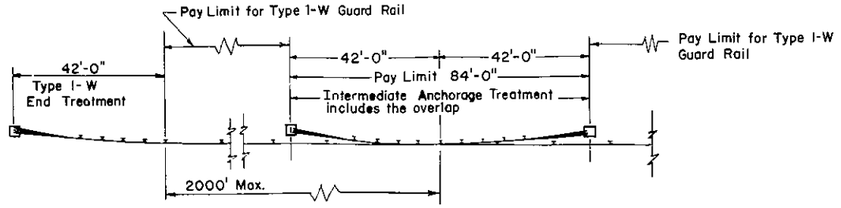
Recommended May 1, 1978
Director, Bureau of Design

Approved May 4, 1978
Deputy Chief Hwy. Engr.

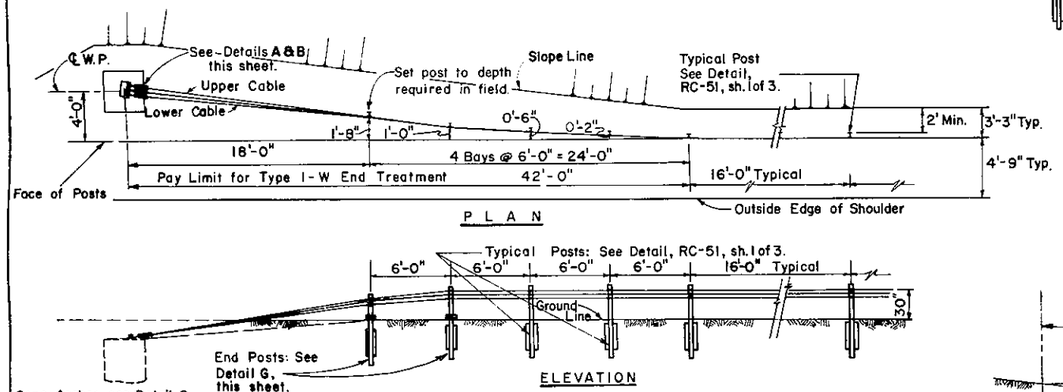
Sht. 1 Of 3

RC-51

TRACED BY
FINAL BY



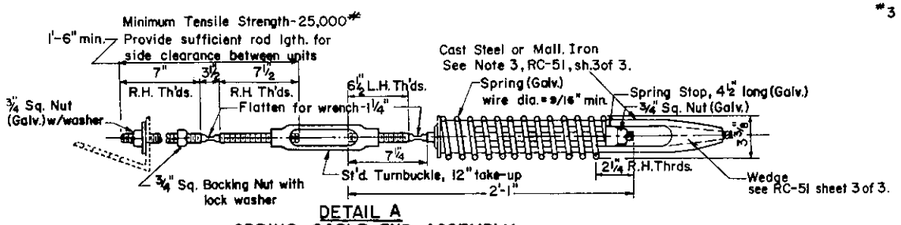
SKETCH OF TYPICAL LAYOUT
(PLAN)



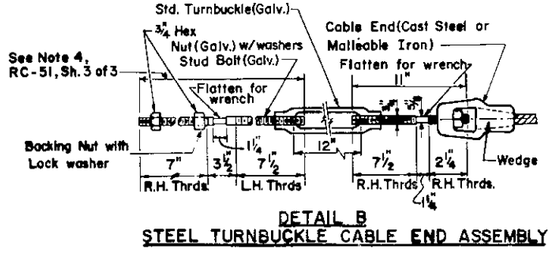
PLAN

ELEVATION

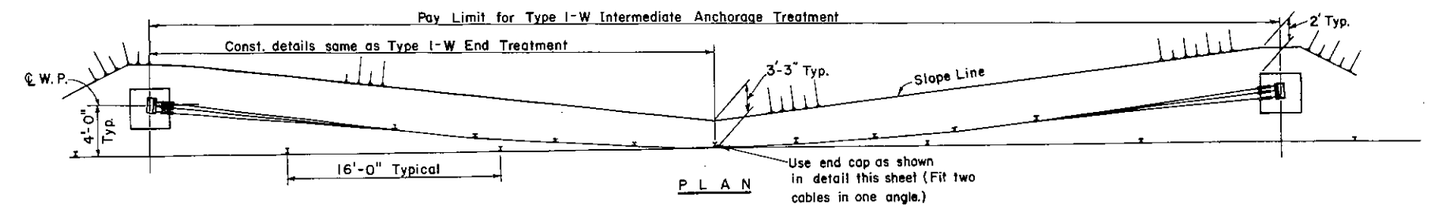
TYPE 1-W END TREATMENT



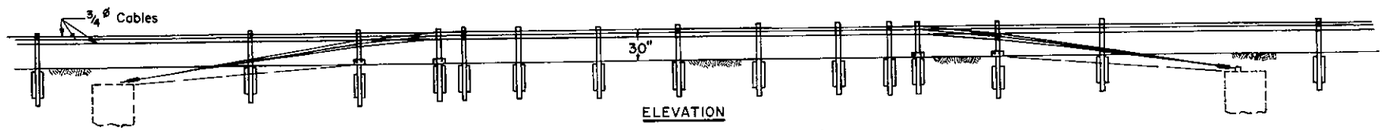
DETAIL A
SPRING CABLE END ASSEMBLY
(COMPENSATING DEVICE)



DETAIL B
STEEL TURNBUCKLE CABLE END ASSEMBLY

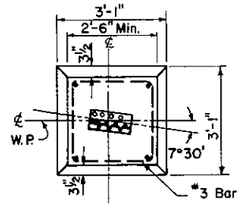


PLAN

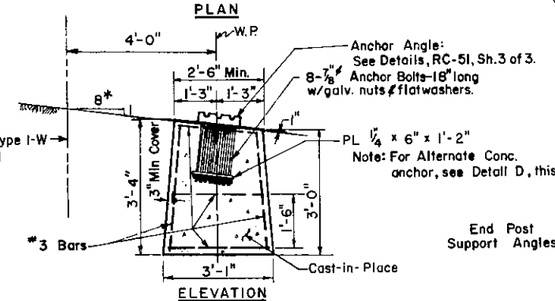


ELEVATION

TYPICAL INTERMEDIATE ANCHORAGE TREATMENT



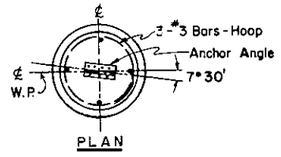
PLAN



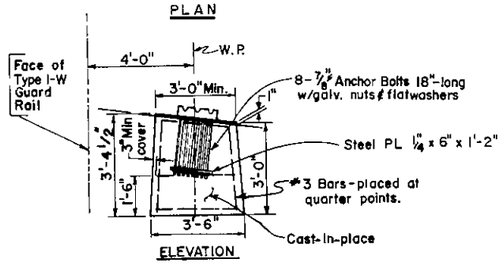
ELEVATION

DETAIL C
CONCRETE ANCHOR

* can be varied
if warranted

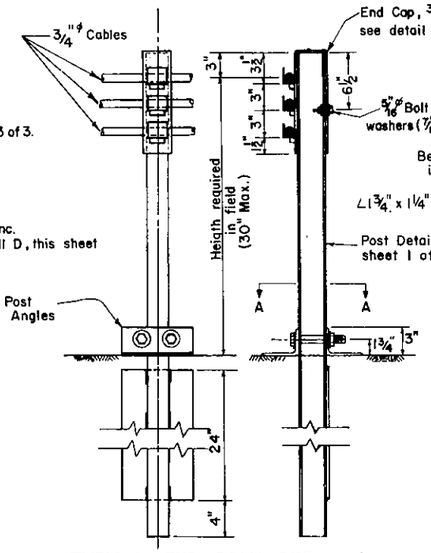


PLAN

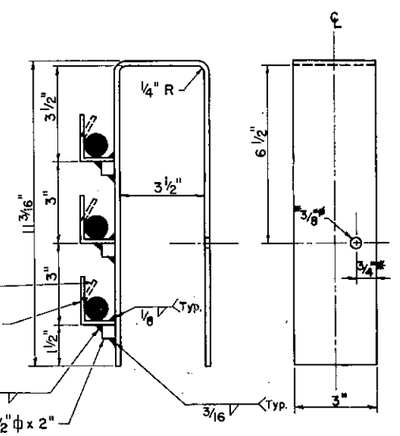


ELEVATION

DETAIL D
ALTERNATE CONC. ANCHOR

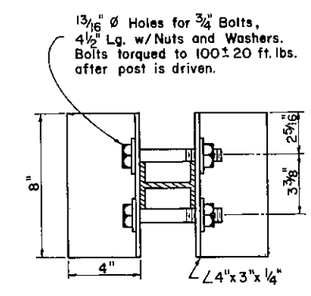


TYPICAL END POST DETAIL G



END CAP

* ⅜" ø hole to be located on ℄ for Channel Post.

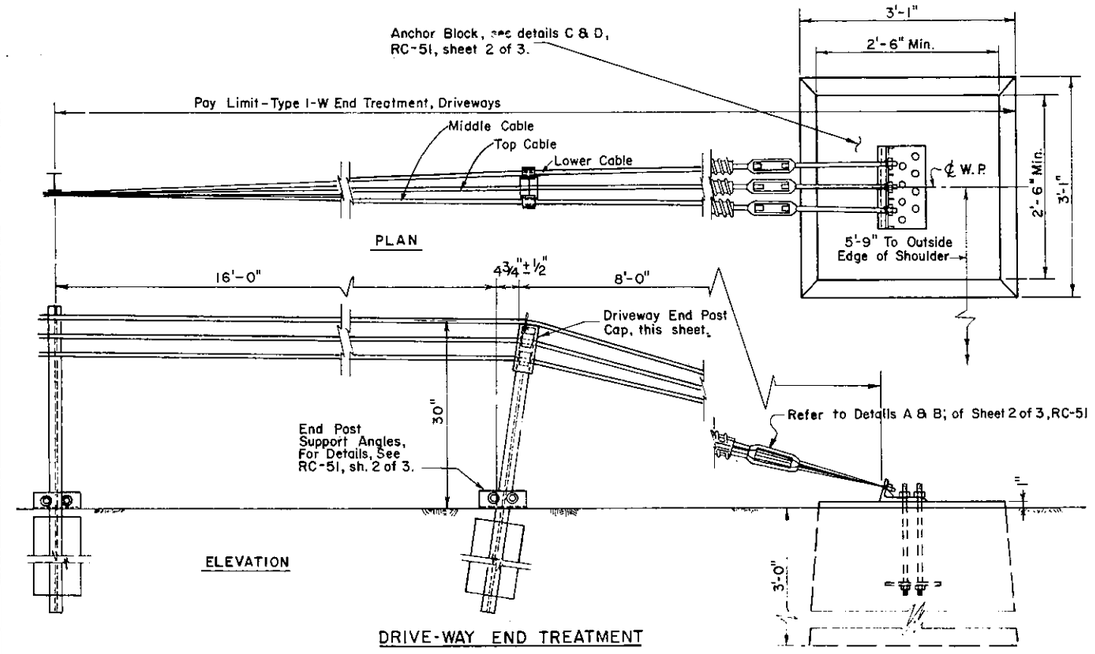


SECTION A-A

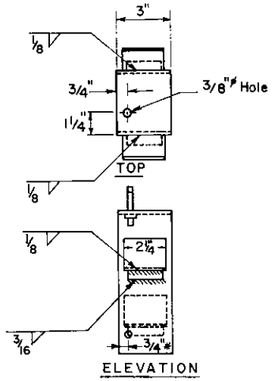
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

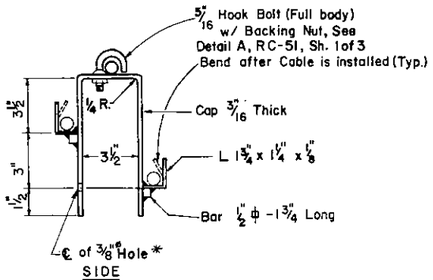
TYPE 1 WEAK POST GUARD RAIL

Recommended May 1, 1978	Approved May 4, 1978	Sht. 2 Of 3
B.D. Rounsley	James M. Sabatini	RC-51
Director, Bureau of Design	Deputy Chief Hwy. Engr.	



DRIVE-WAY END TREATMENT





DRIVEWAY END POST CAP

*For Channel Post, 3/8"ϕ hole to be located on ℄.

NOTES

1. The following criteria shall apply for arrangement of Spring Cable End Assemblies and Turnbuckle Cable End Assemblies:

   Length of Cable Runs:
   To 1000'- Use Compensating Device on one end, and Turnbuckle on other end of each individual cable.
   Over 1000' to 2000'- Use Compensating Device & Turnbuckle on each end of each individual cable.
   Over 2000'- Start new Stretch by overlapping at last parallel post. (See Typical layout Sketch)

2. Fittings: All fittings shall be so designed and be of such section as to develop the full strength of a single cable or cable assemblies, as the case may be.
   Single Cable End Assembly- Min. Tensile Strength = 25,000 Lbs.

   All fittings shall be galvanized according to ASTM, A153.

3. Material indicated as "Cast Steel" shall conform to AASHTO-M103, or ASTM-A27, that indicated as "Malleable Iron" shall conform to AASHTO-M106 or ASTM-A47. Reference should be made to Form 409 for details.

4. Designs for a combination or single unit compensating device and turnbuckle assembly may be submitted for approval.

5. Hook bolts, as installed, shall develop an ultimate pull open strength of from 500 Lbs. to 1000 Lbs. applied in a direction normal to the longitudinal axis of the post.

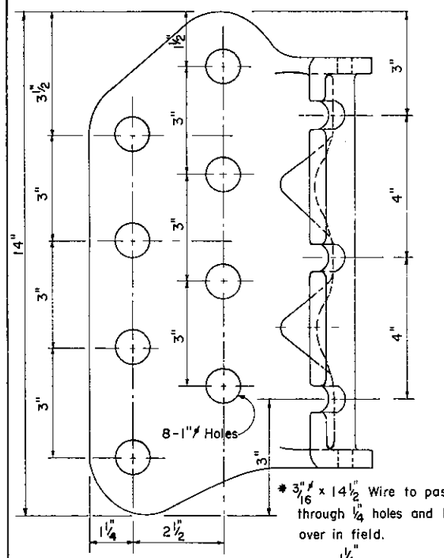
6. At all locations where the cable is connected to a cable socket with a wedge type connection, one wire of the wire rope shall be crimped over the base of the wedge to hold it firmly in place.

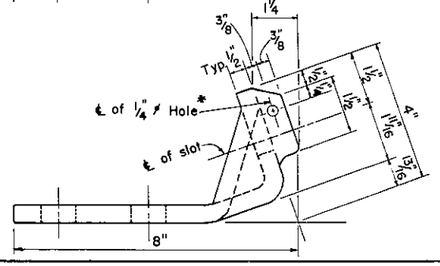
7. Compensating devices must have a spring rate of 450± 50 lbs. per inch and a total available "throw" of 6" min.

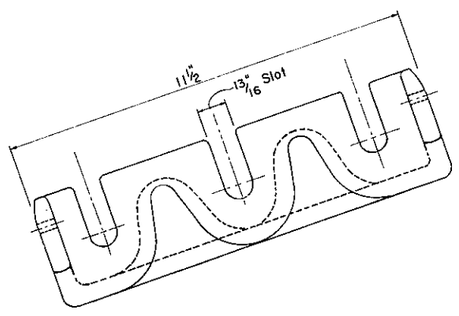
8. The cable tension shall be controlled by the following table:

Temp. range-	120° To 100°	99° To 80°	79° To 60°	59° To 40°	39° To 20°	19° To 0°	-1° To -20°
Spring Compression from unloaded position in each spring	1"	1 1/2"	2"	2 1/2"	3"	3 1/2"	4"

9. Alternate designs may be submitted for approval.
10. Installation of delineator assemblies shall be done under a separate pay item or contract. See Traffic Standard TC-7709, sheet 3 of 4.
11. Guard Rail over underground structures shall be constructed as shown on RC-53, sheet 1 of 2.



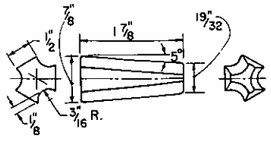




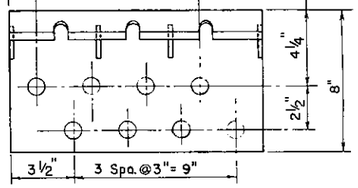
ALTERNATE CABLE ANCHOR ANGLE CASTING

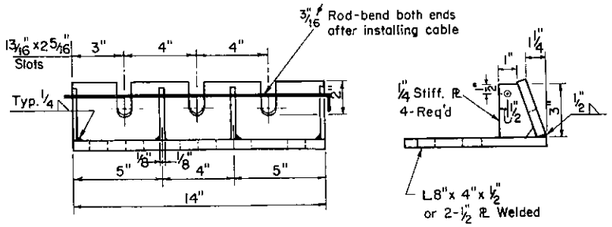
(Malleable Iron)

See Note 9.



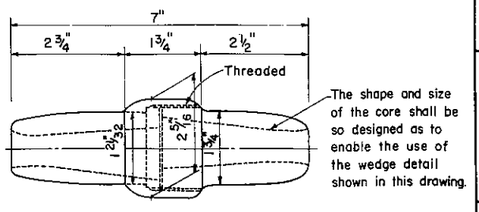
WEDGE DETAIL





CABLE ANCHOR ANGLE

See Note 9.



CABLE SPLICE

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

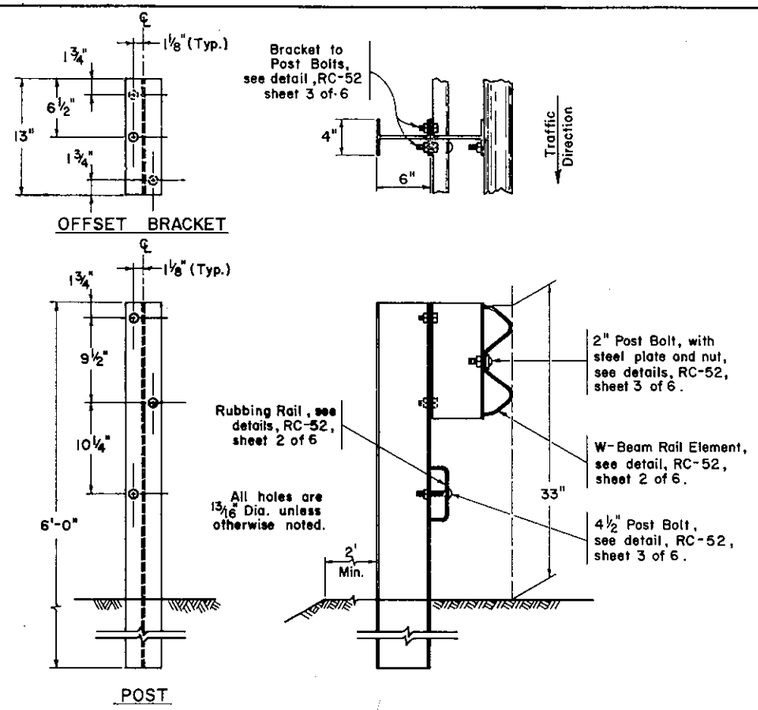
TYPE 1 WEAK POST GUARD RAIL

Recommended May 1, 1978
B.D. Rowalt
Director, Bureau of Design

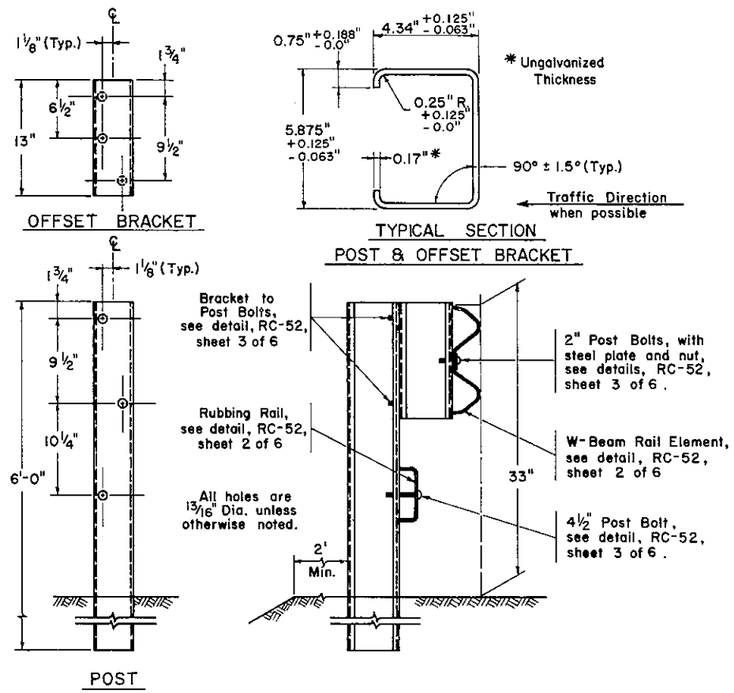
Approved May 1, 1978
James H. Hebenstreit
Deputy Chief Hwy. Engr.

Sht. 3 Of 3

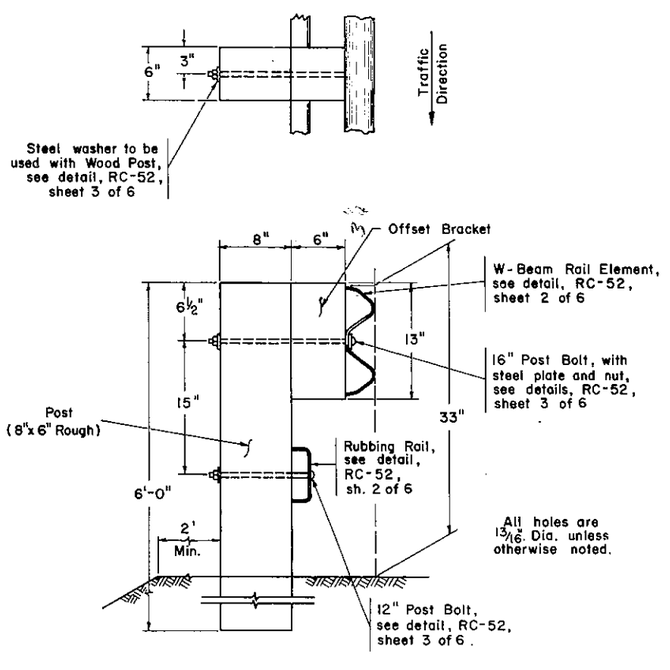
RC-51



W6 x 9 POST DETAILS

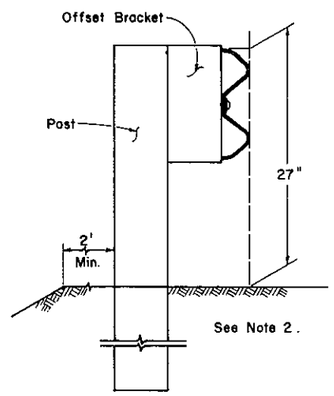


5⅞" COLD FORMED C-POST DETAILS

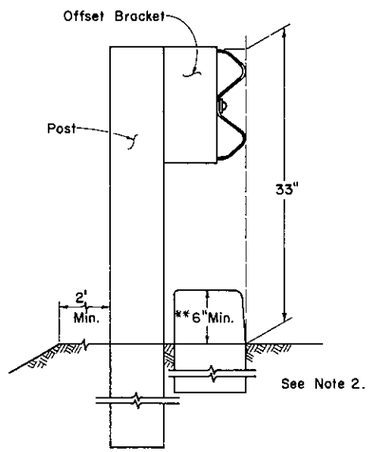


8"x 6" WOOD POST DETAILS

TYPE 2-S & 2-SC GUARD RAIL



TYPE 2-S SPECIAL & 2-SC SPECIAL GUARD RAIL



TYPE 2-S MODIFIED & 2-SC MODIFIED GUARD RAIL

** Standard Type 2-S & 2-SC Guard Rail (with rubbing rail), will be used with conc. or bit. curbs less than 6" in height and located as shown in the detail for Type 2-S Modified & 2-SC Modified Guard Rail.

NOTES

1. All materials shall conform to the requirements of Form 408.
2. Details other than those shown for the 2-S Special, 2-SC Special, 2-S Modified, and 2-SC Modified shall conform to the details of the 2-S and 2-SC Guard Rail, but without rubbing rail.
3. The 5⅞" Cold Formed C-Posts, W6 x 9 Posts and Wood Posts with matching offset brackets may be bid as alternatives for the Strong Post Guard Rail Systems. However, mixing of different posts and offset brackets will not be acceptable within a project.
4.

TYPE	POST SPACING
2-S	6'-3"
2-SC	3'-1½"
2-S Special	6'-3"
2-SC Special	3'-1½"
2-S Modified	6'-3"
2-SC Modified	3'-1½"

5. Wherever a W6 x 9 steel shape is designated for guard rail, a W6 x 8.5 steel shape may be used.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

TYPE 2 STRONG POST GUARD RAIL

Recommended Sept. 8, 1981
B. O. Romski
Dir. Bureau of Highway Design

Approved Sept. 8, 1981
Alfred D. Clark
Chief Highway Engineer

Sht. 1 Of 6
RC-52

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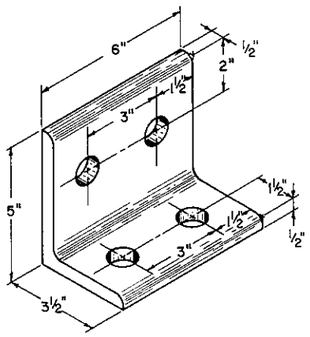
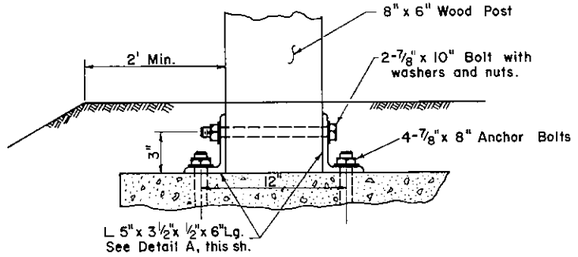


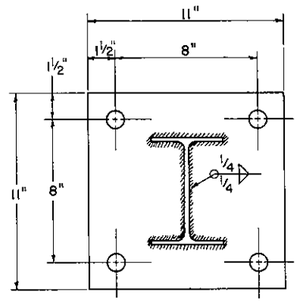
DETAIL A

All holes to be 1" diameter.



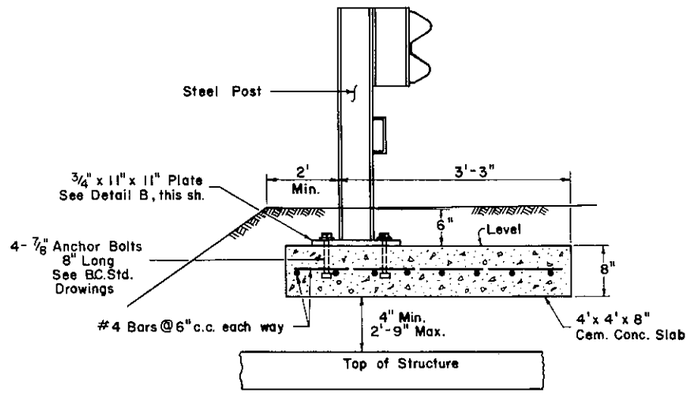
WOOD POSTS OVER UNDERGROUND STRUCTURES

All other details shall be as in the Steel Posts Over Underground Structures details.
Angles to be mounted on front and back of posts.
See Note 1, this sheet.



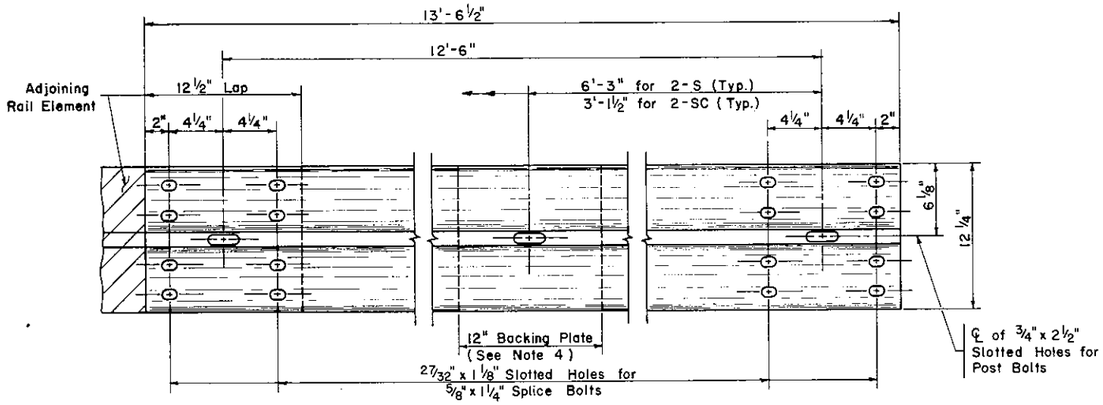
DETAIL B

Thickness is ¾"
All holes 1" Ø unless otherwise noted.
Use same base plate details for 5 7/8 Cold Formed C-Post and W6 x 9 Post.

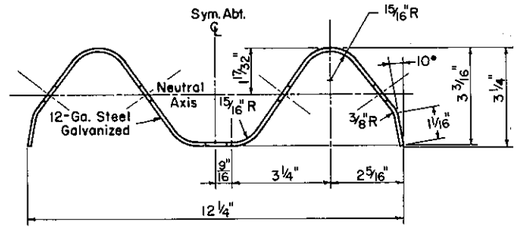


STEEL POSTS OVER UNDERGROUND STRUCTURES

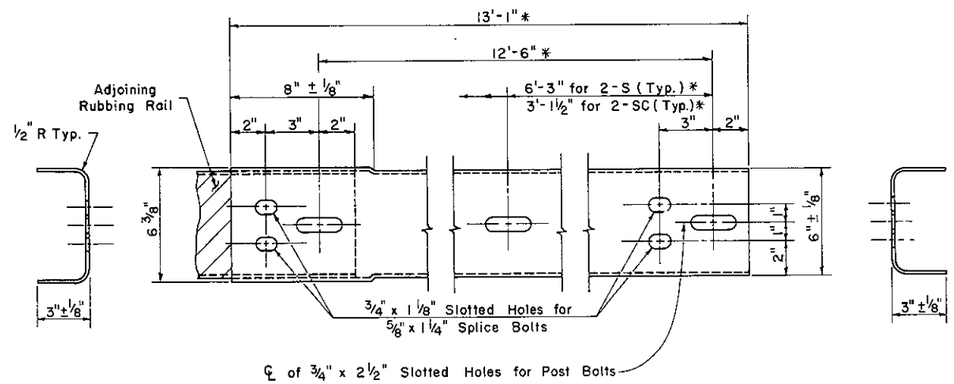
See Note 1, this sheet.



W-BEAM RAIL ELEMENT



SECTION THRU W-BEAM RAIL ELEMENT



6" x 3" x 10 GA. COLD FORMED CHANNEL RUBBING RAIL

* See Note 2

NOTES

1. No separate payment will be made for installation of guard rail over underground structures. Concrete, reinforcement bars, and hardware shall be considered incidental to the guard rail pay item.
2. For rubbing rails installed on small radii, dimensions noted for hole spacing should be adjusted to allow splices to only occur at posts.
3. W-Beam and rubbing rails shall be attached to each post. Splices shall only occur at posts and be lapped in the direction of traffic.
4. The 12" Backing Plate for the W-Beam Rail Elements shall be used at all intermediate posts and shall be the same section as the W-Beam Rail Element.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

TYPE 2 STRONG POST GUARD RAIL

Recommended Sept. 8, 1981	Approved Sept. 8, 1981	Sht. 2 Of 6
B. O. Rowekie	Alfred D. Clary	RC-52
Dir. Bureau of Highway Design	Chief Highway Engineer	

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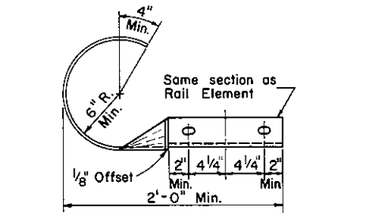
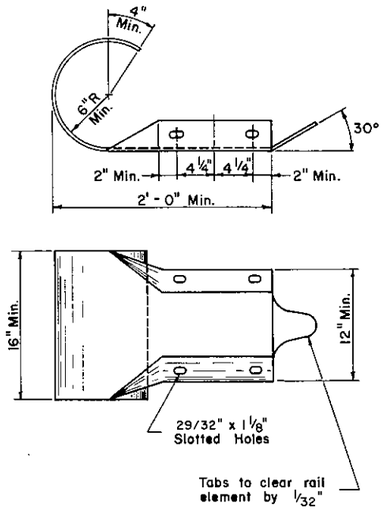
FINAL BY

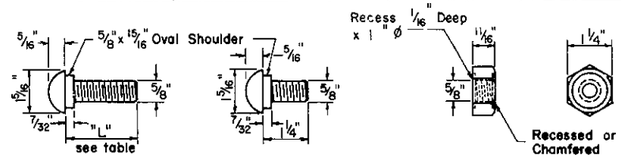


TERMINAL TO BE PLACED ON BACK OF RAIL ELEMENT



TERMINAL TO BE PLACED ON FACE OF RAIL ELEMENT

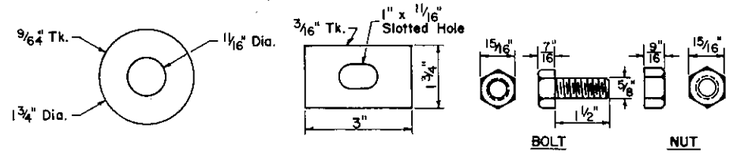
ALTERNATE TERMINAL SECTIONS (SINGLE)



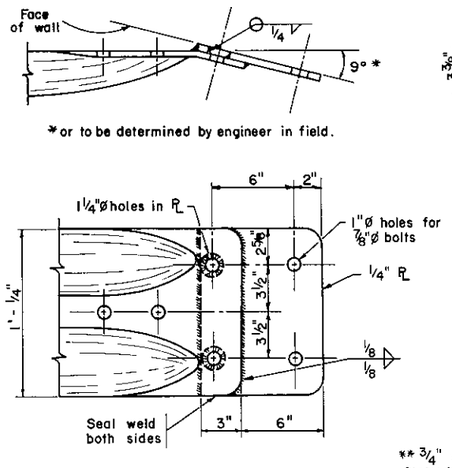
POST BOLT SPLICE BOLT NUT

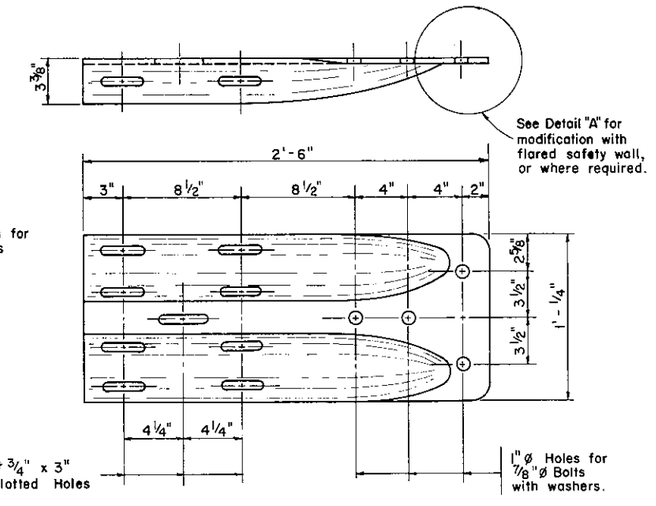
TABLE OF POST BOLT LENGTHS - L

Post	Rubbing Rail	W-Beam
W6 x 9 & 5 7/8" C Post	4 1/2" Post Bolt	2" Post Bolt
Wood Post	12" Post Bolt	16" Post Bolt



STEEL WASHER STEEL PLATE BRACKET TO POST



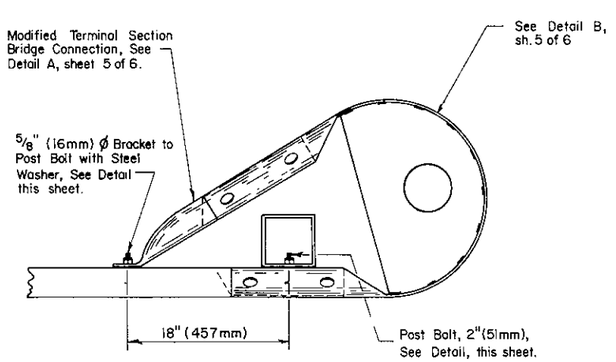


DETAIL "A"

The bridge connection terminal modification may be fabricated as one piece to eliminate welding.

TERMINAL SECTION BRIDGE CONNECTION

** Splice bolts shall be provided with a lock nut or double nut and shall be tightened only to a point that will allow guard rail to be free to move. Splice bolts shall be centered in the slotted holes. See B.C. Standard Drawings for attachment details.



TERMINAL SECTION - B.C.T.

NOTES

1. Splice bolts shall develope the design strength of the rail element.
2. Post bolts shall withstand a 5000 pound side pull in either direction without rupture.
3. No additional compensation will be allowed for providing Terminal Section Bridge Connection with welded plate for flared walls.
4. The round heads of the Post and Splice Bolts may be slightly notched to provide for wrench.
5. All terminal sections shall be 12 gauge galvanized steel.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

TYPE 2 STRONG POST GUARD RAIL

Recommended Sept. 8, 1981
B. D. Rowlie
Dir. Bureau of Highway Design

Approved Sept. 8, 1981
Alfred D. Taylor
Chief Highway Engineer

Sht. 3 Of 6

RC-52

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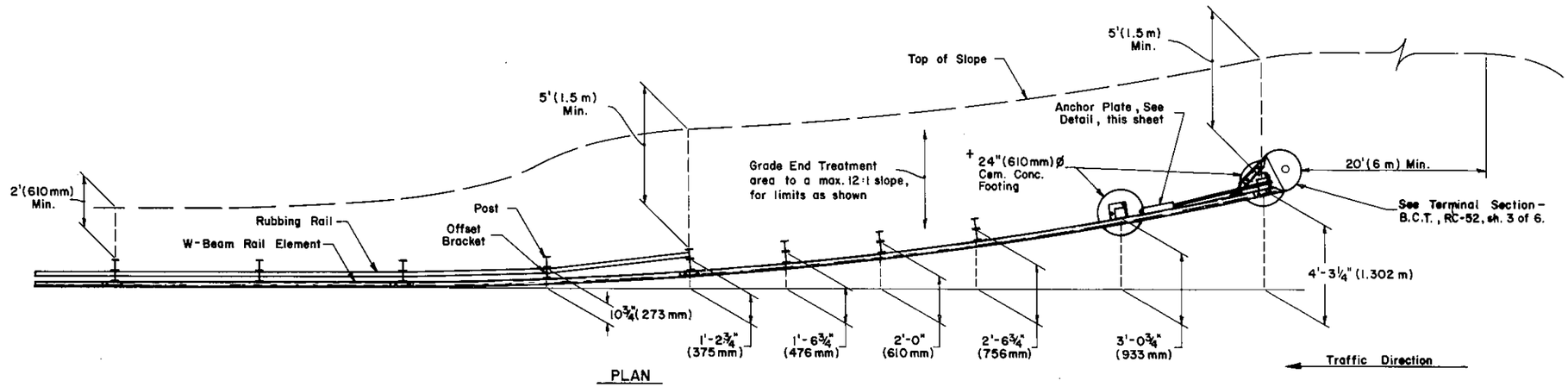
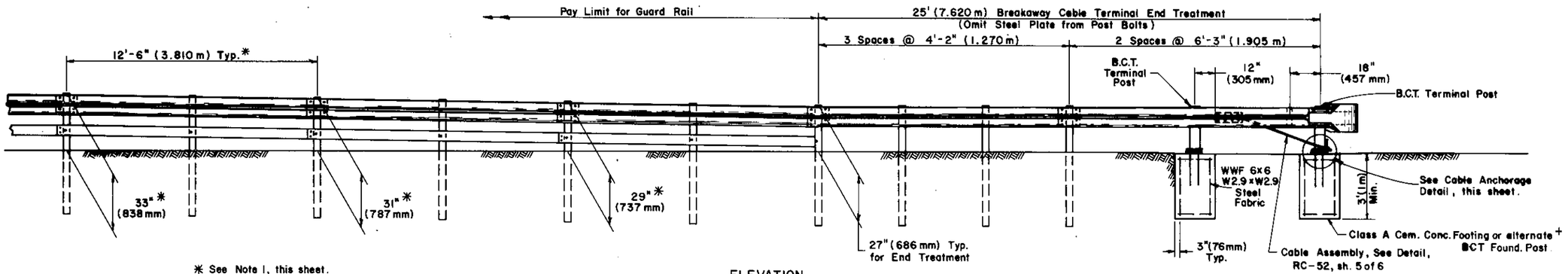


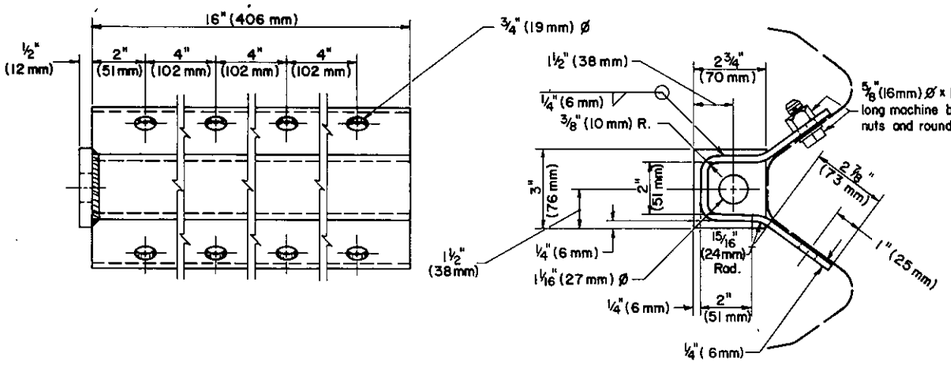
PLAN



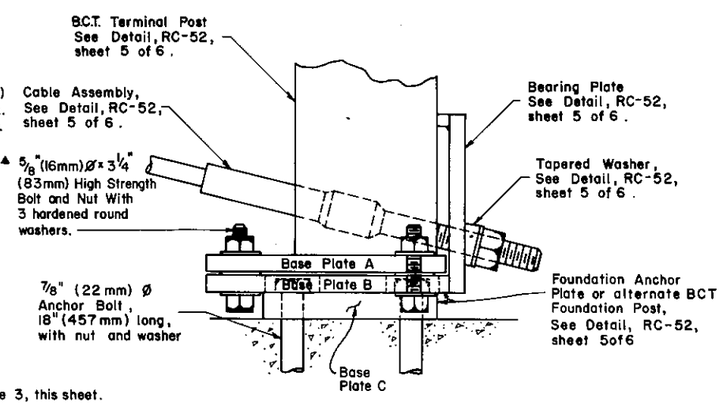
* See Note 1, this sheet.

ELEVATION

BREAKAWAY CABLE TERMINAL END TREATMENT



ANCHOR PLATE



▲ See Note 3, this sheet.

CABLE ANCHORAGE DETAIL

NOTES

1. Breakaway Cable Terminal End Treatment shall be used for Type 2-S, Type 2-SC, Type 2-S Special, and Type 2-SC Special Guard Rail, when specified. Approaching guard rail height shall be transitioned as shown where necessary to the 27"(686 mm) height for the Breakaway Cable Terminal End Treatment.
2. Payment for the Breakaway Cable Terminal End Treatment will include the last 25'(7.620 m) of rail element, posts, terminal section - B.C.T, cable assembly, hardware, anchor and bearing plates, excavation, and Class A Cement Concrete.
3. Base Plate bolts shall be torqued to 155-170 ft.-lbs. (210-230 N·m).

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

TYPE 2 STRONG POST GUARD RAIL
BREAKAWAY CABLE TERMINAL END TREATMENT

Recommended Sept. 8, 1981	Approved Sept. 8, 1981	Sht. 4 Of 6
B.D. Reynolds	Reynolds Page	RC-52
Dir. Bureau of Highway Design.	Chief Highway Engineer	

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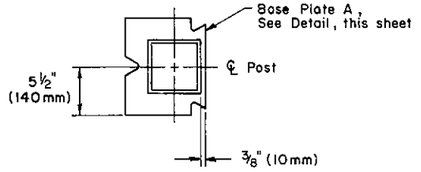
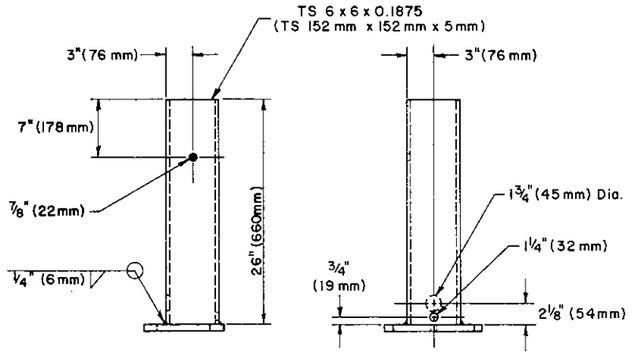
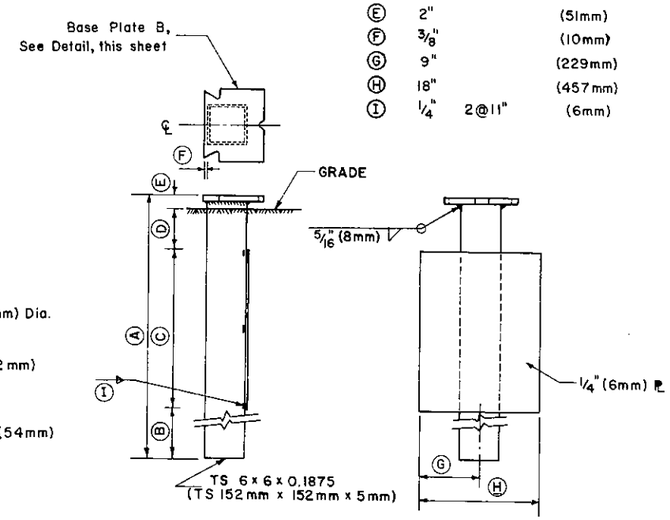


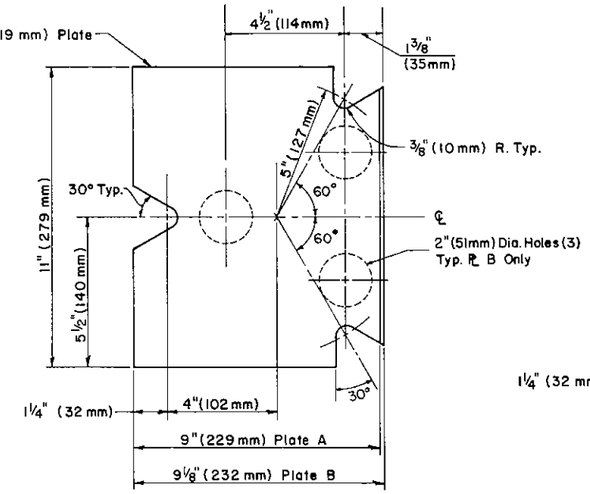


B.C.T. TERMINAL POST

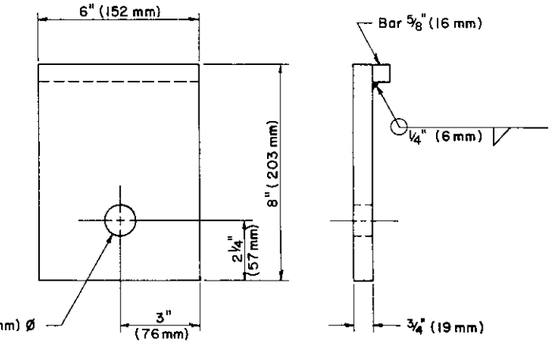


Ⓐ	6'-0¾"		(1.852 m)
Ⓑ	3'-4¾"		(1.039m)
Ⓒ	24"		(610mm)
Ⓓ	6"		(152mm)
Ⓔ	2"		(51mm)
Ⓕ	⅜"		(10mm)
Ⓖ	9"		(229mm)
Ⓗ	18"		(457mm)
Ⓘ	¼"	2@11"	(6mm)

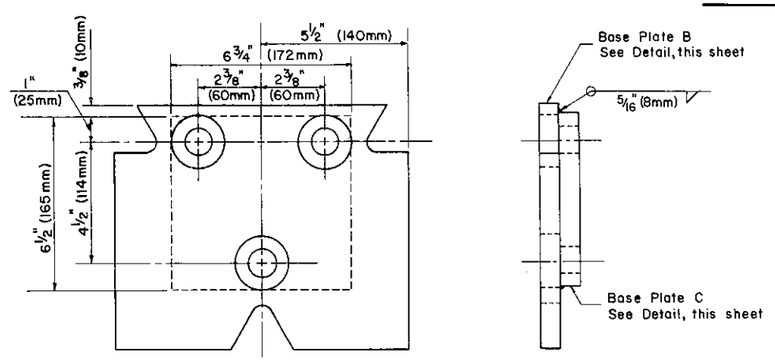
BCT FOUNDATION POST



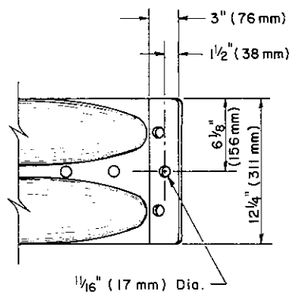
BASE PLATES A & B



BEARING PLATE

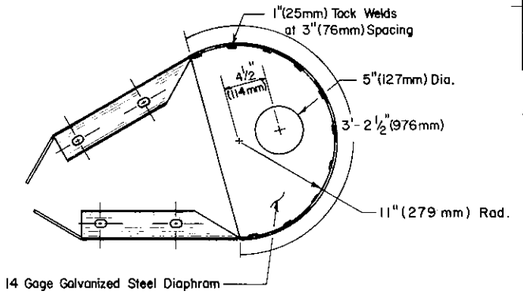


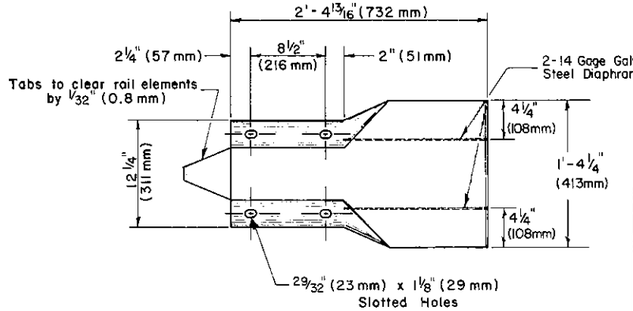
FOUNDATION ANCHOR PLATE



DETAIL A

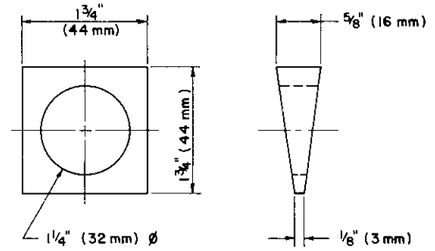
For other details see sheet 3 of 6



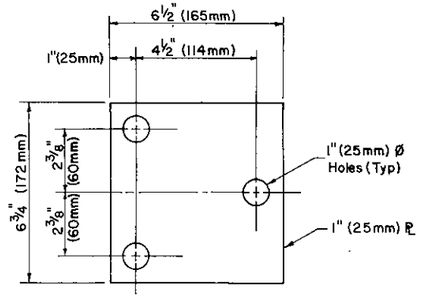


DETAIL B

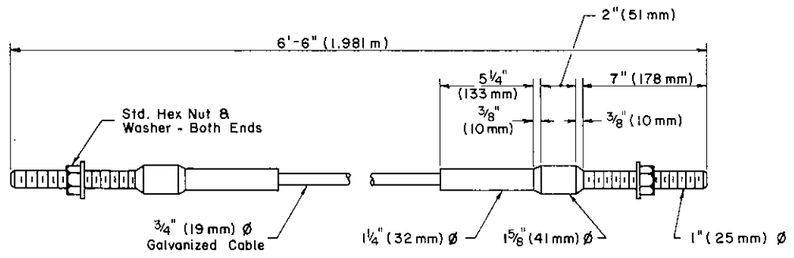
See sheet 3 of 6 for complete assembly of the Terminal Section B.C.T.



TAPERED WASHER



BASE PLATE C



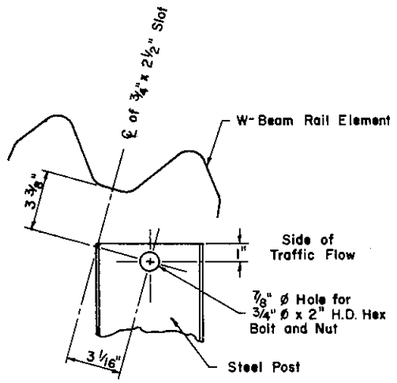
CABLE ASSEMBLY

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

TYPE 2 STRONG POST GUARD RAIL

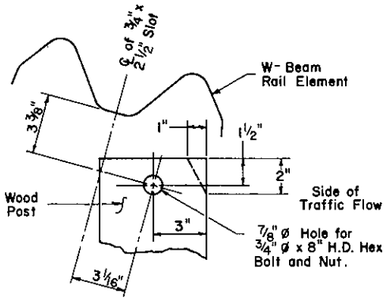
Recommended Sept. 8, 1981 B.D. Rountree Dir. Bureau of Highway Design	Approved Sept. 8, 1981 Alfred D. Tighe Chief Highway Engineer	Sht. 5 Of 6 RC-52

TRACED BY
FINAL BY



TYPICAL FOR
15° THRU 75° POSITIONS

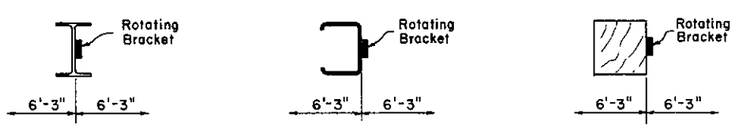
STEEL POSTS



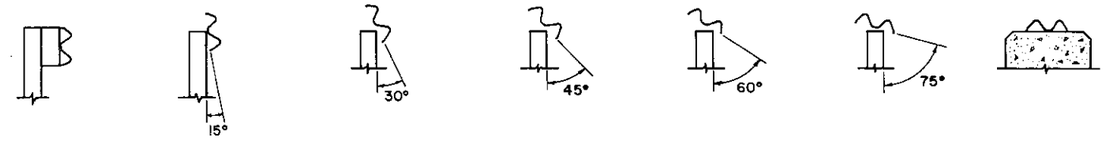
TYPICAL FOR
15° THRU 75° POSITIONS

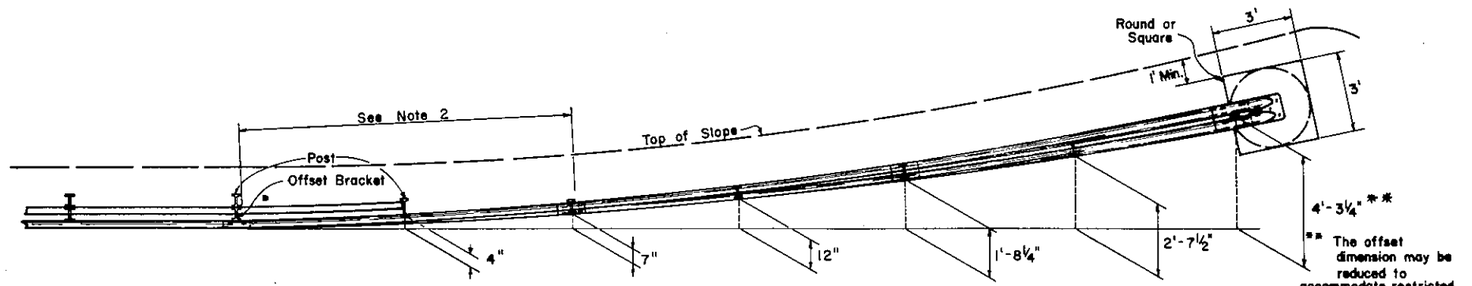
WOOD POSTS

ROTATING BRACKET REQUIREMENTS

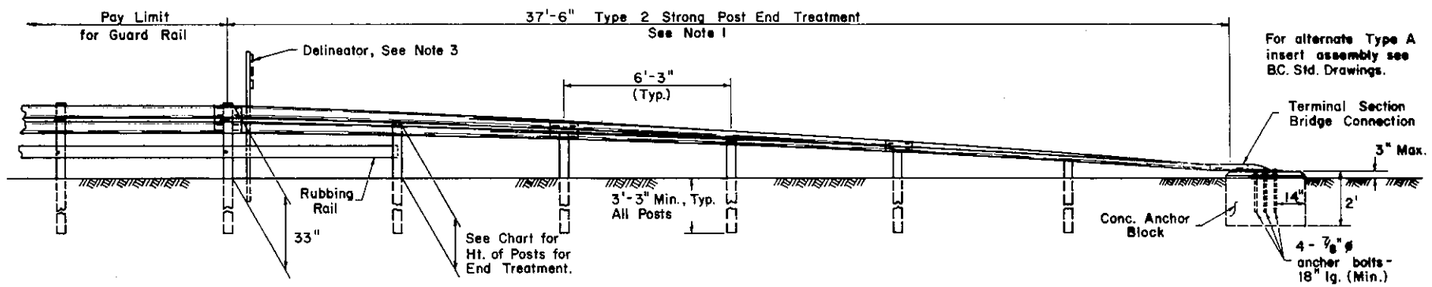


POSITIONING OF ROTATING BRACKET ON POSTS OF THE END TREATMENT





PLAN
(See Note 5)



ELEVATION

TYPE 2 STRONG POST END TREATMENT

Type 2 Strong Post End Treatment shall be used for Type 2-S, Type 2-SC, Type 2-S Special, Type 2-SC Special, Type 2-S Modified and Type 2-SC Modified Guard Rail, when specified.

HEIGHT OF POST					
ROTATION ANGLE	15°	30°	45°	60°	75°
2-S, 2-S MODIFIED, 2-SC, 2-SC MODIFIED	1'-10"	1'-7"	1'-2¾"	10½"	5½"
2-S SPECIAL, 2-SC SPECIAL	1'-5"	1'-2½"	11¾"	8½"	4½"

NOTES

1. Payment for Type 2 Strong Post End Treatment will include the last 37'-6" of sloping rail, terminal section, hardware, and concrete.
2. This length of rubbing rail is not to be included as part of the end treatment and should be incidental to the guard rail pay item.
3. Installation of delineator assemblies shall be done under a separate pay item or contract. For additional details, see Traffic Standard TC-7709.
4. This standard depicts only the necessary dimensions for uniformity and interchangeability of rotating brackets. It does not show details of the rotating bracket for supporting the rotated portion of the end treatment. Only rotating brackets which are supplied by an approved manufacturer as listed in Bulletin No. 15 will be permitted.
5. All offsets are measured from the projected front face of the guard rail to the face of the post.

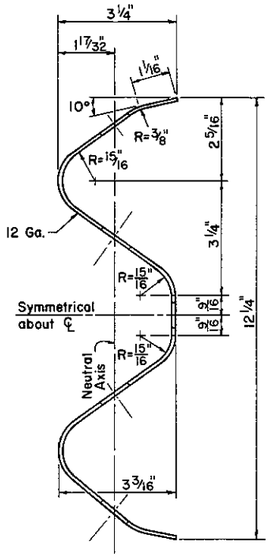
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

TYPE 2 STRONG POST GUARD RAIL
TYPE 2 STRONG POST END TREATMENT

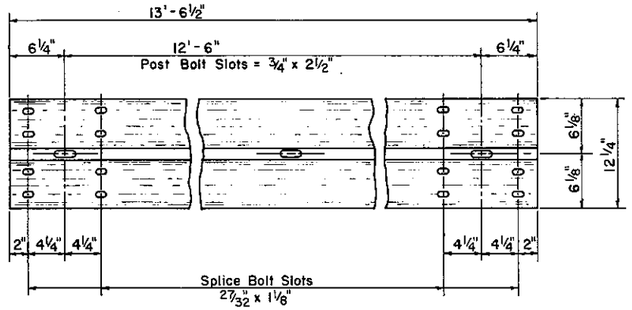
Recommended Sept. 8, 1981
B. D. Ronaldson
Dir. Bureau of Highway Design

Approved Sept. 8, 1981
Alfred D. Clyde
Chief Highway Engineer

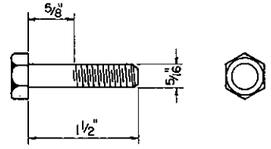
Sht. 6 Of 6
RC-52



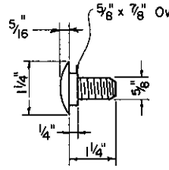
DETAIL D
RAIL ELEMENT



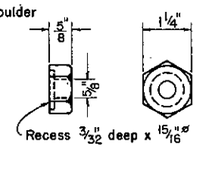
DETAIL E
TYPICAL RAIL SECTION



DETAIL G
5/16" DIA. HEX. BOLT

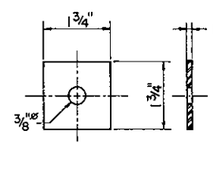


SPLICE BOLT

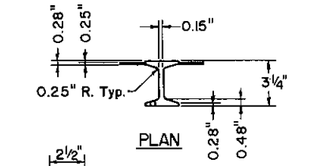


HEX NUT

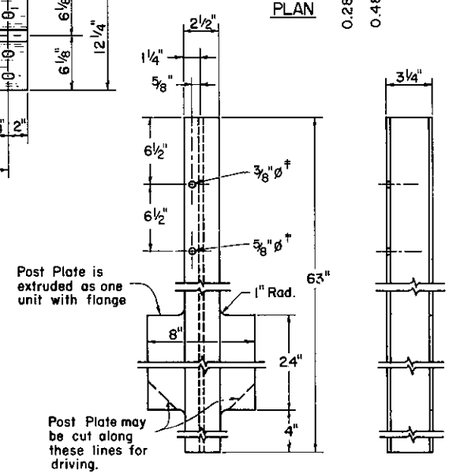
DETAIL F
BEAM SPLICE HARDWARE



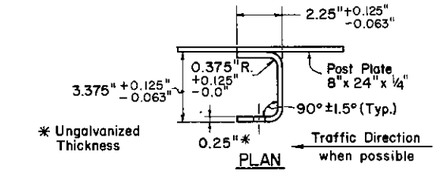
DETAIL I
SQUARE WASHER



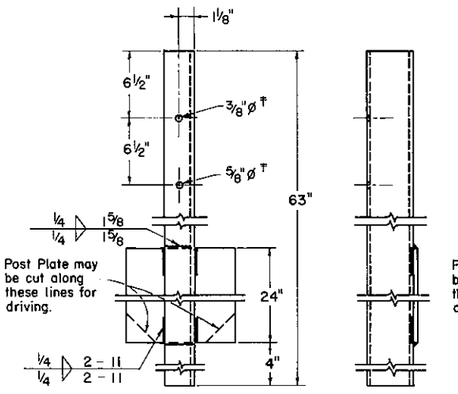
PLAN



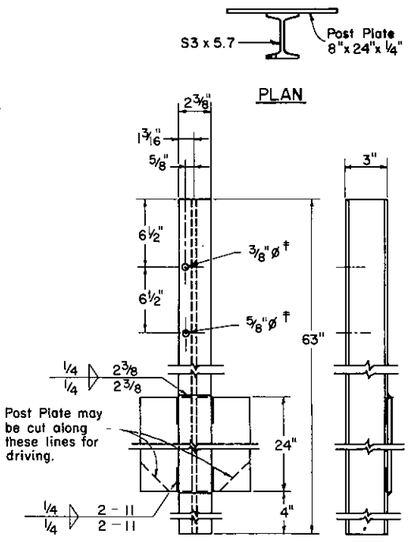
ELEVATION SIDE
ALUMINUM ALLOY POST



PLAN



ELEVATION SIDE
3⅜" x 2¼" COLD FORMED CHANNEL POST



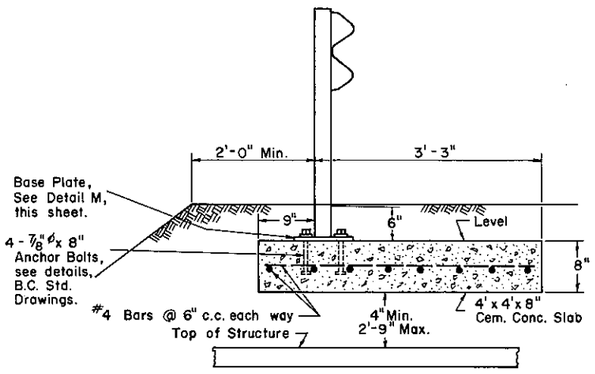
ELEVATION SIDE
S3 x 5.7

TYPE 2-W GUARD RAIL POSTS

† Post details for Type 2-WM median barrier shall conform to the details as shown, except that the mounting bolt and support bolt holes shall be located on the front and rear flanges.

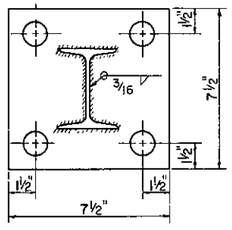
Notes

1. All materials shall conform to the requirements of Form 408.
2. The 3⅜" x 2¼" Cold Formed Channel Post, S3 x 5.7 Post and Aluminum Alloy Post may be bid as alternates for Type 2 Weak Post Guard Rail System, however, mixing of different posts will not be acceptable within a project.



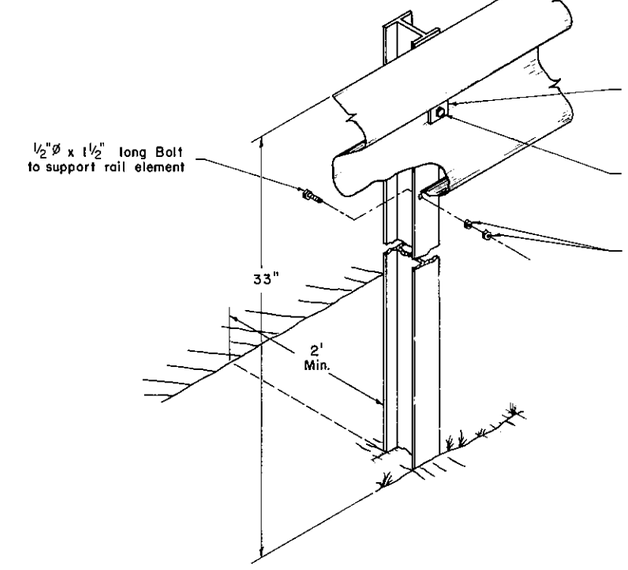
GUARD RAIL OVER UNDERGROUND STRUCTURES

No separate payment will be made for installation of guard rail over underground structures. Concrete, reinforcement bars, and hardware shall be considered incidental to the guard rail pay item.



BASE PLATE DETAIL M

Note: All holes 1"ø unless otherwise noted. Use same base plate details for 3⅜" x 2¼" Cold Formed Channel Post, Aluminum Alloy Post and S3 x 5.7 Post.



TYPICAL INSTALLATION

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

TYPE 2 WEAK POST GUARD RAIL

Recommended May 4, 1978
B. D. Rumbo
Director, Bureau of Design

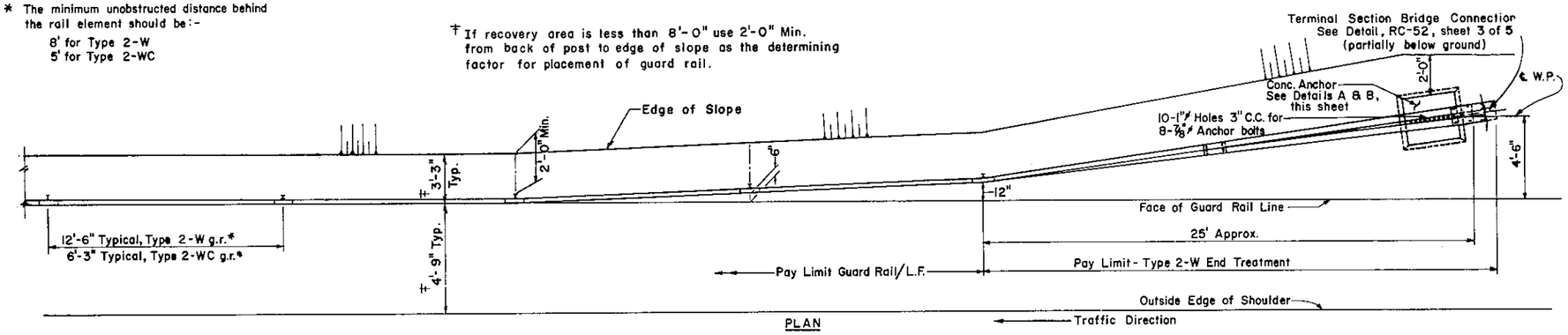
Approved May 4, 1978
James M. Sabatini
Deputy Chief Hwy. Engr.

Sht. 1 Of 2
RC-53

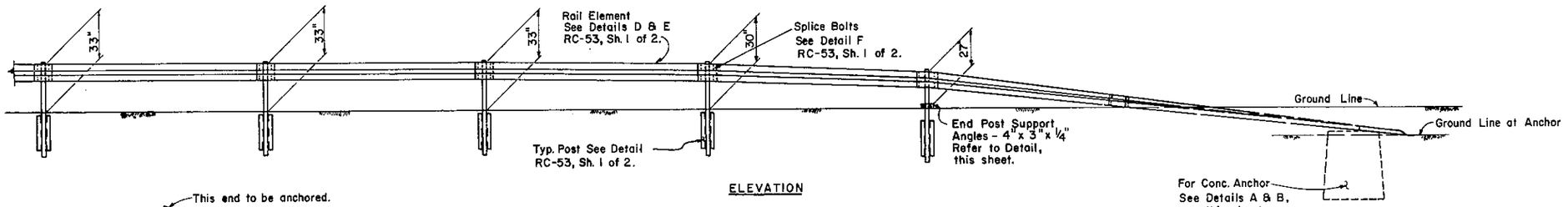
FORM 4837 REV. 7-68

* The minimum unobstructed distance behind the rail element should be:-
8' for Type 2-W
5' for Type 2-WC

† If recovery area is less than 8'-0" use 2'-0" Min. from back of post to edge of slope as the determining factor for placement of guard rail.

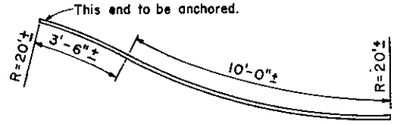


PLAN



ELEVATION

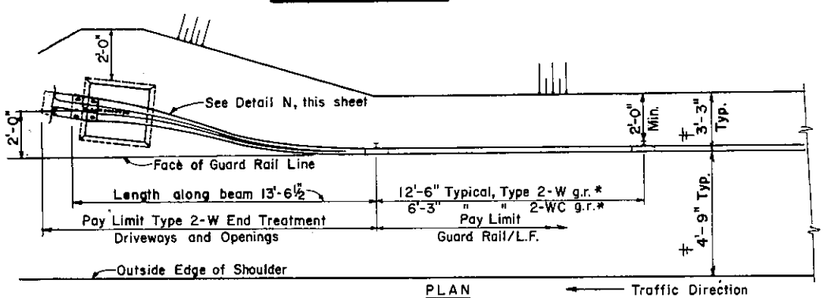
TYPE 2-W END TREATMENT



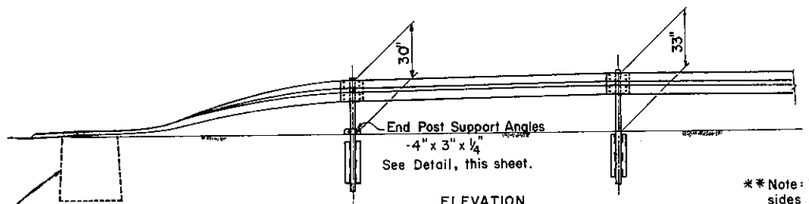
Shop bending required to make the End Treatment at Driveways & Openings.

DETAIL N

SHOP CURVED RAIL



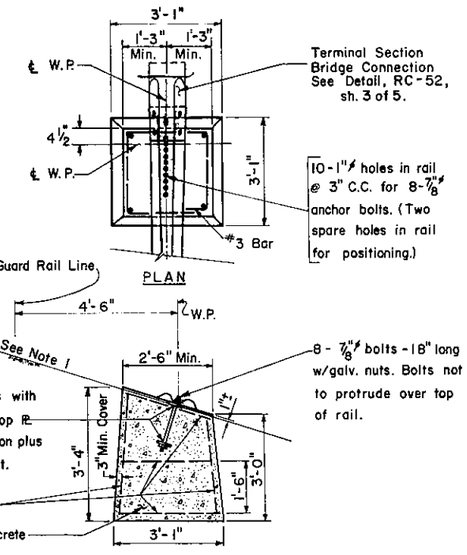
PLAN



ELEVATION

TYPE 2-W END TREATMENT** DRIVEWAYS & OPENINGS

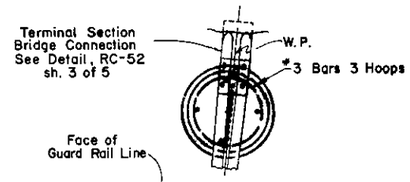
** Note: To be used on both sides of driveways and openings.



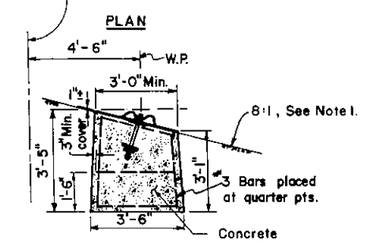
PLAN

ELEVATION

DETAIL A CONCRETE ANCHOR

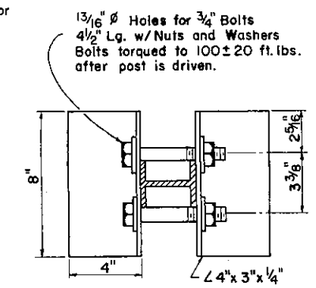


PLAN



ELEVATION

DETAIL B ALTERNATE CONC. ANCHOR



END POST SUPPORT ANGLES

NOTES

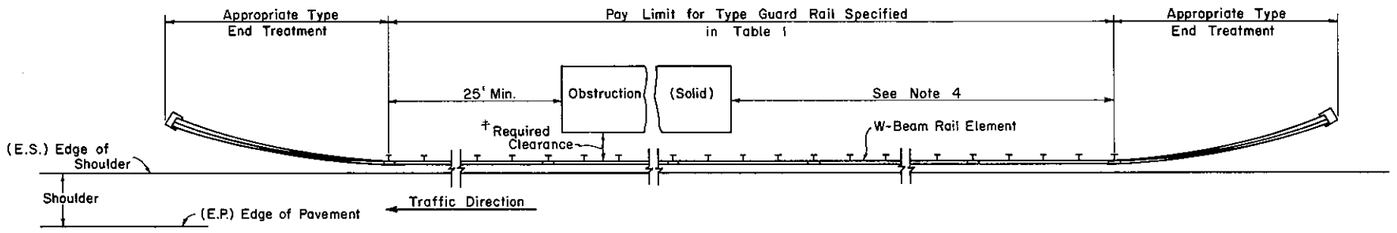
1. Slope can be varied if warranted.
2. Installation of delineator assemblies shall be done under a separate pay item or contract. See Traffic Standard TC-7709, sheet 3 of 4.
3. Type 2-W End Treatment must be used at approach and trailing ends of Type 2-W Guard Rail.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

TYPE 2 WEAK POST GUARD RAIL

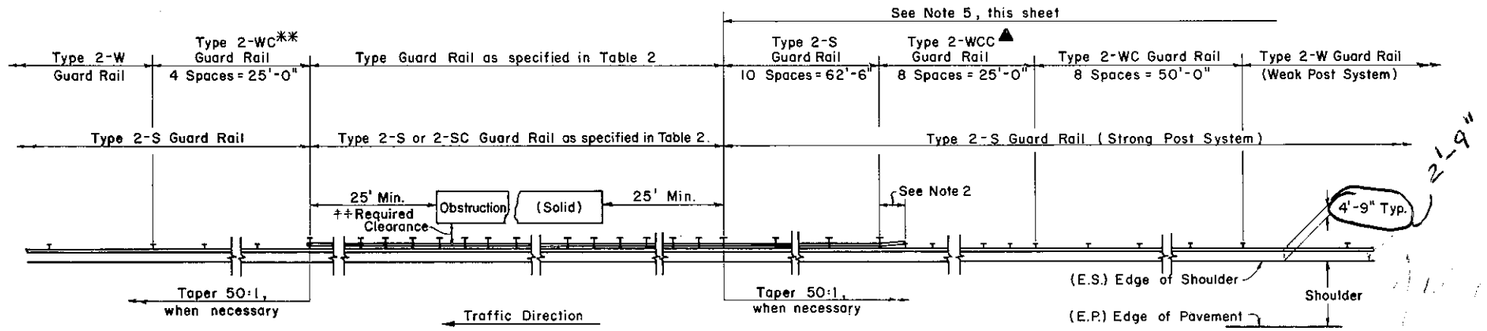
Recommended May 1, 1978	Approved May 1, 1978	Sht. 2 Of 2
B.D. Rowand	James R. Sebastian	RC-53
Director, Bureau of Design	Deputy Chief Hwy. Engr.	

TRACED BY
FINAL BY



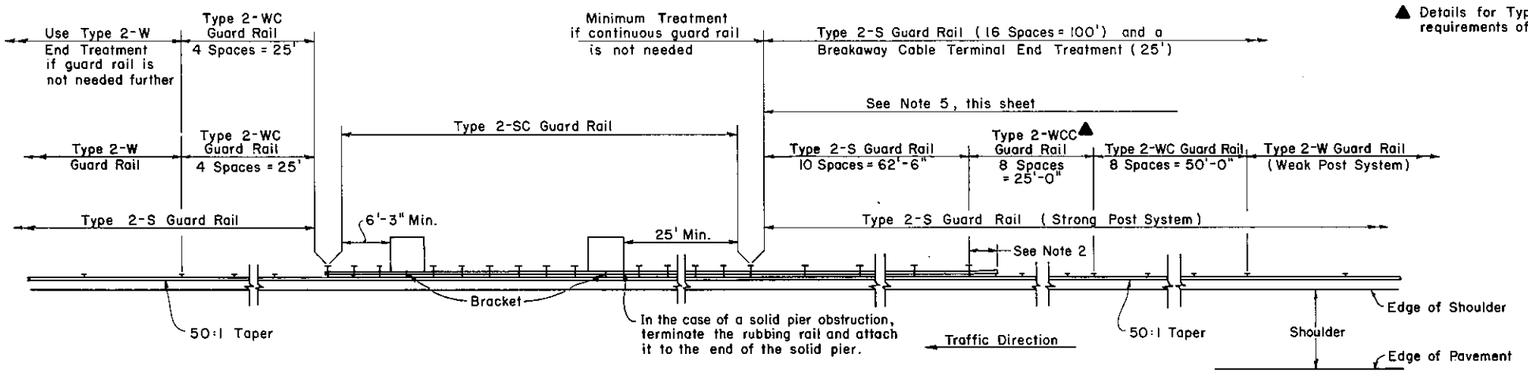
TREATMENT WHEN EDGE OF SHOULDER TO FACE OF OBSTRUCTION IS 3' OR GREATER WHERE CONTINUOUS GUARD RAIL IS NOT USED ◐

◐ If the situation requires continuous guard rail at one end and not continuous guard rail at the other end of an obstruction, an appropriate modification of the treatment should be used.



** If 2-W or 2-WC Guard Rail is used at the obstruction this section of 2-WC Guard Rail may be eliminated.

TREATMENT WHEN EDGE OF SHOULDER TO FACE OF OBSTRUCTION IS 3' OR GREATER WHERE CONTINUOUS GUARD RAIL IS USED ◐



TREATMENT WHEN EDGE OF SHOULDER TO FACE OF OBSTRUCTION IS LESS THAN 3'

TABLE 1

Dist. to Obst. from Edge of Shld.	Type of Guard Rail	† Required ① Clearance (Dist. to Obst. from Back of Rail)
3' up to 6'	2-SC	2'
6'-1" up to 8'	2-S	4'
8'-1" up to 12'	2-WC	5'
12'-1" & Greater	2-W	8'

TABLE 2

Type of Approaching Guard Rail	Dist. to Obst. from Edge of Shld.	Type of Guard Rail	†† Required ① Clearance (Dist. to Obst. from Back of Rail)
Weak Post	3' up to 6'	2-SC	2'
	6'-1" up to 7'	2-WCC	4'
	7'-1" up to 13'	2-WC	5'
	13'-1" & Greater	2-W	8'
Strong Post	3' up to 6'	2-SC	2'
	6'-1" & Greater	2-S	4'

① Maintain the alignment of the approaching guard rail, when it allows greater clearance (dist. from obstacle to back of rail) than what is shown as the required clearance on the table.

▲ Details for Type 2-WCC Guard Rail shall conform to the requirements of Type 2-W with post spacing at 3'-1½"

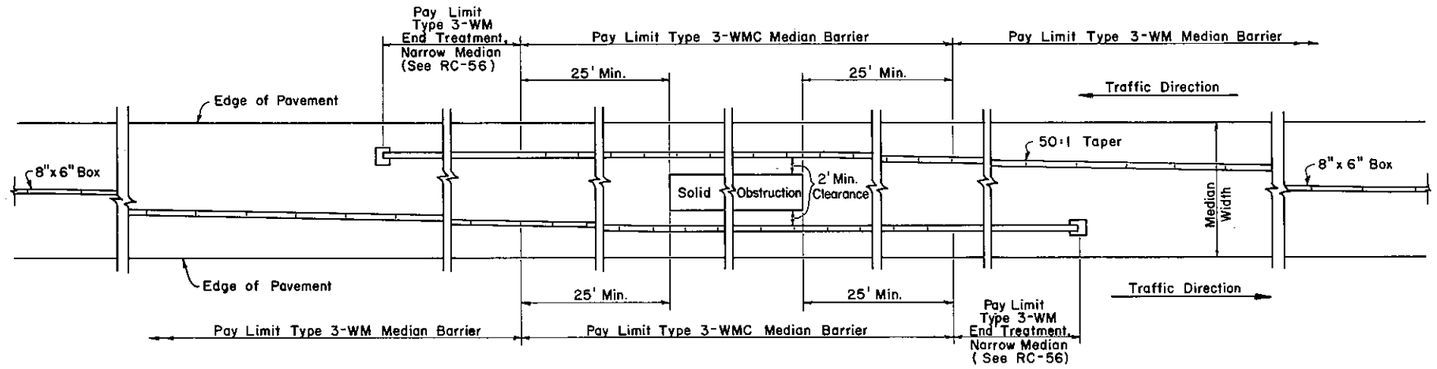
NOTES

1. The treatments shown are for four lane divided highways. The approach end side of the treatments should be used at both sides of the obstruction on two lane facilities with two way traffic.
2. This length of the Rubbing Rail is not to be included as part of the Type 2-WCC Guard Rail and should be incidental to the Type 2-S Guard Rail pay item.
3. This standard has been prepared as a guide for the placement of guard rail and median barrier. It is impractical to provide a standard for all possible conditions. Modifications of treatments can be made to fit existing conditions, however they shall follow recommended guide lines.
4. This distance varies and the required length shall be determined by the designer using the guidelines found in DM-2, Chapter 15, and shall be shown on the tabulations. Where calculations show a distance less than 125', use 125' as a minimum distance.
5. Use the necessary portion of the guard rail types and lengths as indicated for transitioning the approaching guard rail to the type of guard rail which is required at the obstruction.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

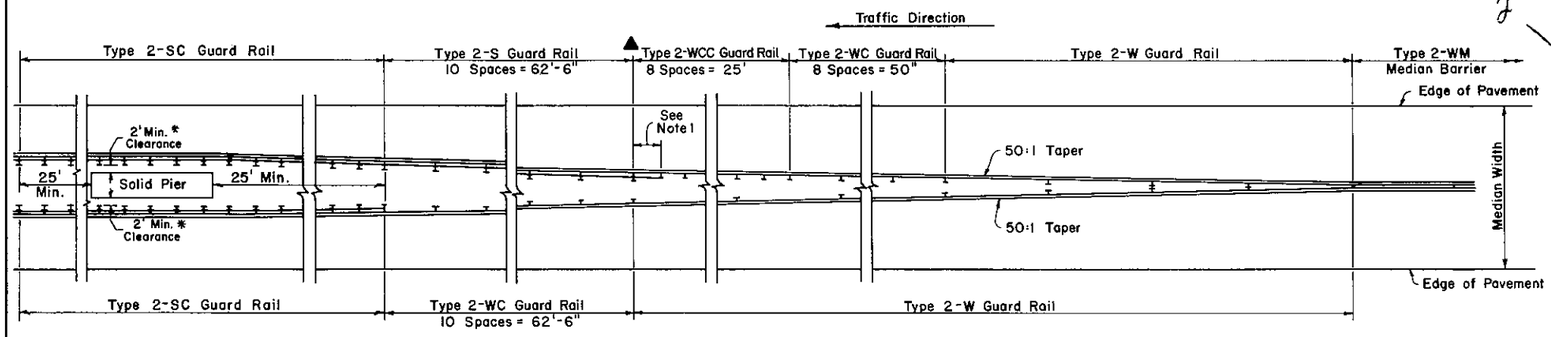
GUARD RAIL AND MEDIAN BARRIER PLACEMENT

Recommended	Approved	Sht. 1 Of 3
May 1, 1978	May 1, 1978	RC-54
B.D. Rowbin	James M. Shrawder	
Director, Bureau of Design	Deputy Chief Hwy. Engineer	



TREATMENT AT OBSTRUCTION FOR MEDIAN WIDTHS UP TO 16' WHERE CONTINUOUS BARRIER IS USED

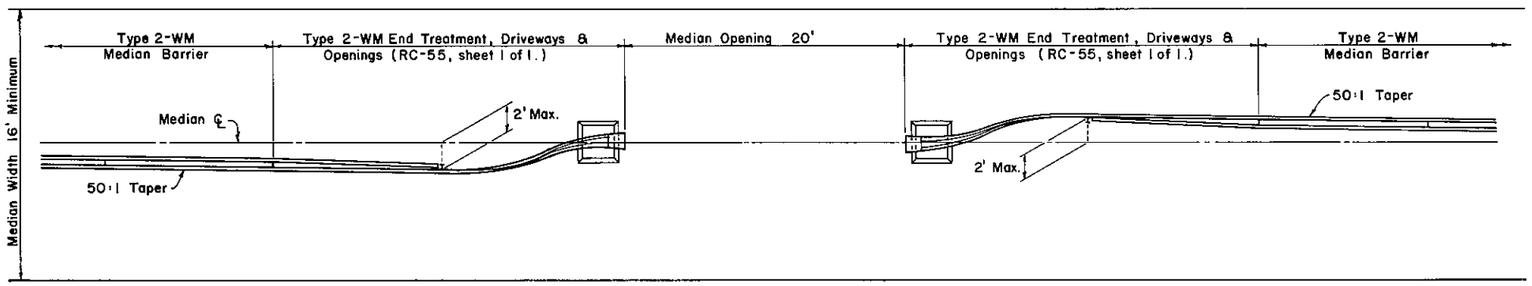
▲ Details for Type 2-WCC Guard Rail shall conform to the requirements of Type 2-W with post spacing at 3'-1½"



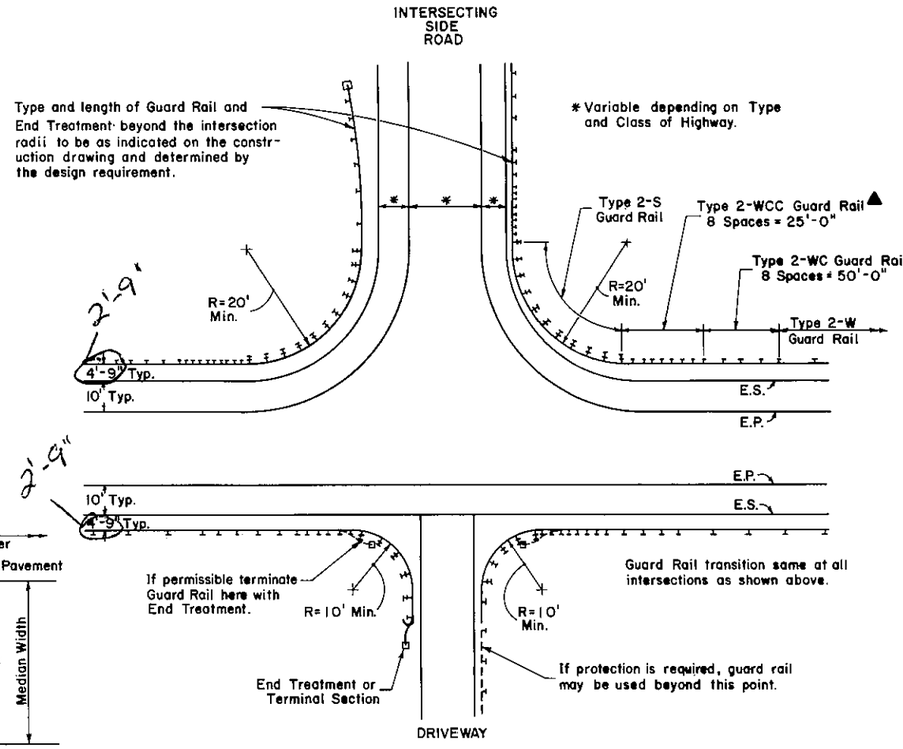
* See Notes 3 & 4

TREATMENT AT OBSTRUCTION FOR MEDIAN WIDTHS GREATER THAN 16' WHERE CONTINUOUS BARRIER IS USED ⊕

⊕ This treatment is intended for median widths up to 20'. In special instances where median barrier is used in median widths greater than 20' use appropriate type guard rail.



TREATMENT FOR TYPE 2-WM MEDIAN BARRIER CROSS-OVER



TREATMENT AT INTERSECTIONS

NOTES

1. This length of the Rubbing Rail is not to be included as part of the Type 2-WCC Guard Rail and should be incidental to the Type 2-S Guard Rail pay item.
2. This standard has been prepared as a guide for the placement of guard rail and median barrier. It is impractical to provide a standard for all possible conditions. Modifications of treatments can be made to fit existing conditions, however they shall follow recommended guide lines.
3. If 2' minimum clearance is not available, fasten the guard rail to the obstruction and continue offset bracket spacing of 3'-1½" up to the end of the obstruction.
4. When the guard rail is fastened to a solid obstruction, terminate the rubbing rail at each end and fasten it to the obstruction.

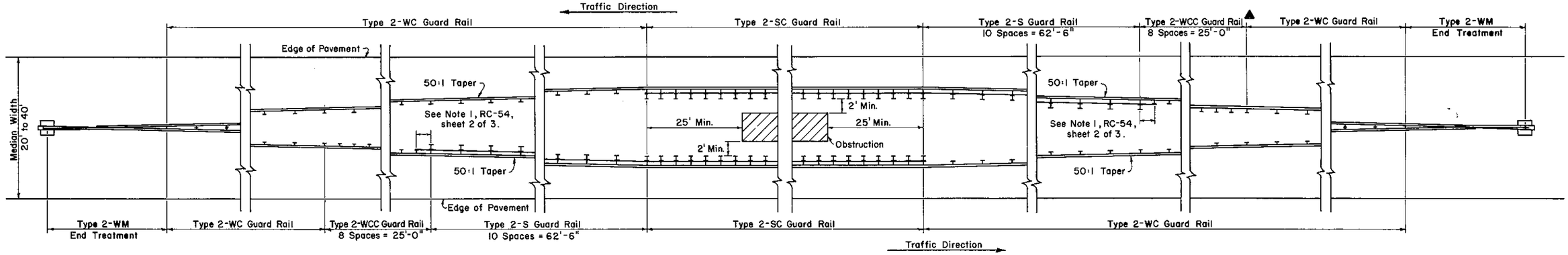
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

GUARD RAIL AND MEDIAN BARRIER PLACEMENT

Recommended May 1, 1978
B.D. Burkett
Director, Bureau of Design

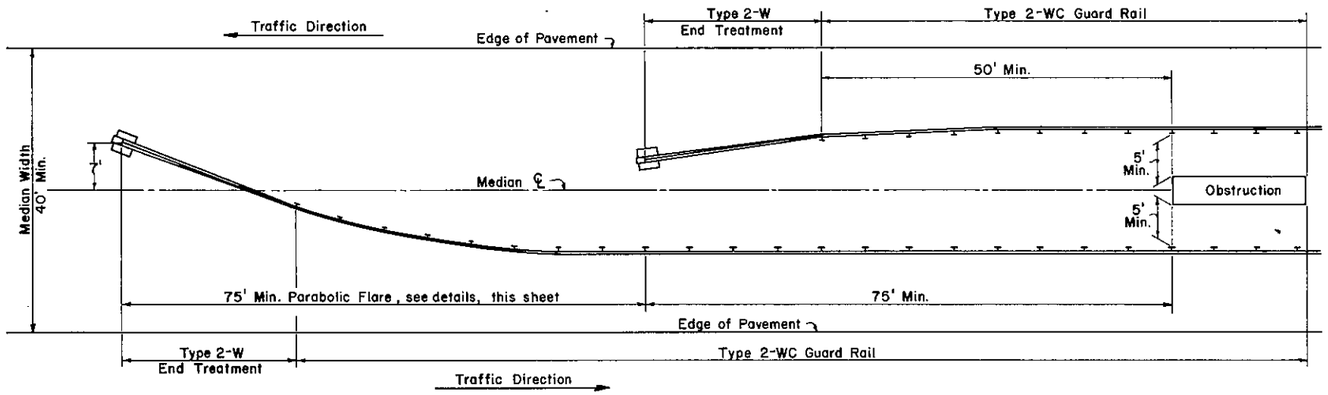
Approved May 5 1978
James M. Sabatini
Deputy Chief Hwy. Engr.

Sht. 2 Of 3
RC-54

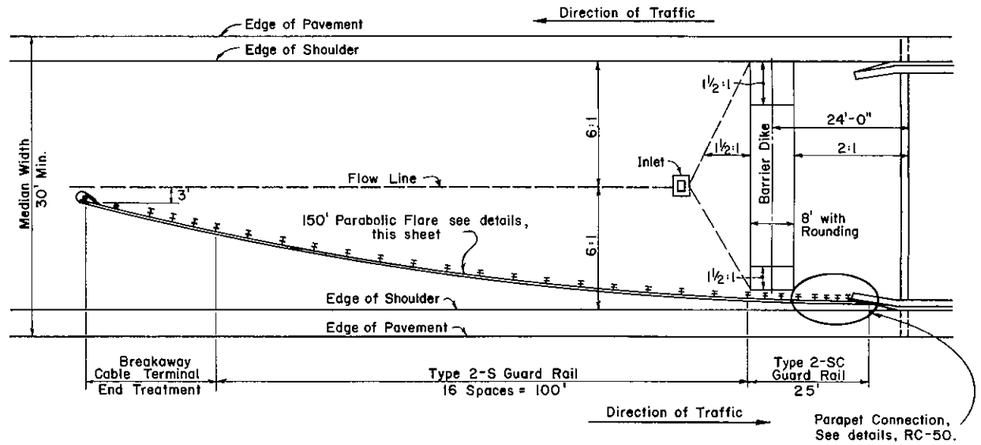


TREATMENT AT OBSTRUCTIONS FOR MEDIAN WIDTHS OF 20' TO 40' WHERE CONTINUOUS BARRIER IS NOT USED

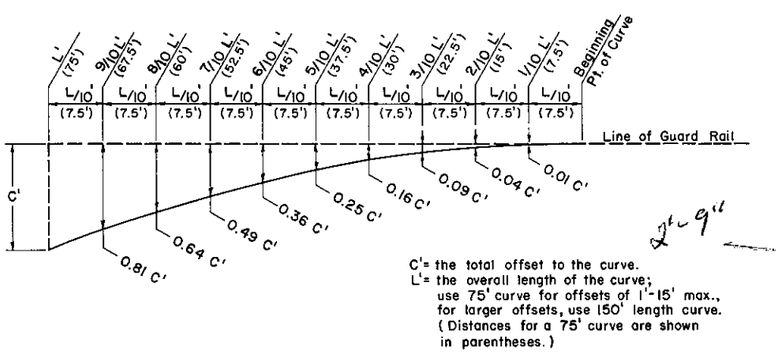
▲ Details for Type 2-WCC Guard Rail shall conform to the requirements of Type 2-W with post spacing at 3'-1½"



TREATMENT AT OBSTRUCTION FOR MEDIAN WIDTHS OF 40' OR GREATER WHERE CONTINUOUS BARRIER IS NOT USED

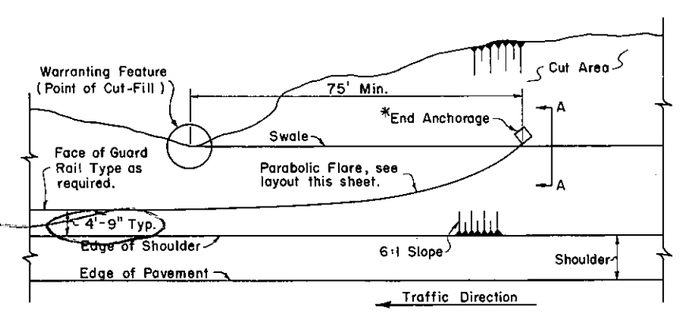


MEDIAN TREATMENT AT DUAL STRUCTURES

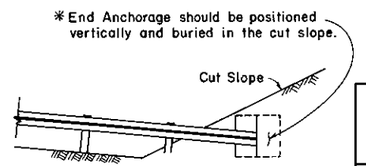


C' = the total offset to the curve.
L' = the overall length of the curve; use 75' curve for offsets of 1'-15' max., for larger offsets, use 150' length curve. (Distances for a 75' curve are shown in parentheses.)

PARABOLIC FLARE LAYOUT



TREATMENT - CUT TO FILL CONDITIONS



Payment for end anchorage shall include excavation, concrete, reinf. & hardware. See Details A & B, RC-55. (Terminal section not required.)

SECTION A-A

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

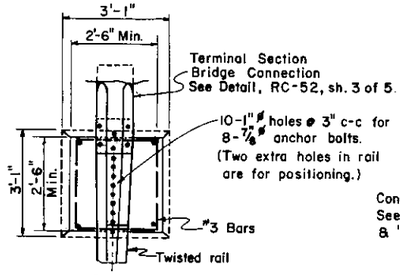
GUARD RAIL AND MEDIAN BARRIER PLACEMENT

Recommended May 1, 1978
B.D. Rauch
Director, Bureau of Design

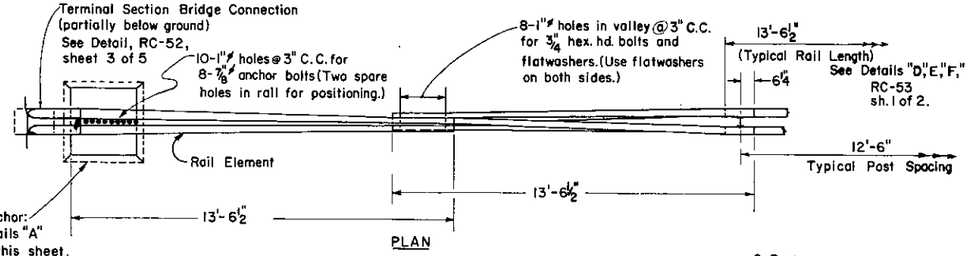
Approved May 1 1978
James M. Shrubin
Deputy Chief Hwy. Engr.

Sht. 3 Of 3
RC-54

TRACED BY
FINAL BY



PLAN



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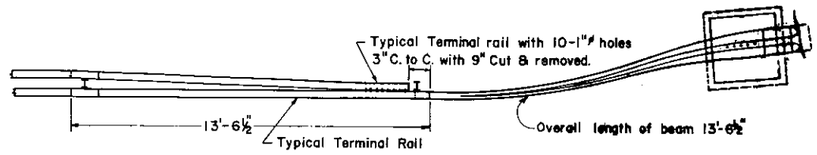

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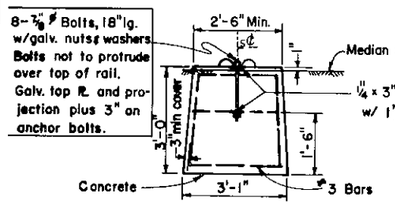
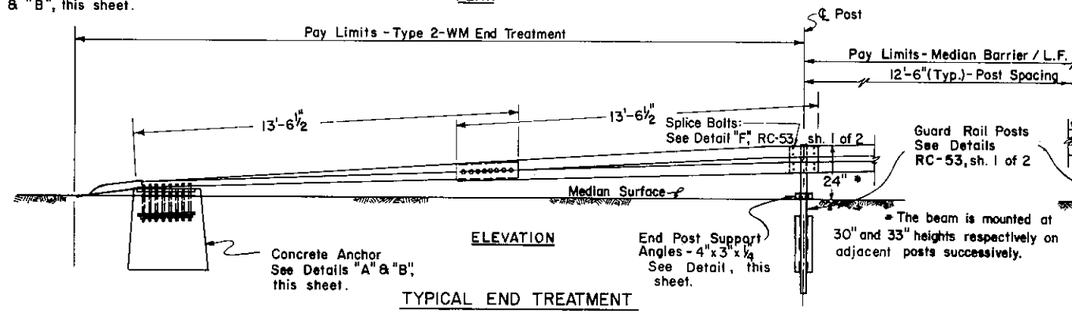


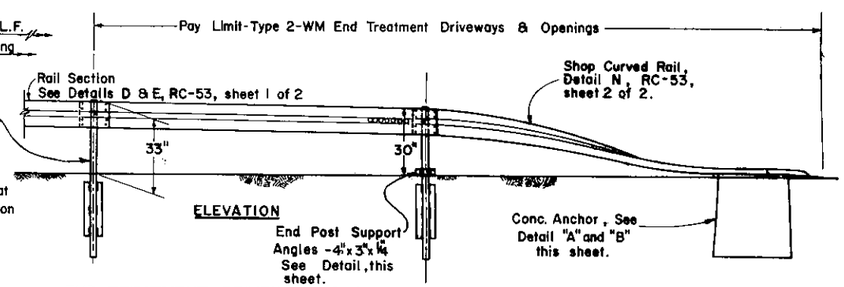
ELEVATION

DETAIL "A" CONCRETE ANCHOR



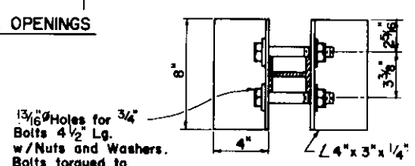
ELEVATION

TYPICAL END TREATMENT

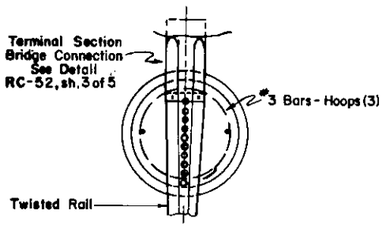


ELEVATION

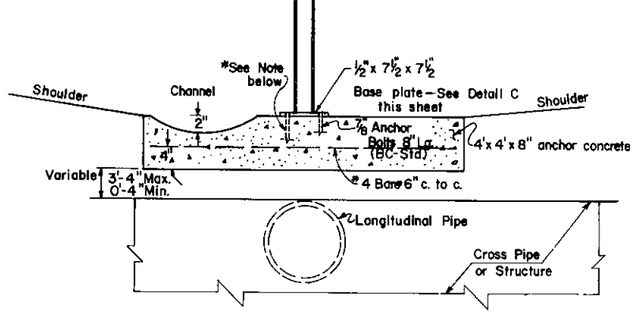
END TREATMENT DRIVEWAYS & OPENINGS



END POST SUPPORT ANGLES



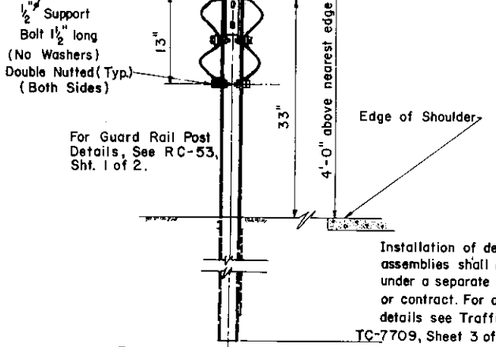
PLAN



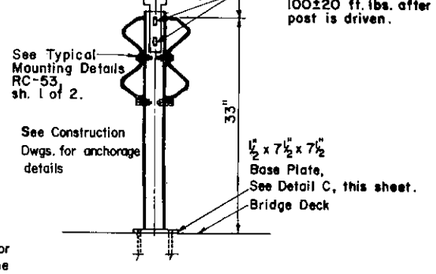
TYPICAL INSTALLATION WHEN CROSSING UNDERGROUND STRUCTURE

No separate payment will be made for this type construction. See Note 1 on RC-52 sheet 2 of 5

* For anchorage to existing bridge decks and divisors, see Bridge Construction Drawings.

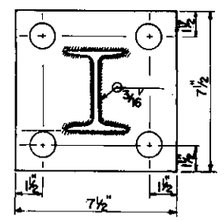


TYPE 2-WM MEDIAN BARRIER WITH TRAFFIC DELINEATOR BRACKET



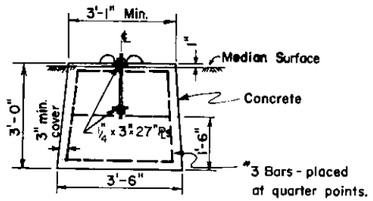
STRUCTURE MOUNTED BARRIER

(Existing Structure)



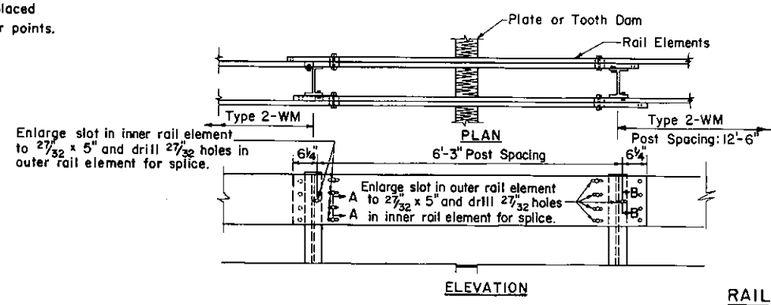
BASE PLATE DETAIL C

Note: All holes 1" ø unless otherwise noted. All welds 3/16". Use the same Base Plate Details all Type 2-W & 2-WC Guard Rail Posts.



ELEVATION

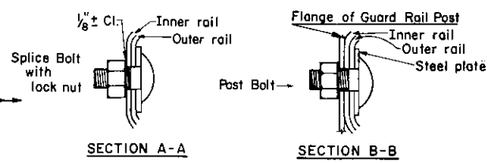
DETAIL "B" ALTERNATE CONC. ANCHOR



PLAN

ELEVATION

RAIL EXPANSION JT. DETAIL



SECTION A-A

SECTION B-B

No separate or additional payments will be made for installing Rail Expansion Joints.

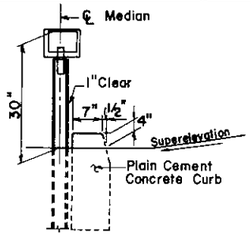
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

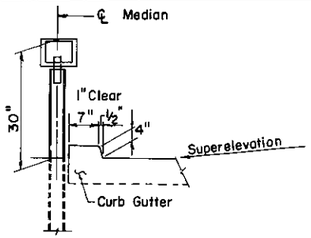
TYPE 2 WEAK POST MEDIAN BARRIER

Recommended May 1, 1978
B.D. Gaukler
Director, Bureau of Design

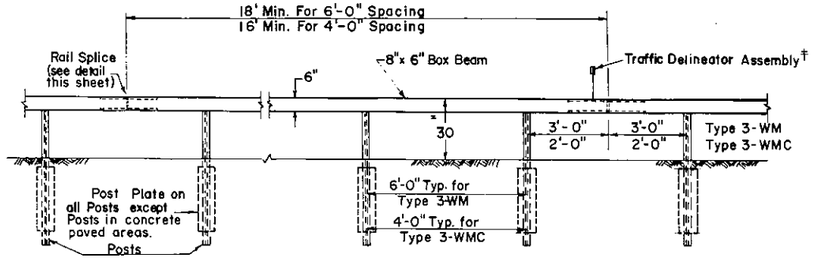
Approved May 1, 1978
James R. Sebastian
Deputy Chief Hwy. Engr.

Sht. 1 Of 1
RC-55



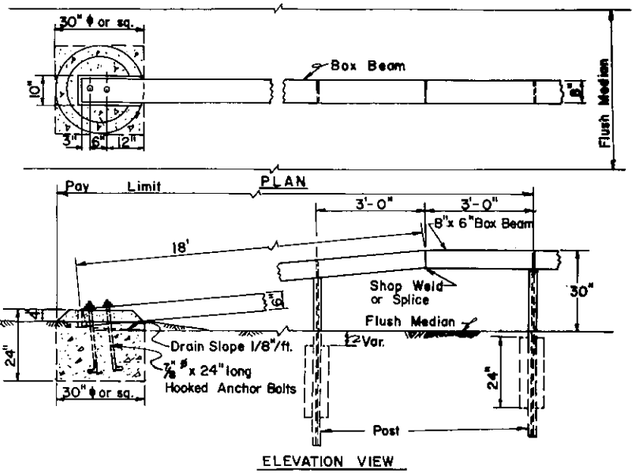


METHODS FOR CONTROLLING MEDIAN DRAINAGE

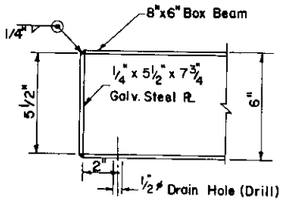


TYPICAL RAIL SPLICE & POST SPACING

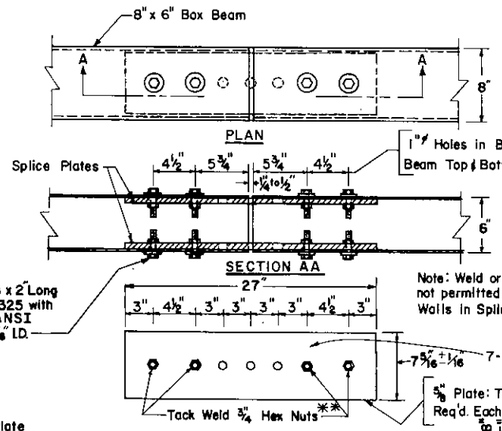
† Note: Installation of delineator assemblies shall be done under a separate pay item or contract. For additional details see Traffic Std. TC-7709.



TYPE 3-WM END TREATMENT- NARROW MEDIAN



BOX BEAM END PLATE DETAIL

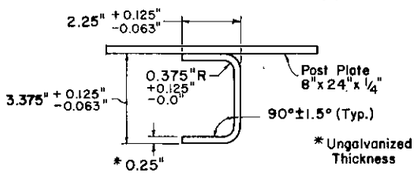


** These holes may be tapped to accomodate the ¾" bolts.

Note: Weld or Galvanizing Protrusions not permitted on Top or Bottom inside Walls in Splice Area.

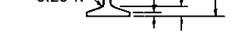
INTERNAL SPLICE PLATE DETAIL

BOX BEAM SPLICE JOINT

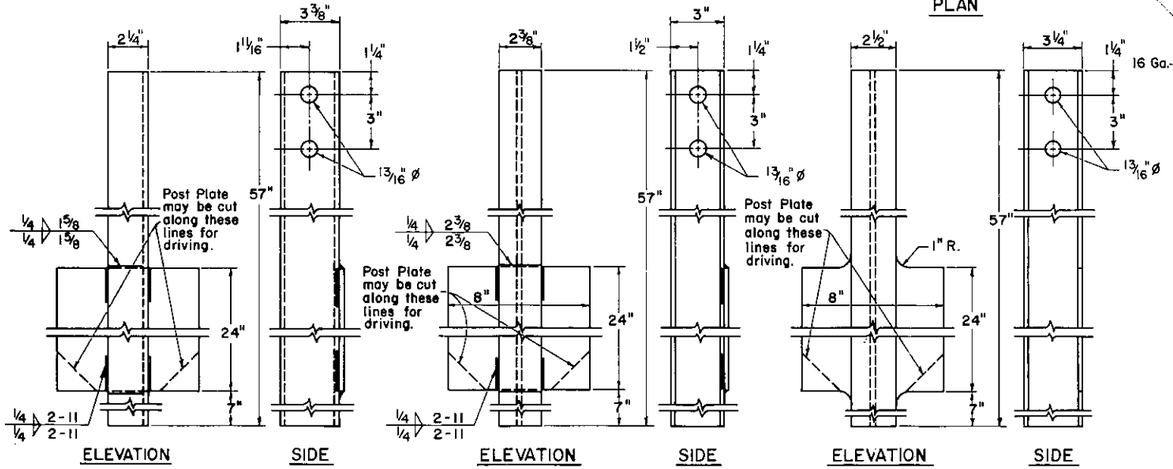


* Ungalvanized Thickness

PLAN

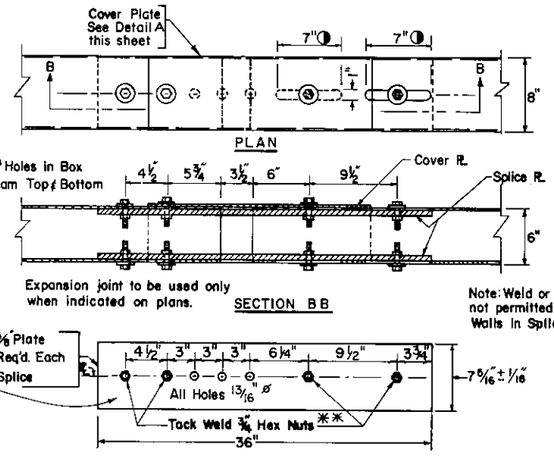


PLAN



TYPE 3-WM GUARD RAIL POSTS

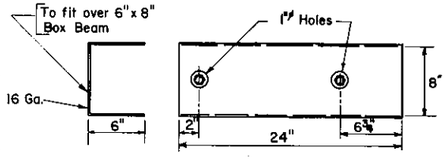
◑ Slot at top and bottom of box beam



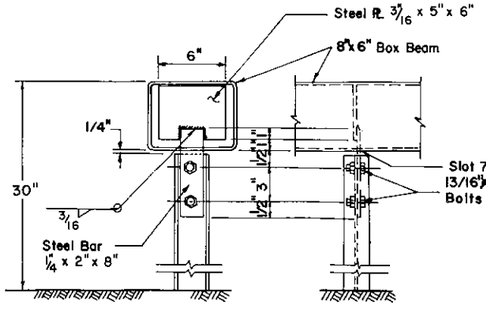
Note: Weld or Galvanizing Protrusions not permitted on Top or Bottom inside Walls in Splice Area.

INTERNAL SPLICE PLATE DETAIL

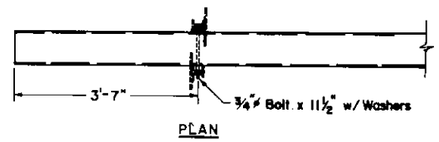
BOX BEAM EXPANSION JOINT



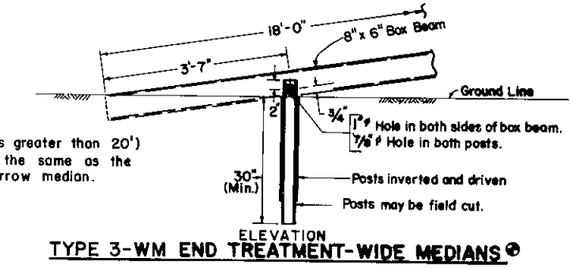
DETAIL A - COVER PLATE



TYPICAL MOUNTING DETAIL



PLAN



TYPE 3-WM END TREATMENT-WIDE MEDIANS ◐

◐ (For median widths greater than 20') Pay limit shall be the same as the end treatment - narrow median.

NOTES

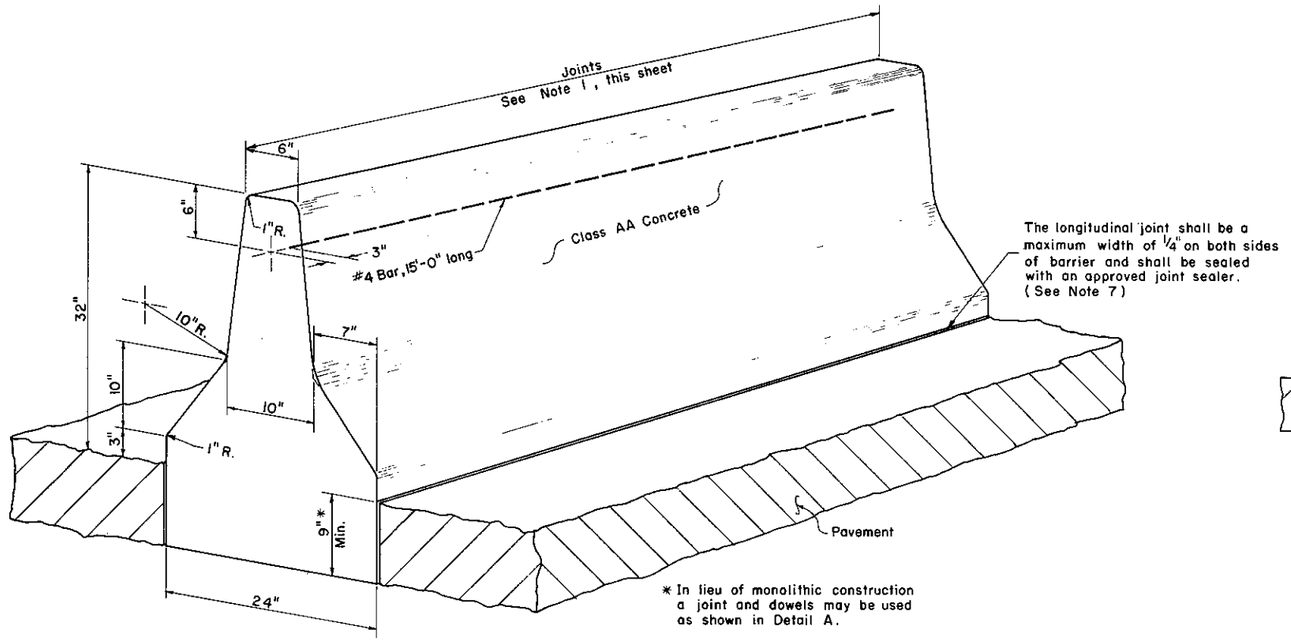
1. Median Barrier over underground structures shall be constructed as shown on RC-53, sheet 1 of 2.
2. For degree of curves greater than 3° 30', the rail elements shall be shop worked to the required curvature. No separate or additional compensation will be allowed for this work.
3. Where typical post spacing results in posts being located over cross drains, posts shall be shifted 1'-0" in direction to provide maximum clearance between post and cross drain.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

TYPE 3 WEAK POST MEDIAN BARRIER

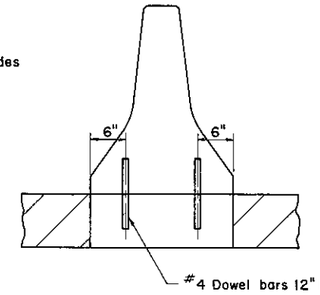
Recommended May 4, 1978	Approved May 4, 1978	Sht. 1 of 1
B.D. Barnhart	James R. Martin	RC-56
Director, Bureau of Design	Deputy Chief Hwy. Engr.	

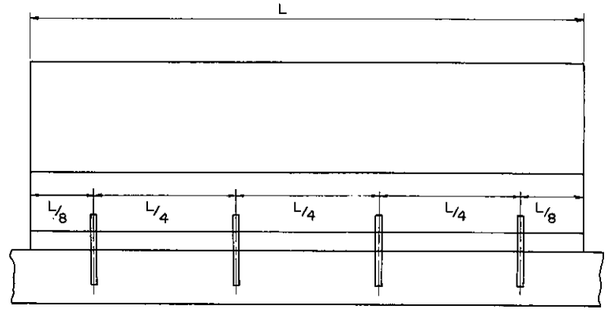
VOIDED BY CHANGE #1



The longitudinal joint shall be a maximum width of 1/4" on both sides of barrier and shall be sealed with an approved joint sealer. (See Note 7)

* In lieu of monolithic construction a joint and dowels may be used as shown in Detail A.

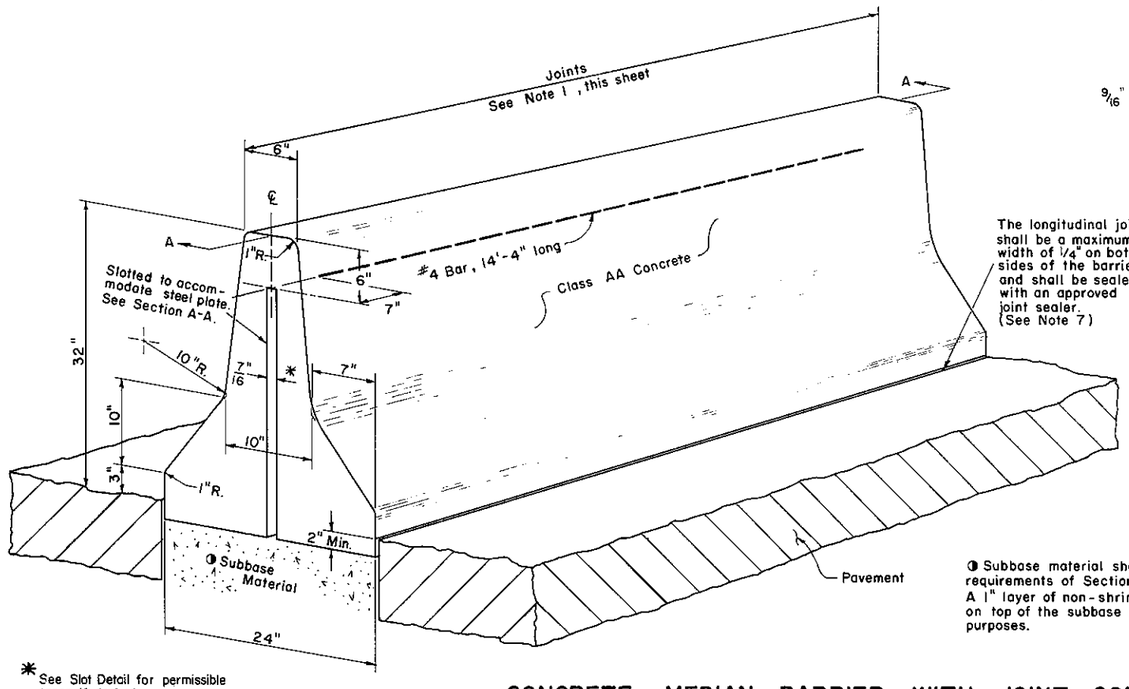




DETAIL A

CONCRETE MEDIAN BARRIER WITHOUT JOINT CONTINUITY

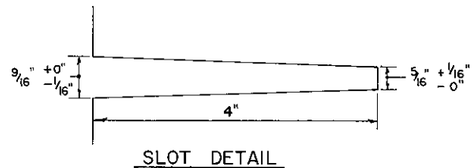
(See Note 2)



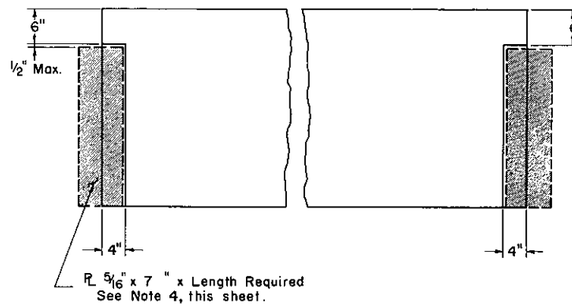
The longitudinal joint shall be a maximum width of 1/4" on both sides of the barrier and shall be sealed with an approved joint sealer. (See Note 7)

◑ Subbase material shall meet the compaction requirements of Section 350.3(d), Form 408. A 1" layer of non-shrink mortar may be used on top of the subbase material for leveling purposes.

* See Slot Detail for permissible taper if desired.



SLOT DETAIL



SECTION A-A

CONCRETE MEDIAN BARRIER WITH JOINT CONTINUITY

(See Note 2)

NOTES

1. Barrier joints, alignment, surface texture, and other construction details shall be in accordance with Section 623, Form 408.
2. The concrete median barrier shown may be constructed using either slip forming, cast in place, or precast units. Modifications or deviation from the standards will require special details to be submitted for approval. Only precast barriers which are supplied by an approved manufacturer as listed in Bulletin No. 15 will be permitted.
3. For sections that are designated as removable sections, a bond breaker such as bituminous paper or polyethylene shall be used where required to assure removability. Lifting holes will be required and shall be plugged with removable plastic or other approved type plugs.
4. The material used for the plates in the joints shall conform to the requirements of AASHTO Designation M183 or ASTM A36, structural steel. Plates shall be galvanized in accordance with AASHTO Designation M111, or coated in accordance with Sec. 714.1, Form 408.
5. Concrete median barrier construction on existing pavement will require special details to be shown on the construction drawings.
6. 1/2" Premolded Joint Material shall be used at all construction joints.
7. For precast units on curved sections a maximum 1/2" joint on one side will be permitted. For curves greater than 2° 30', 30' barrier lengths must be shortened to maintain longitudinal joint tolerances.

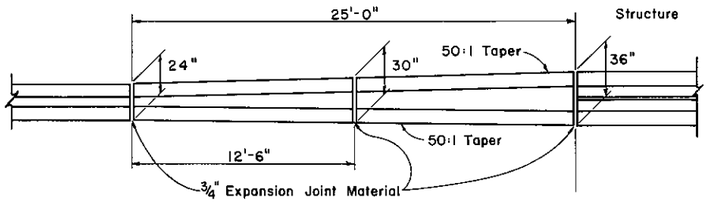
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

CONCRETE MEDIAN BARRIER

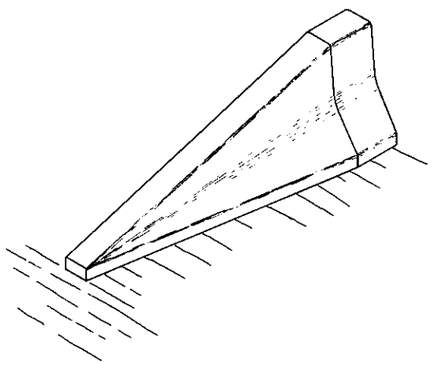
Recommended May 31, 1979 B.D. Kinsbi Director, Bureau of Design	Approved May 31, 1979 David Silvera Chief Hwy. Engr.	Sht. 1 Of 2 RC-57

TRACED BY
FINAL BY

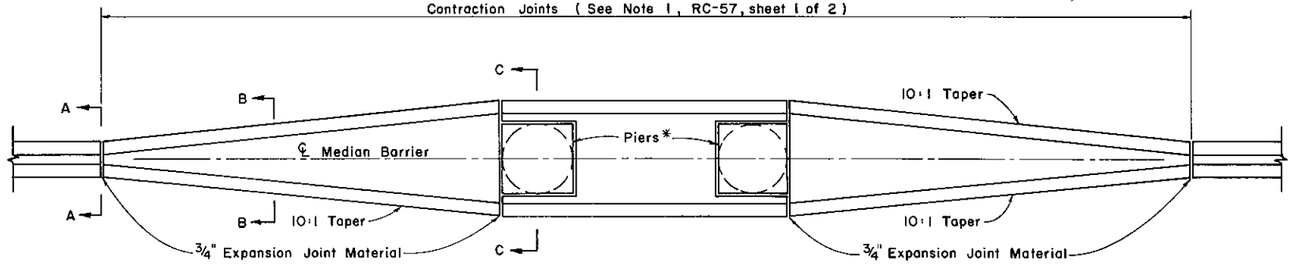
VOIDED BY CHANGE #1



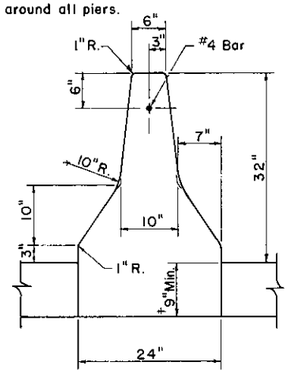
MEDIAN BARRIER TRANSITION DETAIL



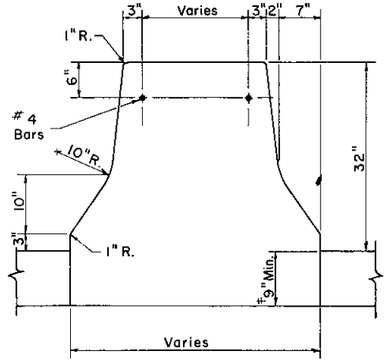
† See RC-57, sheet 1 of 2, for other approved foundation alternates.



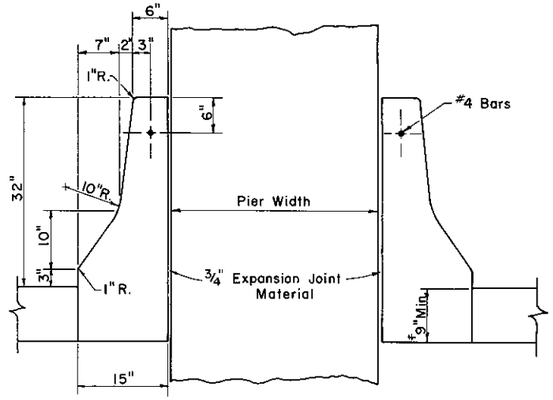
* ¾" Expansion Joint Material shall be used around all piers.



SECTION A-A



SECTION B-B

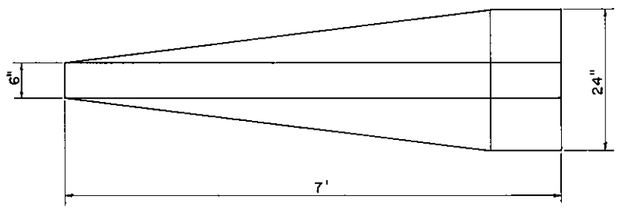


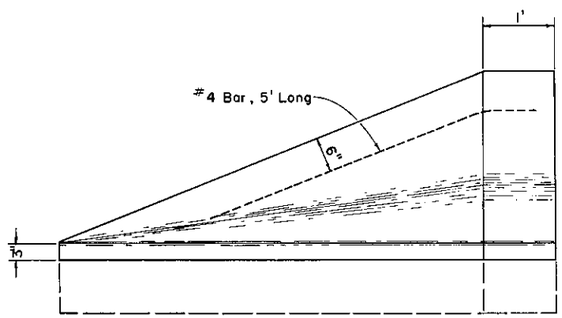
SECTION C-C

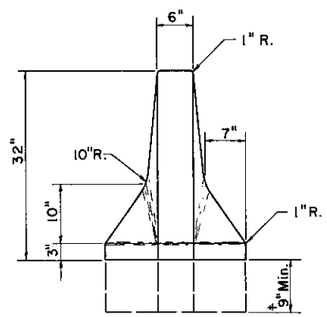
CONCRETE MEDIAN BARRIER TREATMENT AT PIERS

NOTES

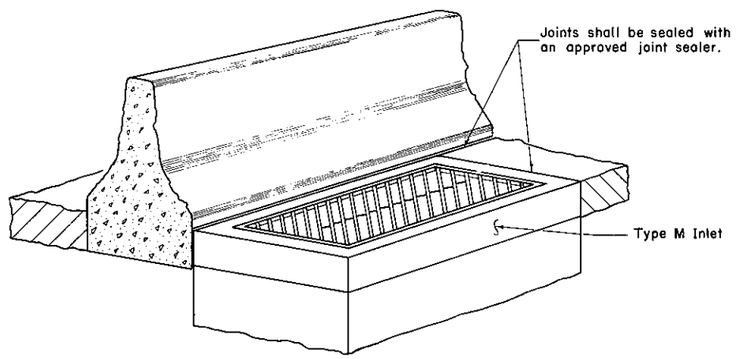
1. No additional compensation will be allowed for transitions in the concrete median barrier at piers or structures.
2. At hazardous locations, impact attenuators such as Hydro Cushion, G.R.E.A.T. System, or Texas Barrels, should only be considered for installations after all alternative protective methods have been ruled out.
3. See Bridge Construction Standard Drawings for details of concrete median barrier across structures.







CONCRETE MEDIAN BARRIER END TRANSITION



INLET PLACEMENT AT CONCRETE MEDIAN BARRIER

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

CONCRETE MEDIAN BARRIER

Recommended May 31, 1979
B.D. Kunkle
Director, Bureau of Design

Approved May 31, 1979
David C. Lind
Chief Hwy. Engr.

Sht. 2 Of 2

RC-57

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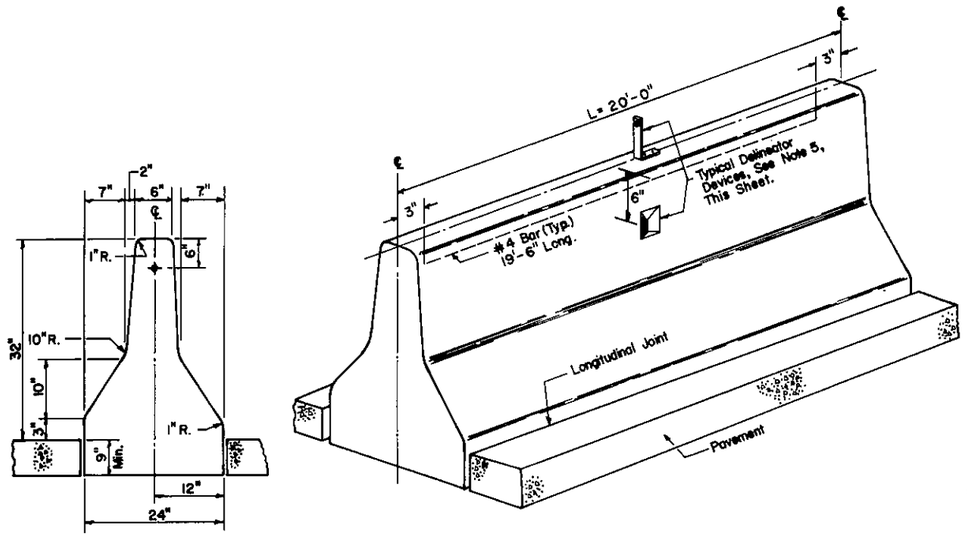
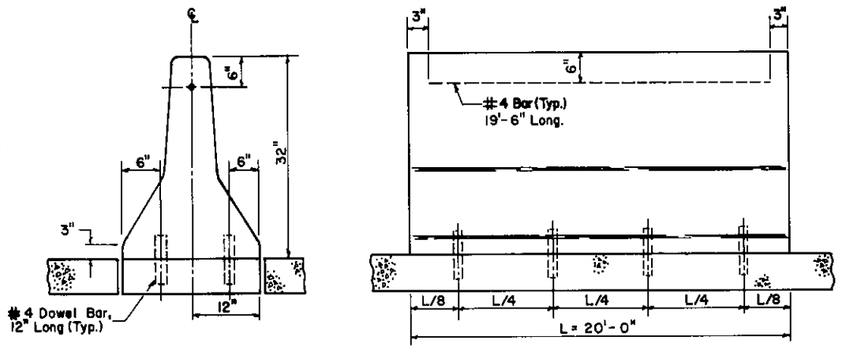
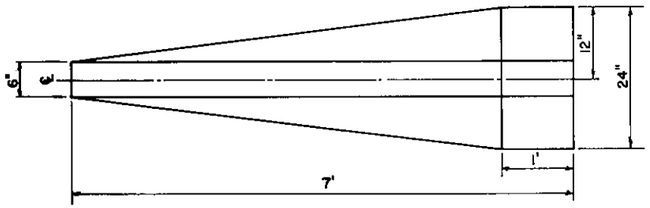


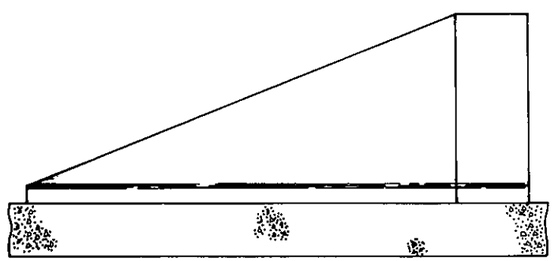
MONOLITHIC CONSTRUCTION



DOWEL CONSTRUCTION

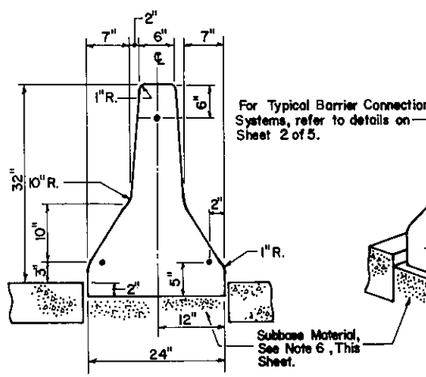
TYPICAL CAST-IN-PLACE OR SLIP-FORM CONSTRUCTION

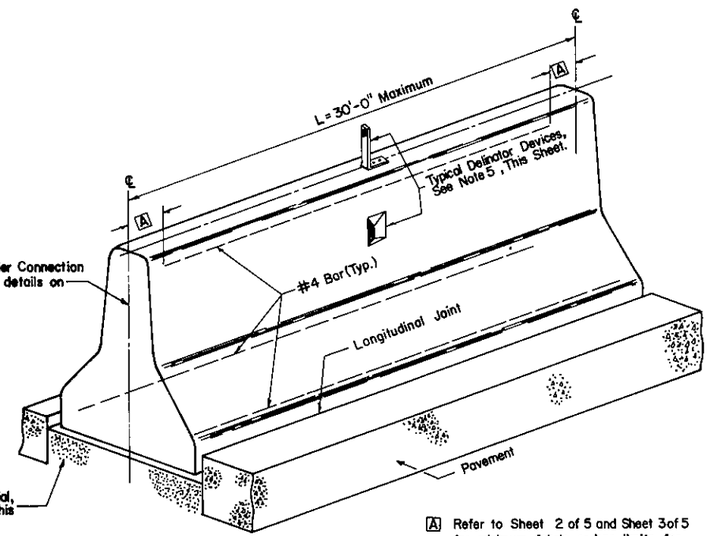




TYPICAL END TRANSITION CONSTRUCTION*

*See Note 8, This Sheet.





A Refer to Sheet 2 of 5 and Sheet 3 of 5 for minimum fabric or bar limits for precast barrier.

TYPICAL PRECAST CONSTRUCTION

NOTES

1. For permanent and temporary precast barrier, only those items supplied by an approved manufacturer, as listed in Bulletin No. 15, will be permitted. Any manufacturer desiring to be listed in Bulletin No. 15 for these items shall submit a 22"x 36" reproducible shop drawing to the Bureau of Contract Quality Control, Materials and Testing Division, for approval. Modifications or deviations from the standard will also require the submission of shop drawings for approval.
2. Barrier joints, alignment, surface texture, materials and construction details shall meet the requirements of Form 408 Specifications, Section 623, Concrete Median Barrier, and Section 713.2(f), Precast Concrete Median Barrier.
3. For cast-in-place or slip-form construction, a one-half inch premolded joint material shall be used at all construction joints.
4. Concrete median barrier construction on existing pavement will require special details to be shown on the construction drawings.
5. For permanent barrier installations, delineators shall be side-mount or top-mount, as determined on a project by project basis. Side-mount delineators shall be located 6 inches from the top face of the barrier to the center of the device. Top-mount delineators shall be installed as shown on Traffic Standard TC 7709, Sheet 4 of 6. Delineators shall be installed at a maximum longitudinal spacing of 88 feet for tangent sections and 66 feet for curve sections with a horizontal curvature greater than 2°-30'. Only delineators supplied by an approved manufacturer, as listed in Bulletin No. 15, will be permitted.
6. Compaction shall be in accordance with Form 408 Specifications, Section 350.3(d). A one inch layer of non-shrink mortar shall be used on top of the subbase material for leveling purposes.
7. For reinforcement locations for permanent barrier, refer to Typical Reinforcement Details on Sheet 2 of 5.
8. A typical barrier end transition section may be used for permanent barrier installations only when the last barrier section is located outside the required clear zone, as determined in DM-2, Chapter 12. A 20:1 sloped end transition is acceptable for permanent installations where the legal speed limit is 40 MPH or less. Otherwise, an impact attenuator, designed to absorb the energy of an impacting vehicle in the weight range of 2,000 to 4,500 lbs. at the specified design speed, with a maximum average force of 8.5 G's and a maximum peak force of 12 G's, shall be used.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

CONCRETE MEDIAN BARRIER
PERMANENT

Recommended May 6, 1982	Recommended May 6, 1982	Sht. 1 Of 5
Louis J. O'Brien	Alfred D. Hoyt	RC-57
Dir., Bureau of Highway Design	Chief Highway Engineer	

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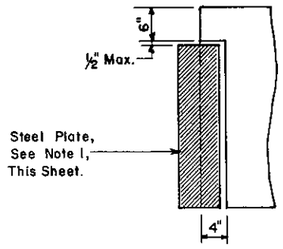
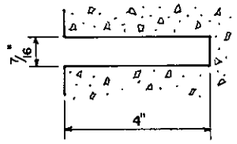
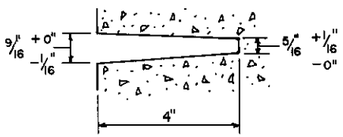


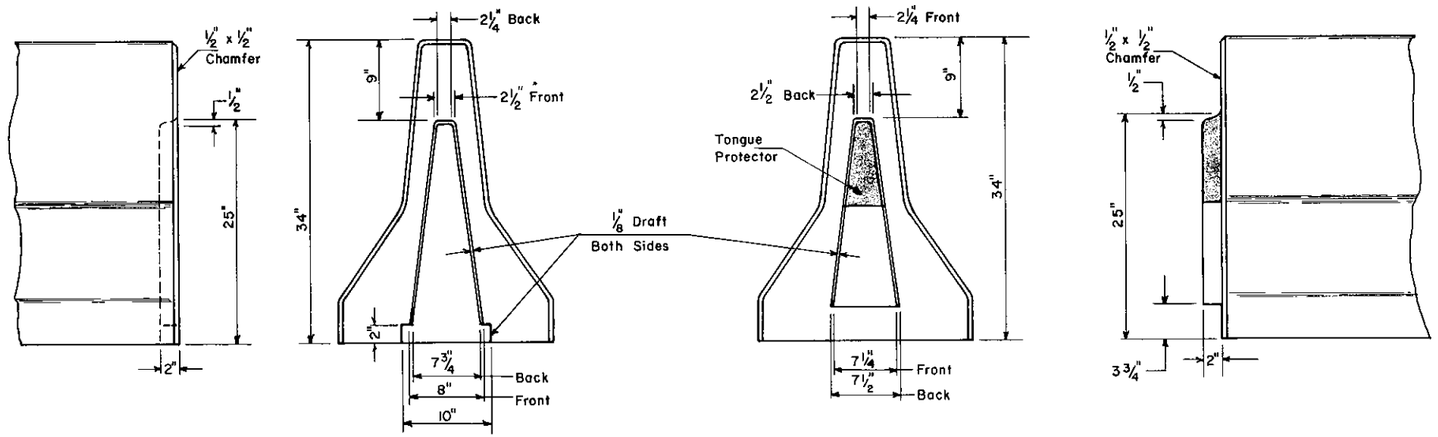


SLOT DETAIL



PERMISSIBLE TAPER

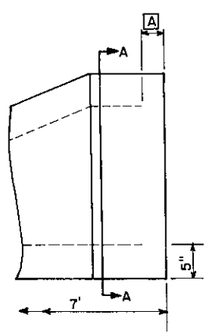
SLOTTED PLATE CONNECTION



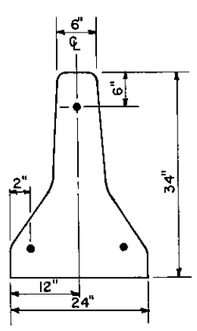
FEMALE KEYWAY

MALE KEYWAY

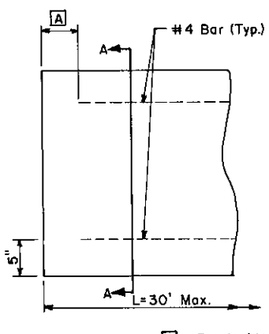
TONGUE - AND-GROOVE CONNECTION
TYPICAL BARRIER CONNECTION SYSTEMS

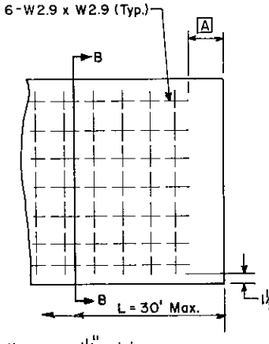


END TRANSITION

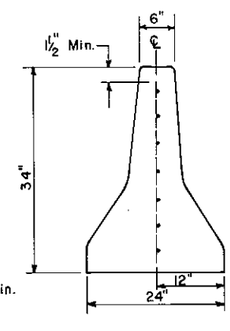


SECTION A-A

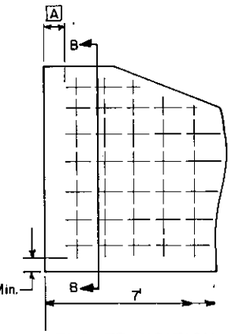




A For double-male connections, use 1½" minimum, for double-female connections, use 3½" minimum, and for slotted plate connections, use 5½" minimum for fabric or bar limits.



SECTION B-B



END TRANSITION

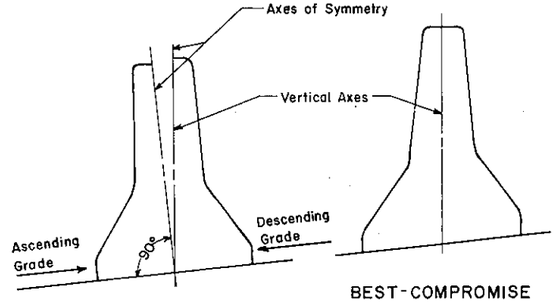
WELDED WIRE FABRIC

TYPICAL REINFORCEMENT DETAILS

NOTES

1. The material used for the plates in the joints shall meet the requirements of AASHTO Designation M183 or ASTM A36 structural steel. Plates shall be galvanized in accordance with AASHTO Designation M 111 or coated in accordance with Form 408 Specifications, Section 714. All plates shall be 5/16" x 7" x length required.
2. All tongue-and-groove barriers shall be cast either double-male or double-female. All tongue-and-groove end transition units shall be cast with either a male or a female connection. All tolerances for male connections shall be + 0" to - 1/16" and +1/16" to -0" for female connections.
3. The ideal barrier orientation on superelevated sections is a vertically-oriented barrier when the grade toward the barrier is descending and a perpendicularly-oriented barrier when the grade toward the barrier is ascending. The best compromise is a vertically-oriented barrier with the elevation of the two faces governed by the grade at each side of the barrier.
4. The tongue-and-groove connection design shown represents a barrier system patented by the Smith Cattleguard Company, Midland, Virginia. Contractors shall provide for patented barrier use by suitable legal agreement with the patentee, as required by Form 408 Specifications, Section 107.03.

* See Note 3, This Sheet.



IDEAL ORIENTATION

BEST-COMPROMISE ORIENTATION

BARRIER ORIENTATION ON SUPERELEVATED SECTIONS*

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

CONCRETE MEDIAN BARRIER
PERMANENT

Recommended May 6 1982 Dir., Bureau of Highway Design	Recomended May 6, 1982 Chief Highway Engineer	Sht. 2 Of 5 RC-57

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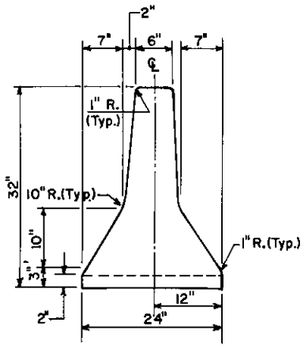
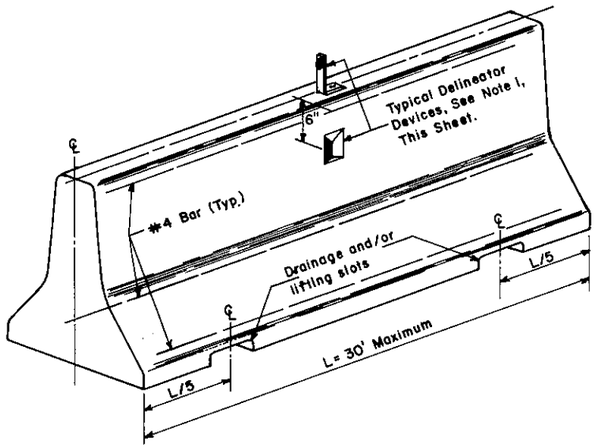
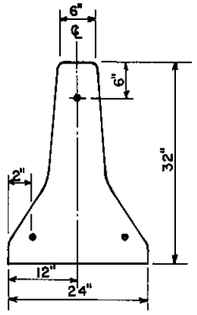
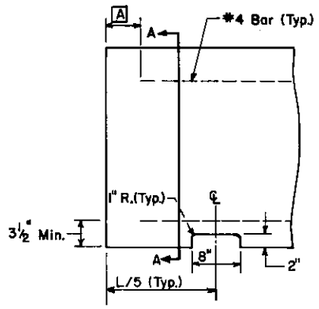




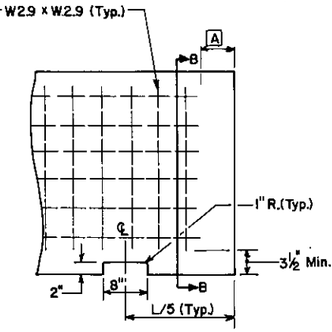
TYPICAL BARRIER SECTION



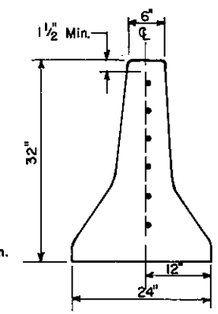
SECTION A-A



REINFORCEMENT STEEL



WELDED WIRE FABRICS



SECTION B-B

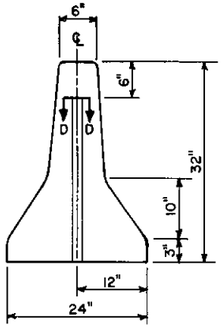
TYPICAL REINFORCEMENT DETAILS

[A] For double-male connections, use 1½" minimum, for double-female connections, use 3½" minimum, and for slotted-plate connections, use 5½" minimum for fabric or bar limits.

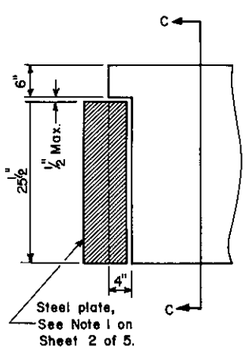
NOTES

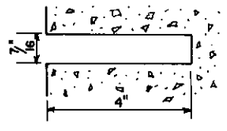
1. For temporary barrier installations, delineators shall be side-mount or top-mount, as determined on a project by project basis. Side-mount delineators shall be located 6 inches from the top face of the barrier to the center of the device. Top-mount delineators shall be installed as shown on Traffic Standard TC 7709, Sheet 4 of 6.
   Delineators shall be installed at a maximum longitudinal spacing of 40 feet and located at L/2 on the designated barrier section.
   Only delineators supplied by an approved manufacturer, as listed in Bulletin No. 15, will be permitted.

2. Warning lights may be provided in lieu of top or side-mount delineators on temporary barriers. They shall be installed at a maximum spacing of 80 feet, located 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. All other warning lights shall be yellow Type C steady burn lights. Only lights supplied by an approved manufacturer, as listed in Bulletin 15, will be permitted.

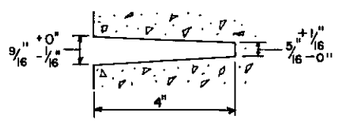


SECTION C-C





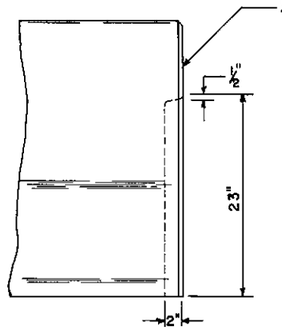
SLOT DETAIL

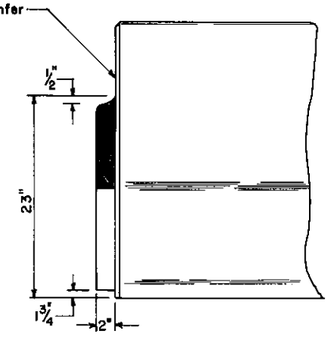


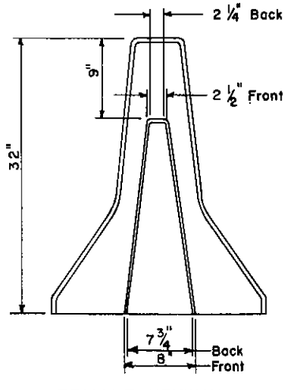
PERMISSIBLE TAPER

SECTION D-D

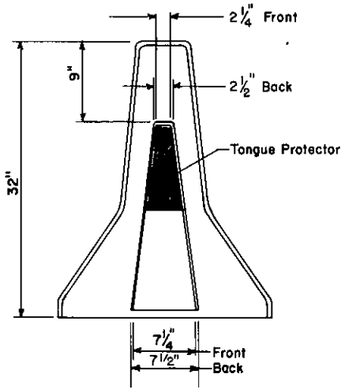
SLOTTED PLATE CONNECTION







FEMALE KEYWAY



MALE KEYWAY

TONGUE-AND-GROOVE CONNECTION
TYPICAL BARRIER CONNECTION SYSTEMS

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

CONCRETE MEDIAN BARRIER
TEMPORARY

Recommended May 6, 1982	Recommended May 6, 1982	Sht. 3 Of 5
Louis G. McBrien	Alfred D. Biehl	RC-57
Dir., Bureau of Highway Design	Chief Highway Engineer	

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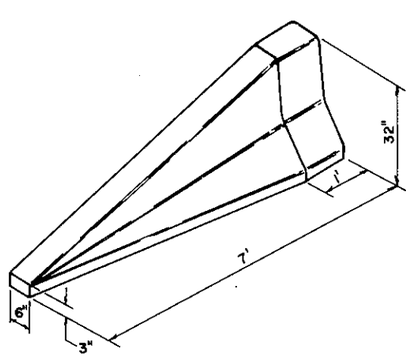
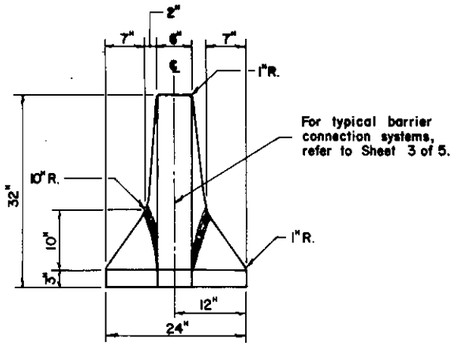
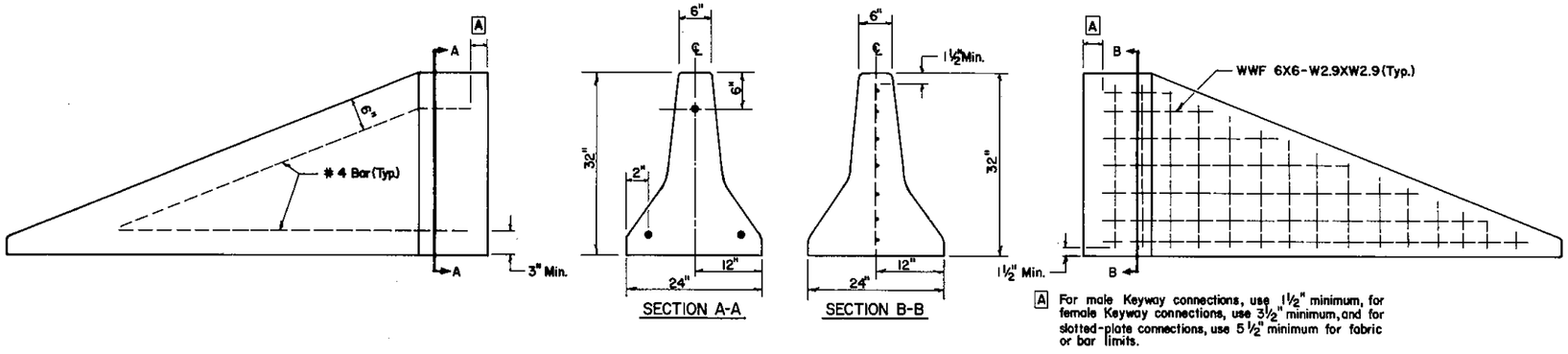


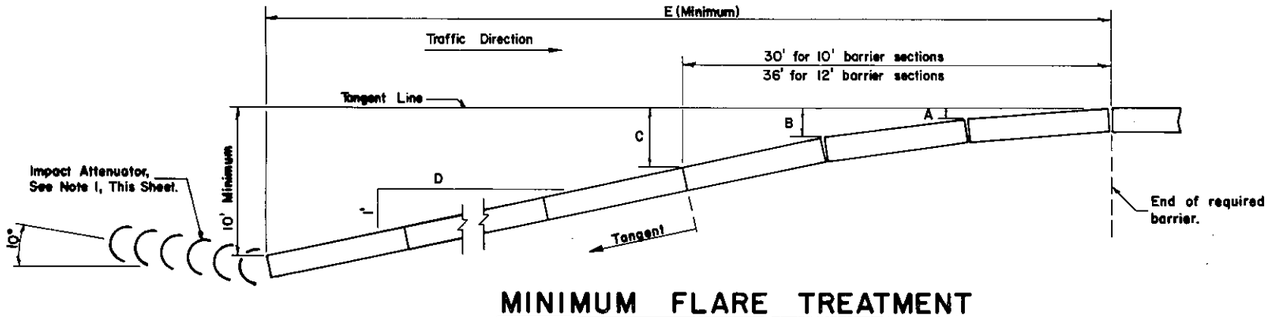


TYPICAL END TRANSITION SECTION



A For male Keyway connections, use 1½" minimum, for female Keyway connections, use 3½" minimum, and for slotted-plate connections, use 5½" minimum for fabric or bar limits.

TYPICAL END TRANSITION REINFORCEMENT DETAILS



MINIMUM FLARE TREATMENT

FLARE RATE DIMENSIONS

LEGAL SPEED LIMIT	A(ft.)*		B(ft.)*		C(ft.)*		D(ft.)	E(ft.) Min.
	10'	12'	10'	12'	10'	12'		
55 MPH	0.2	0.25	0.5	0.6	1.0	1.2	15	170
50 MPH	0.2	0.25	0.5	0.6	1.0	1.2	14	150
45 MPH	0.2	0.25	0.6	0.7	1.2	1.4	12	140
40 MPH	0.2	0.25	0.7	0.8	1.3	1.5	11	130

* For barrier lengths other than 10ft. and 12ft., make dimensional adjustments accordingly.

NOTES

1. The Minimum Flare Treatment guidelines and impact attenuator criteria presented on this sheet shall be used for approach ends of temporary barrier installations.
2. All impact attenuators shall be designed to absorb the energy of an impacting vehicle in the weight range of 2,000 to 4,500 pounds at the specified design speed, with a maximum average force of 8.5 G's and a maximum peak force of 12 G's. For temporary barrier installations, an impact attenuator shall be eliminated only 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 a minimum 30 feet from the edge of the nearest traffic lane.
   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. Lap connection details shall be submitted to the Central Office, Bureau of Highway Design, for approval.
3. End transition sections shall be used to terminate a temporary barrier system only when the criteria in Note 2.A. and/or 2.B. is satisfied. Otherwise, appropriate impact attenuators shall be used.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

CONCRETE MEDIAN BARRIER
TEMPORARY

Recommended May 6, 1982
Louis A. O'Brien
Dir., Bureau of Highway Design

Recommended May 6, 1982
Alfred D. Truby
Chief Highway Engineer

Sht. 4 Of 5
RC-57

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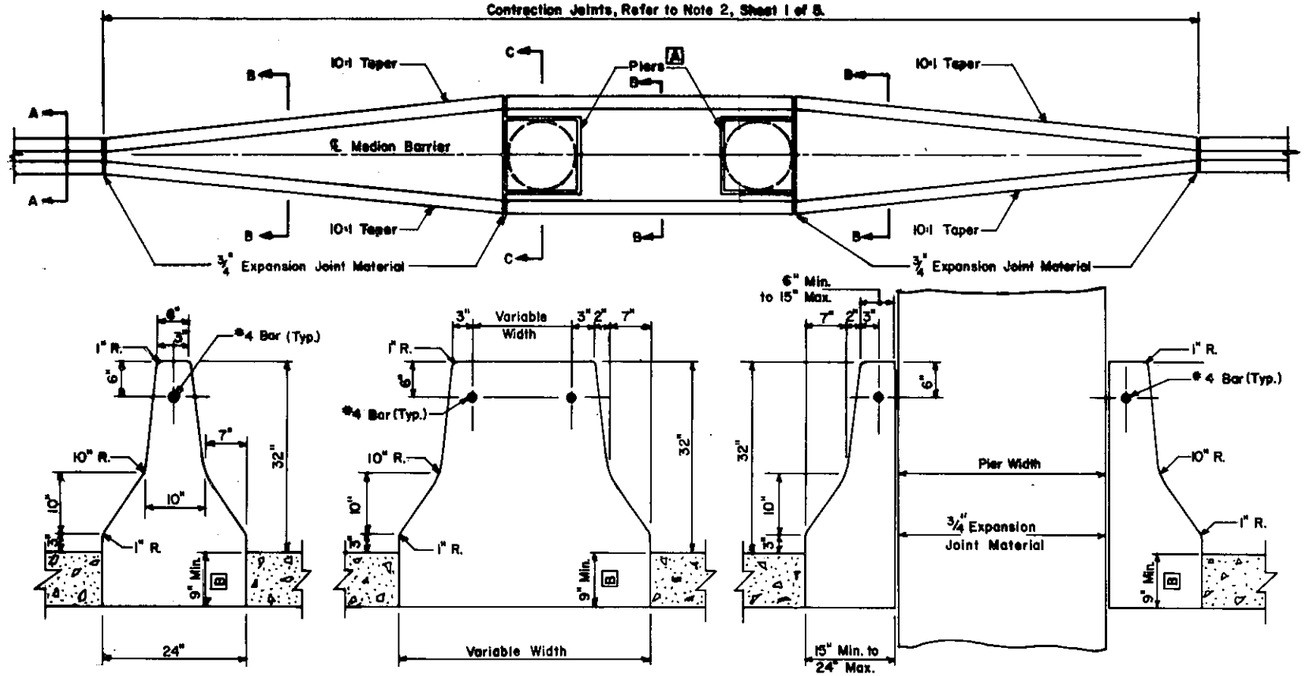
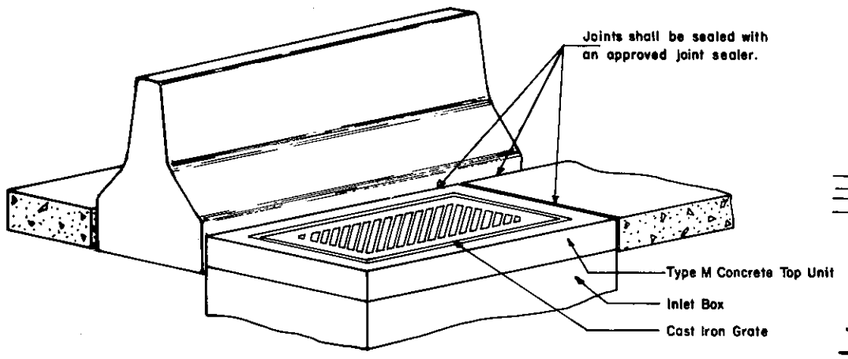


SECTION A-A SECTION B-B SECTION C-C

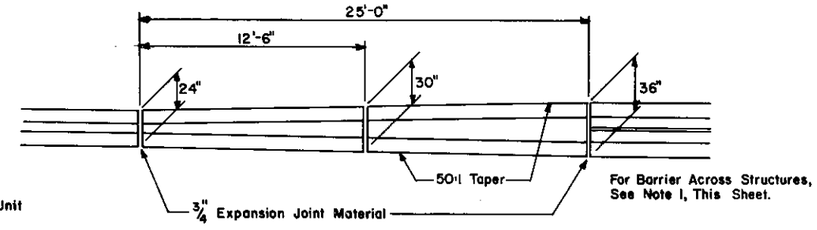
TYPICAL BARRIER TREATMENT AT PIERS

A ¾" Expansion Joint Material shall be used around all piers.

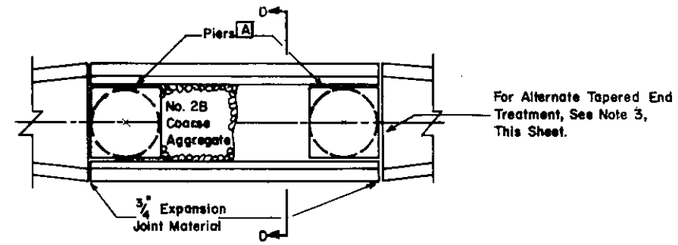
B For Additional Approved Foundation Alternates, refer to Sheet 1 of 5.

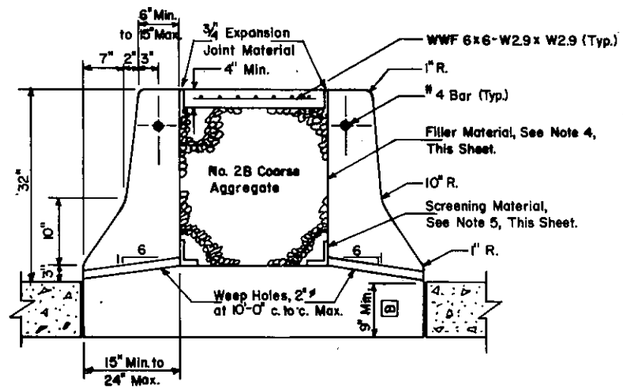


TYPICAL INLET PLACEMENT AT CONCRETE MEDIAN BARRIER



TYPICAL MEDIAN BARRIER TRANSITION DETAIL





SECTION D-D

TYPICAL ALTERNATE BARRIER TREATMENT AT PIERS

NOTES

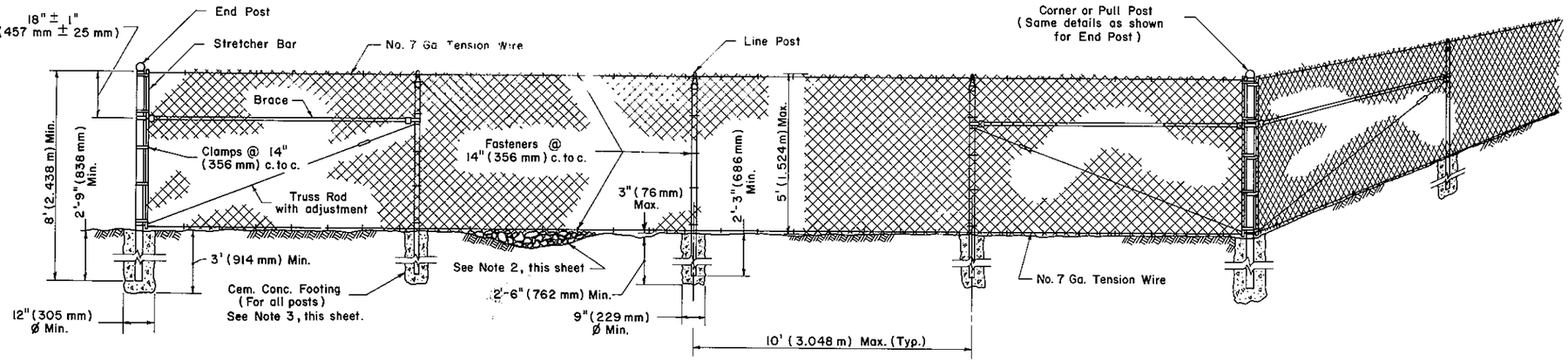
1. Refer to Bridge Construction Standard Drawings (Series BC-300) for details of concrete median barrier across structures.
2. No additional compensation will be allowed for transitions in the concrete median barrier at piers or structures.
3. Additional voids may be cast in the tapered end sections and shall meet the requirements presented in Section D-D.
4. All coarse aggregate shall meet the requirements of Form 408 Specifications, Section 703.3. Alternate suitable granular material may be used as filler material.
5. To prevent intrusion of course aggregate into weep holes, use wire mesh screening, geotextiles or other suitable material.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

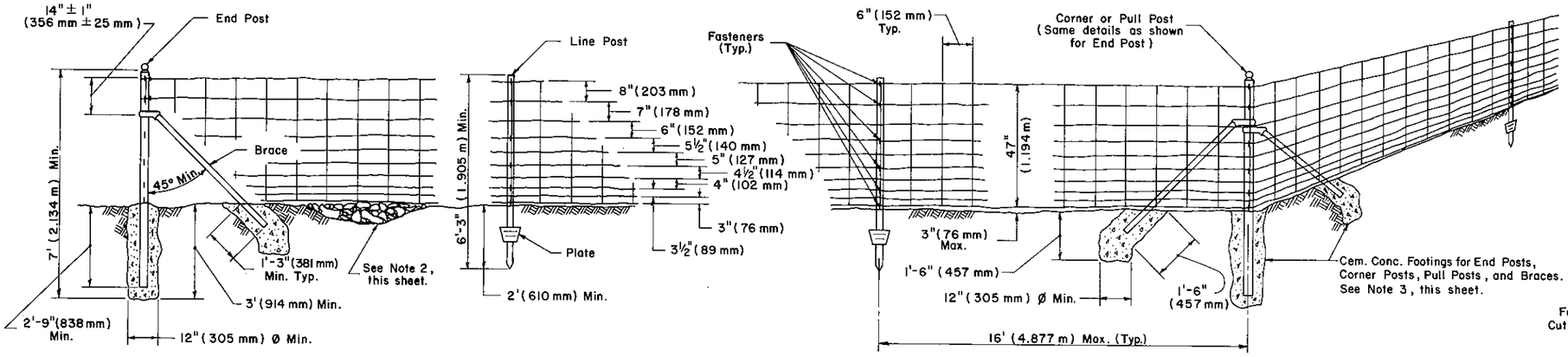
CONCRETE MEDIAN BARRIER

Recommended May 6, 1982 Louis J. O'Brien Dir., Bureau of Highway Design	Recommended May 6, 1982 Alfred T. Lupy Chief Highway Engineer	Sht. 5 Of 5 RC-57

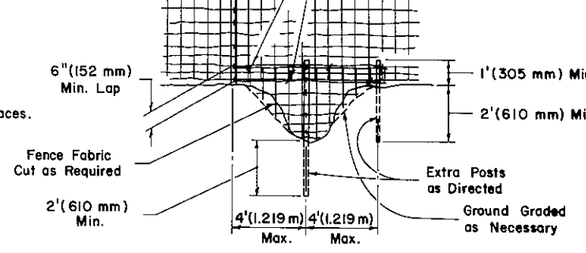
TRACED BY
FINAL BY



TYPE 1 RIGHT-OF-WAY FENCE

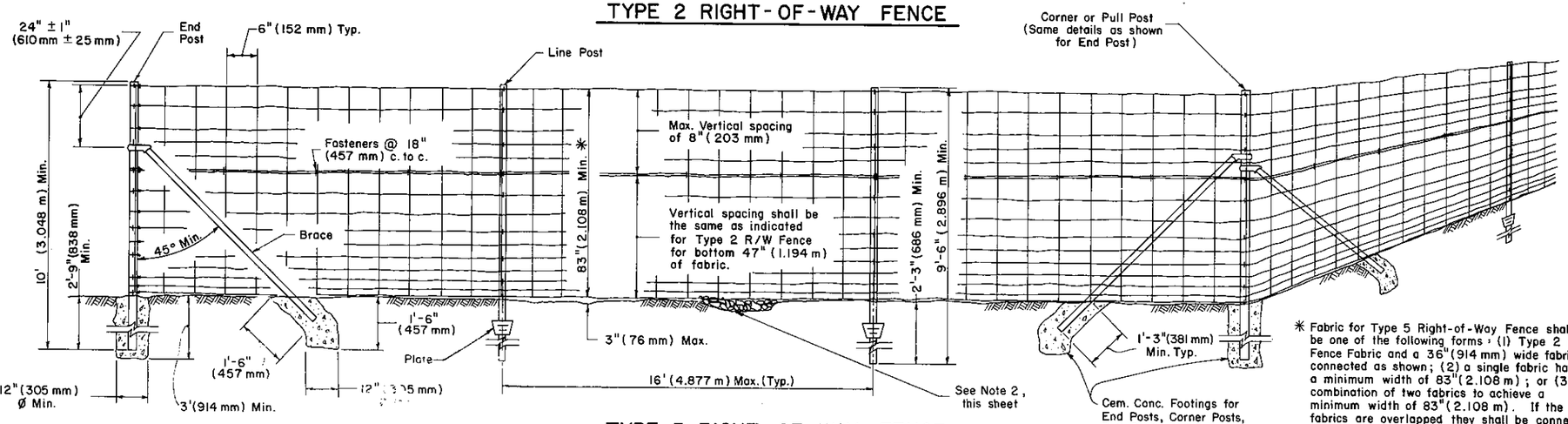


TYPE 2 RIGHT-OF-WAY FENCE



TREATMENT AT GROUND DEPRESSIONS GREATER THAN 1' (305 mm)

(For Type 2 & 5 Right-of-Way Fence)



TYPE 5 RIGHT-OF-WAY FENCE

* Fabric for Type 5 Right-of-Way Fence shall be one of the following forms: (1) Type 2 R/W Fence Fabric and a 36" (914 mm) wide fabric connected as shown; (2) a single fabric having a minimum width of 83" (2.108 m); or (3) a combination of two fabrics to achieve a minimum width of 83" (2.108 m). If the fabrics are overlapped they shall be connected by fasteners spaced at 18" (457 mm) c. to c. staggered on each edge of fabric along the joint.

NOTES

1. All material and workmanship shall be in accordance with Section 624, Form 408.
2. All depressions greater than 3" (76 mm) & less than 1' (305 mm) shall be filled with rocks or compacted earth to prevent animals from going under the Right-of-Way fence.
3. Drive Anchors may be used as an alternate to cement concrete footings for all Right-of-Way fences. See details, RC-60, sheet 2 of 2.
4. Place Pull Posts at angle points in vertical alignment, at maximum 500 feet (152.4 m) intervals between end and/or corner posts in level terrain, and/or where directed.
5. Metric equivalents are shown in parentheses for all given dimensions.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

RIGHT-OF-WAY FENCE

Recommended Sept. 1, 1978	Approved Sept. 1, 1978	Sht. 1 Of 2
R.O. Rankie, Director, Bureau of Design	J. M. Sebastian, Deputy Chief Hwy. Engr.	RC-60

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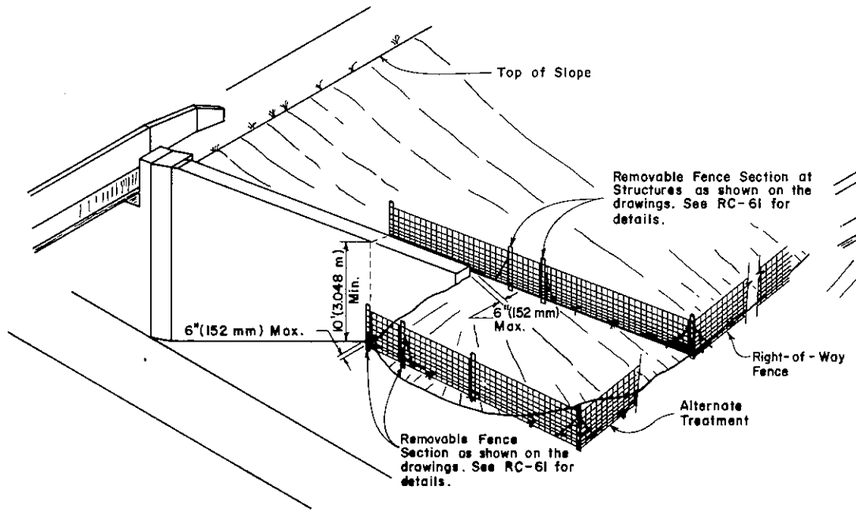
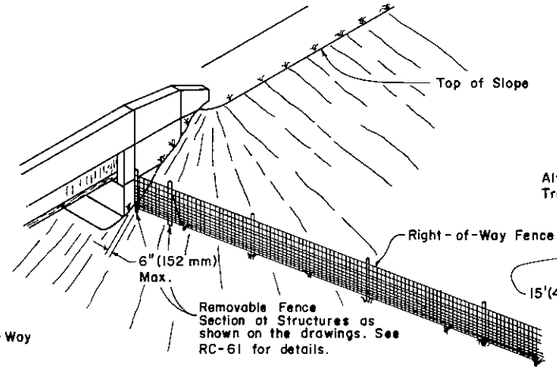
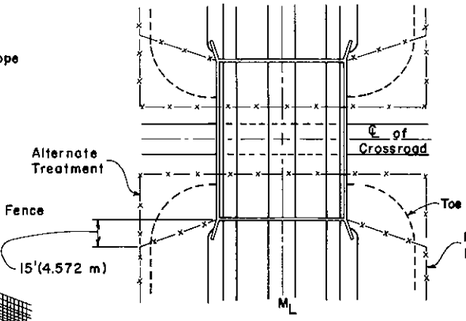
FINAL BY



R/W FENCE TREATMENT AT HIGH WALLED ABUTMENT

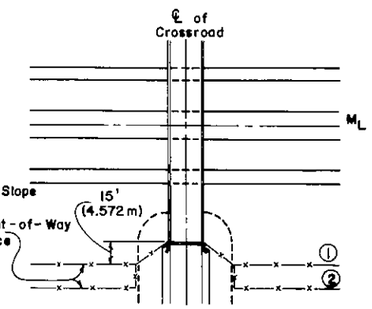


R/W FENCE TREATMENT AT STUB ABUTMENTS



HIGHWAY OVER CROSSROAD

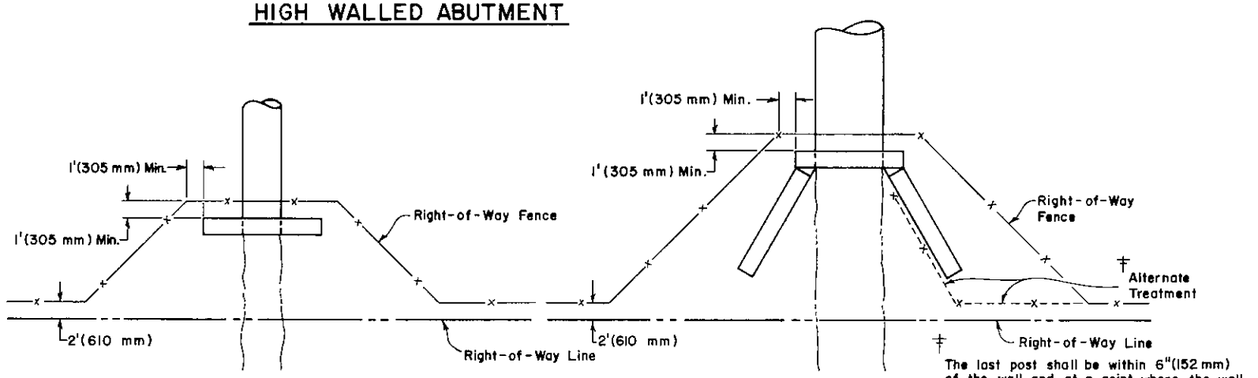
If the roadway has dual stuctures, the right-of-way fence shall be erected to close off the median area.



HIGHWAY UNDER CROSSROAD

① If right-of-way fence is within 15'(4.572 m) or less of the projected face of the backwall, the fence shall be angled into the abutment as shown.

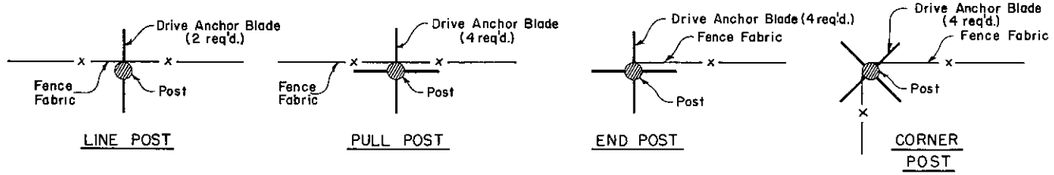
② If right-of-way is greater than 15'(4.572 m) from the projected face of the backwall, place fence parallel to crossroad and angle into abutment as shown.



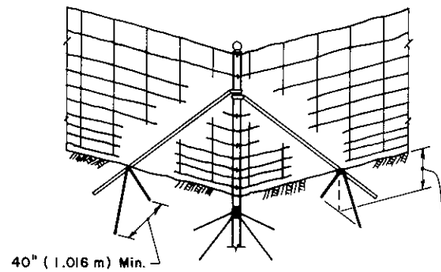
The last post shall be within 6"(152 mm) of the wall and at a point where the wall height is not less than 10'(3.048 m).

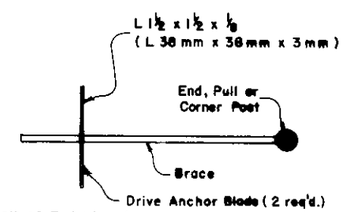
R/W FENCE TREATMENT AT CULVERTS

Caution should be exercised when locating posts near culvert. Any damage will be at contractor's expense.



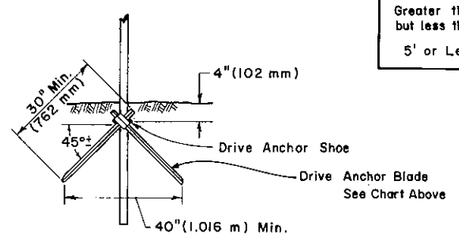
DRIVE ANCHOR ORIENTATION





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

Fence Ht.	Min. Blade Size	
7' or Greater	1½" x 1½" x ⅛"	(38mm x 38mm x 3mm)
Greater than 5' but less than 7'	1¼" x 1¼" x ⅛"	(32mm x 32mm x 3mm)
5' or Less	1" x 1" x ⅛"	(25mm x 25mm x 3mm)



DRIVE ANCHOR

Drive Anchor may be used as an alternate to cement concrete footings for all Types of Right-of-Way Fence.

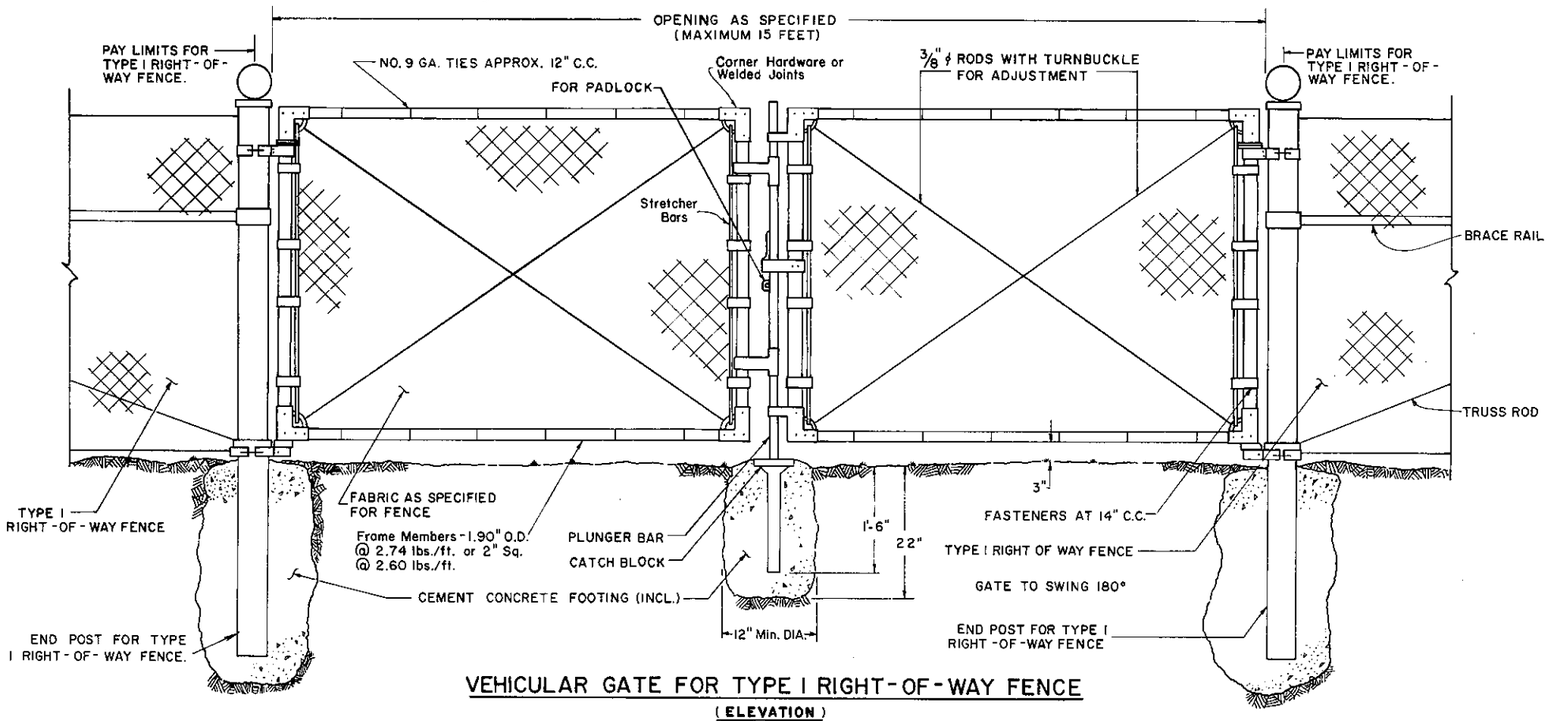
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

RIGHT-OF-WAY FENCE

Recommended Sept 1, 1978	Approved Sept 1, 1978	Sht. 2 Of 2
B.O. Crumbie, Director, Bureau of Design	James M. DeBurkin, Deputy Chief Hwy. Engr.	RC-60

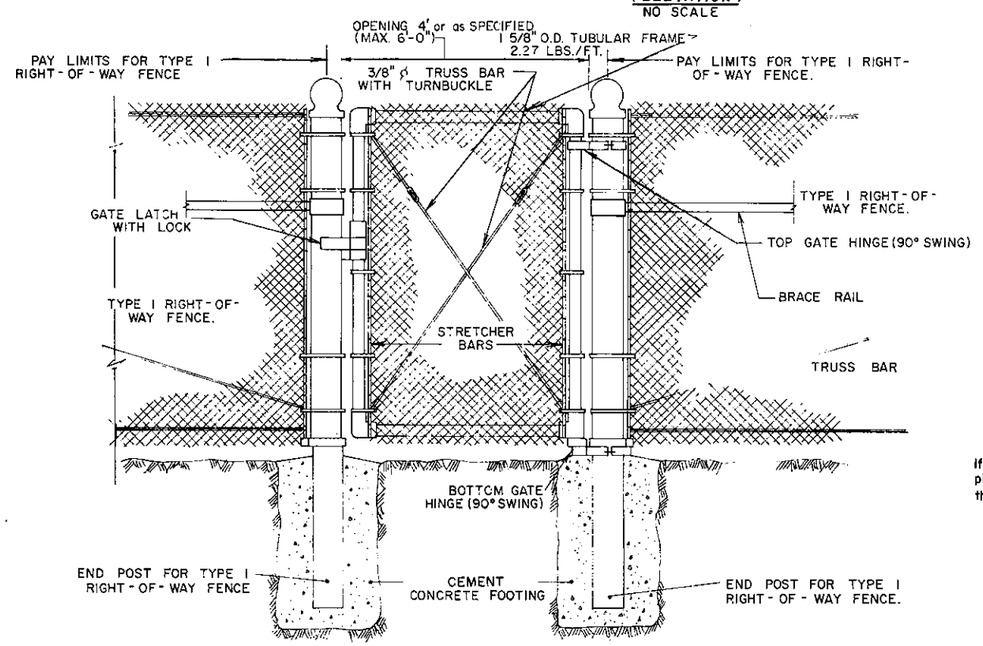
TRACED BY
FINAL BY

FORM 4237 REV 3-69

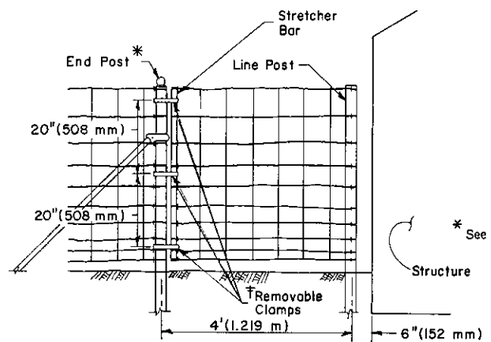


VEHICULAR GATE FOR TYPE I RIGHT-OF-WAY FENCE

(ELEVATION)
NO SCALE

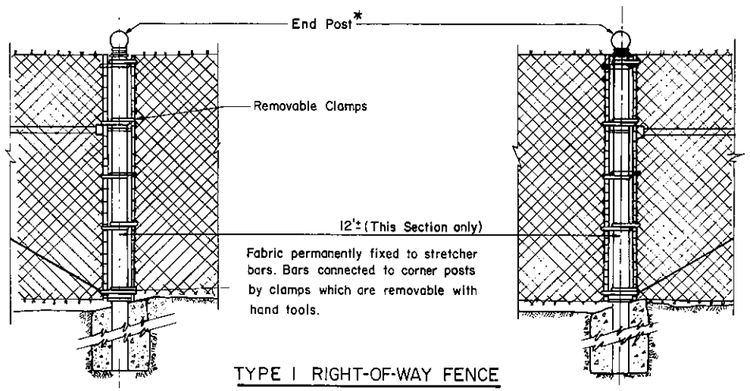


PEDESTRIAN GATE FOR TYPE I RIGHT-OF-WAY FENCE

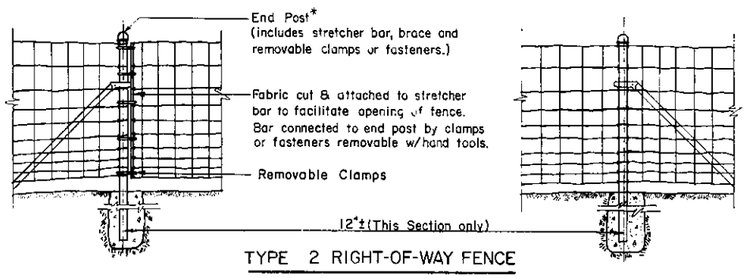


If removable fence sections at structures are placed anywhere in the run of fence other than the end, two end posts will be required.

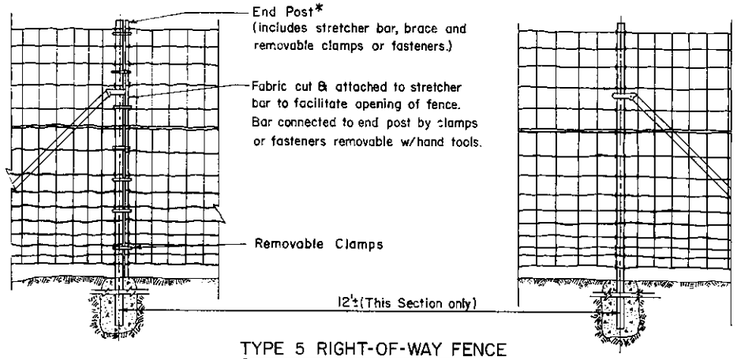
REMOVABLE FENCE SECTIONS AT STRUCTURES



TYPE I RIGHT-OF-WAY FENCE



TYPE 2 RIGHT-OF-WAY FENCE



TYPE 5 RIGHT-OF-WAY FENCE

* See sheet RC-60 for details.

REMOVABLE FENCE SECTIONS

Note:
The payment for Removable Fence Sections will be considered incidental to the R/W fence.

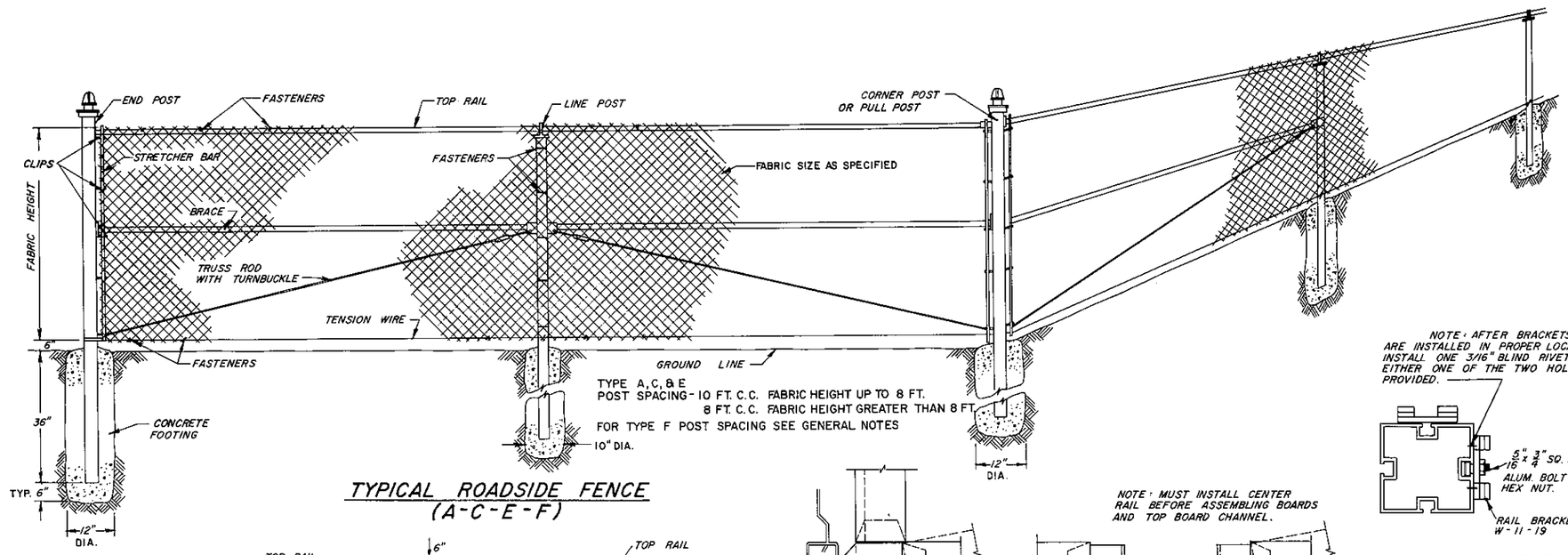
† For Type 2 R/W Fence use 3 clamps as shown. For Type I R/W Fence use 4 clamps equally spaced. For Type 5 R/W Fence use 5 clamps equally spaced.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

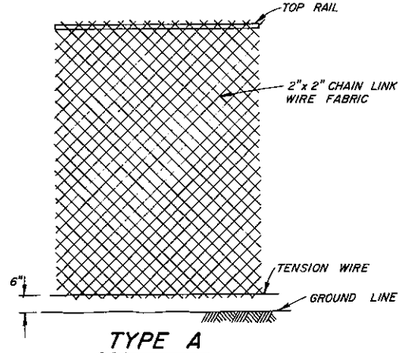
R/W GATE AND REMOVABLE FENCE SECTIONS

Recommended Jan 31, 1977	Approved Jan 31, 1977	Sht. 1 Of 1
B.D. Gaudio	James B. Wilson	RC-61
Director, Bureau of Design	Deputy Chief Hwy. Engr.	

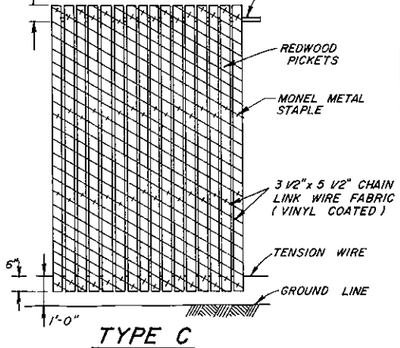
TRACED BY
FINAL BY



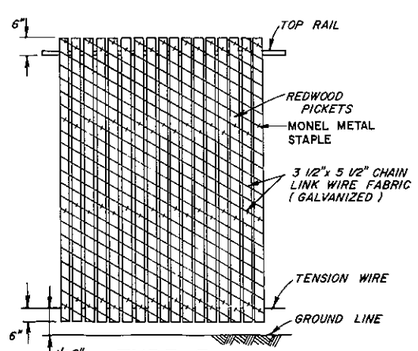
TYPICAL ROADSIDE FENCE (A-C-E-F)



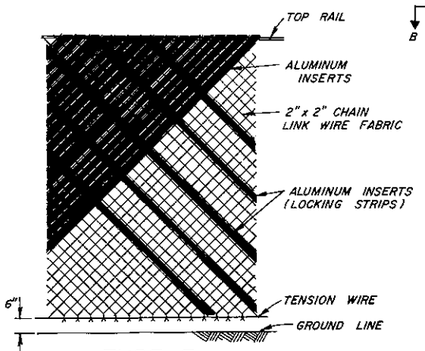
TYPE A



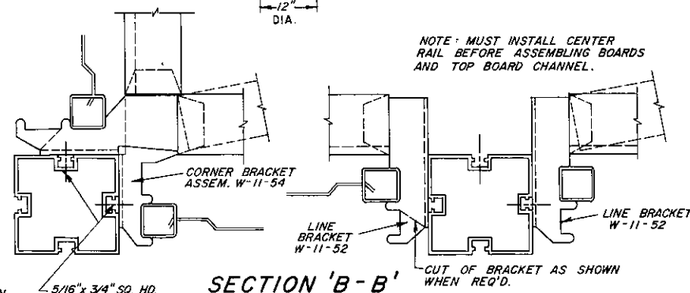
TYPE C



TYPE E



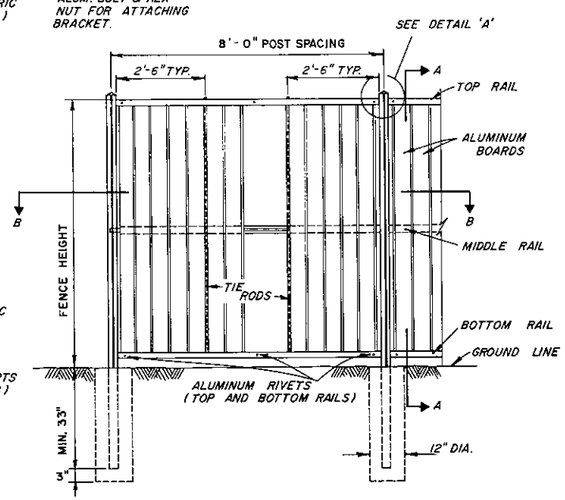
TYPE F



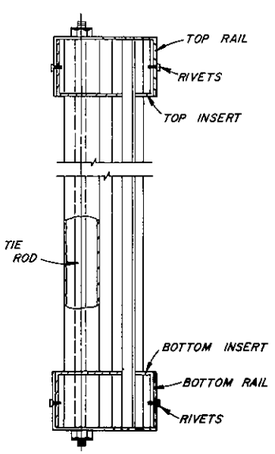
SECTION 'B-B'

DETAIL 'A'

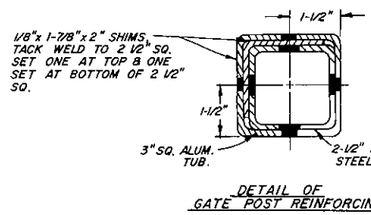
ATTACHMENT FOR TOP AND BOTTOM RAILS



TYPE G



SECTION 'A-A'



DETAIL OF GATE POST REINFORCING

GENERAL NOTES

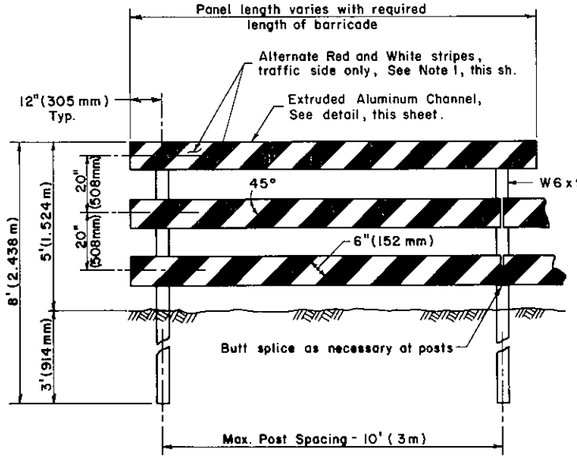
POST SPACING & FOOTING SIZES - TYPE F			
FABRIC HEIGHT (FT.)	POST SPACING STEEL (FT)	POST SPACING ALUMINUM (FT)	FOOTING SIZE (IN.)
6	10	10	9 x 42
7	10	6	10 x 42
8	8	6	12 x 42
9	6	5 *	15 x 42
10	5	5 *	18 x 42
11	5 *	6 **	18 x 48
12	5 *	6 **	18 x 48

NOTE: STEEL H-BEAM 2.25"x 1.95" HI-CARBON
ALUMINUM 2.25"x 1.95" H-BEAM
* 3" SQUARE POSTS 0.155" WALL
** SCH. 40 4" O.D. POSTS 0.226" WALL

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

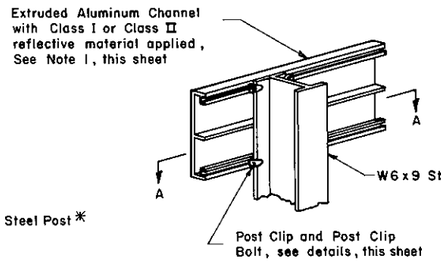
ROADSIDE FENCE

Recommended	Approved	Sht. 1 Of 1
Jan 6, 1975	Jan. 6, 1975	
R.D. Lunatic		RC-62
Director, Bureau of Design	Deputy Chief Hwy Engr.	



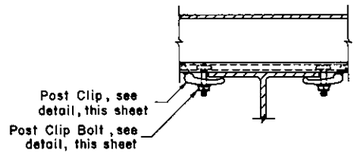
ALUMINUM PANEL - STEEL POSTS

* A W6 x 8.5 steel shape may also be used.

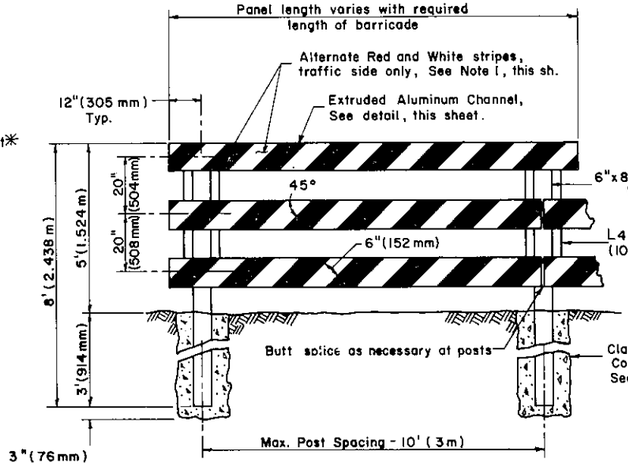


DETAIL A

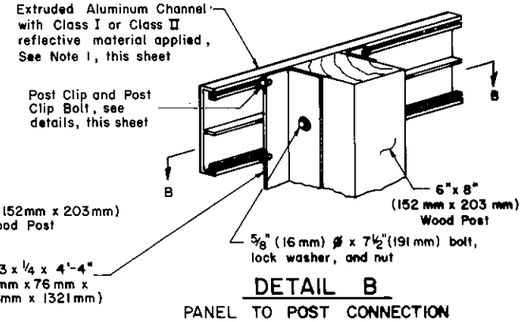
PANEL TO POST CONNECTION



SECTION A-A

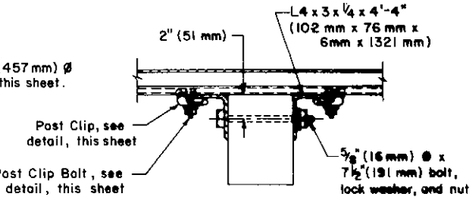


ALUMINUM PANEL - WOOD POSTS

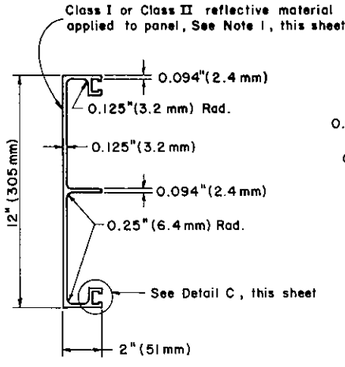


DETAIL B

PANEL TO POST CONNECTION

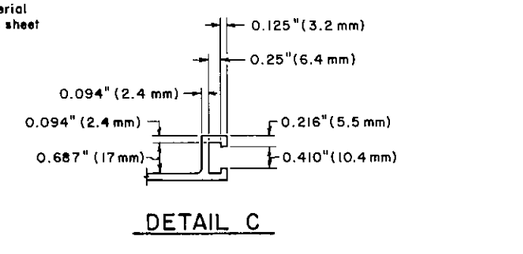


SECTION B-B

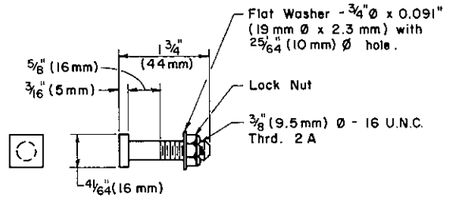


EXTRUDED ALUMINUM CHANNEL

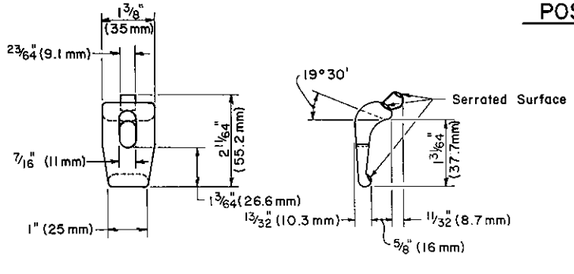
Dimensions for panels may vary depending upon manufacturing company's design.



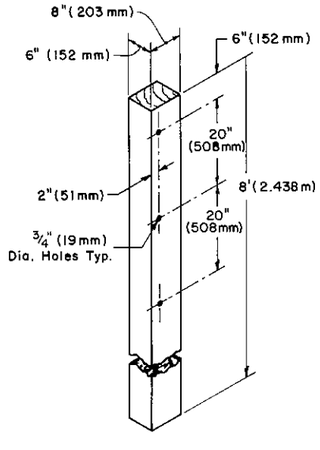
DETAIL C



POST CLIP BOLT



POST CLIP



WOOD POST FOR ALUMINUM PANEL

NOTES

1. Only Class I or Class II reflective sheeting material supplied by an approved supplier as listed in Bulletin No. 15 will be permitted.
2. Wood posts may be mechanically driven. In areas where posts cannot be driven mechanically, the use of concrete footings shall be required.
3. See RC-52, sheet 2 of 5 for mounting of either wood or steel posts on concrete pavement.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

PERMANENT BARRICADES

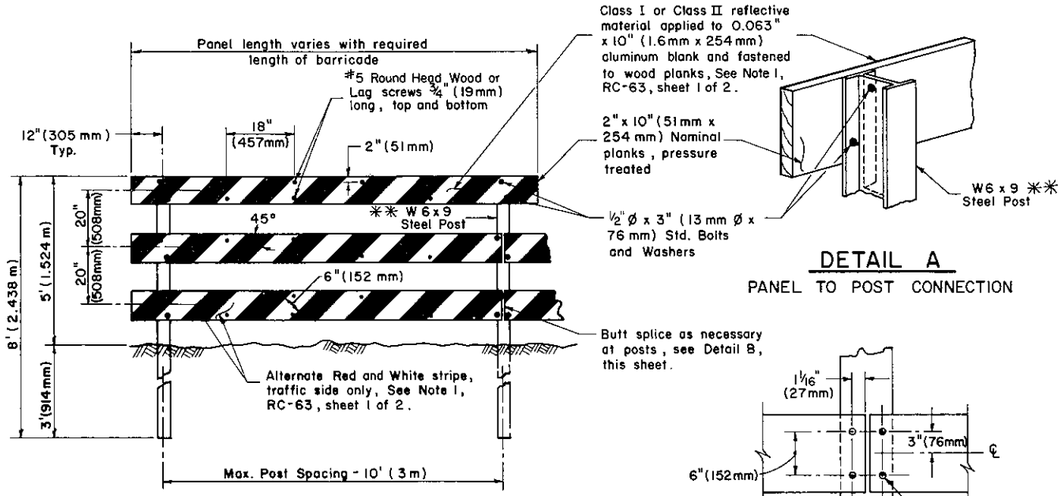
ALUMINUM PANEL

Recommended Sept 1, 1978
B.D. Gouble
Director, Bureau of Design

Approved Sept 1, 1978
James M. DeFrehn
Deputy Chief Hwy. Engr.

Sht. 1 Of 2

RC-63



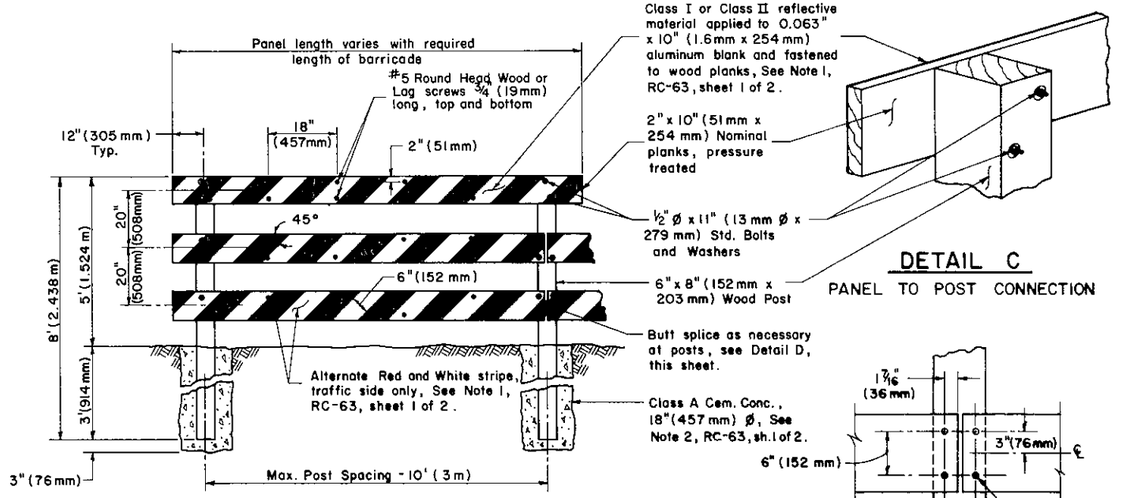
WOOD PANEL - STEEL POSTS

** A W6 x 8.5 steel shape may also be used.

DETAIL B

DETAIL A

PANEL TO POST CONNECTION

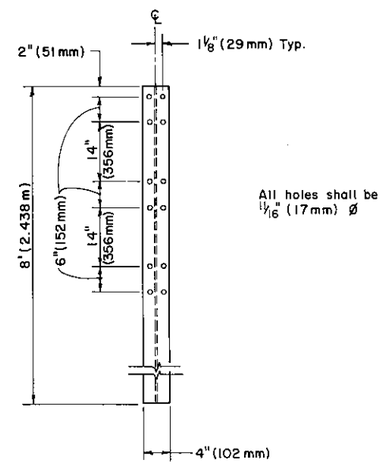


WOOD PANEL - WOOD POSTS

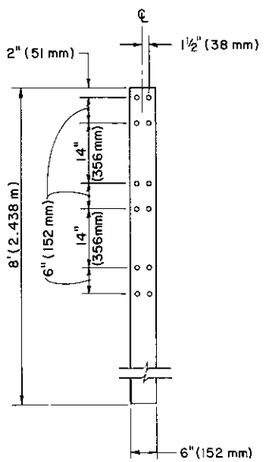
DETAIL D

DETAIL C

PANEL TO POST CONNECTION



STEEL POST FOR WOOD PANEL



WOOD POST FOR WOOD PANEL

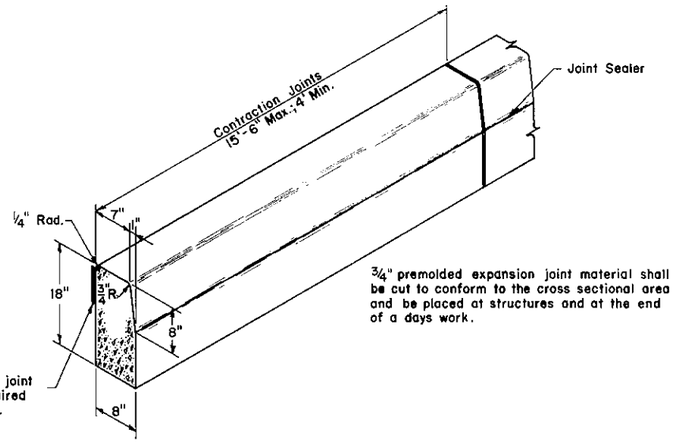
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

PERMANENT BARRICADES

WOOD PANEL

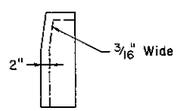
Recommended Sept 1, 1978	Approved Sept. 1, 1978	Sht. 2 Of 2
S.O. Rountree, Director, Bureau of Design	James M. DeAndrea, Deputy Chief Hwy. Engr.	RC-63

TRACED BY
FINAL BY

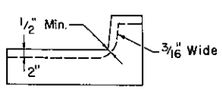


3/4" premolded expansion joint material shall be cut to conform to the cross sectional area and be placed at structures and at the end of a days work.

PLAIN CEMENT CONCRETE CURB

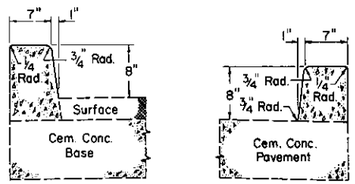


PLAIN CEMENT CONCRETE CURB



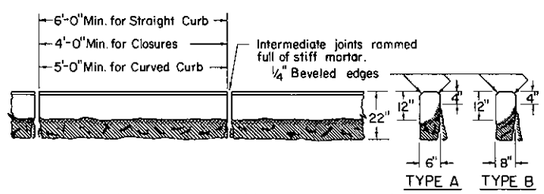
PLAIN CEMENT CONCRETE CURB GUTTERS

SAWED JOINT DETAILS



Curb face may be constructed vertical as permitted for PLAIN CEMENT CONCRETE CURB

INTEGRAL CEMENT CONCRETE CURB

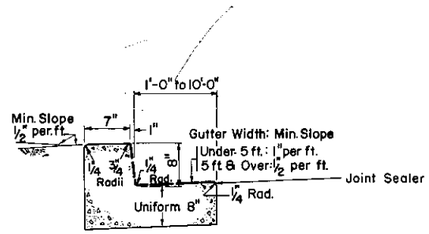


The top, the face for a depth of 12 inches and the back for a depth of 4 inches, as indicated, shall be peen-hammer dressed.

The bottom of curb may have a tolerance of 1 inch less or 2 inches more than the specified width.

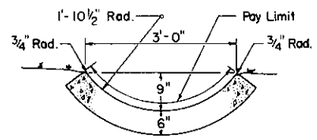
Joints shall not exceed 1/4-inch in width for a distance of 12 inches below the top of curb and 1/2-inch in width for the remainder of the joint.

STONE CURB - TYPES A & B

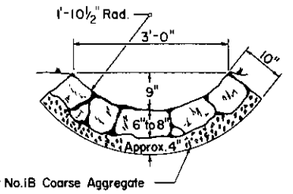


The width of gutter used in computing the pay area is indicated by — — — — —
The gutters shall be reinforced when indicated on the drawings or specified.

PLAIN CEMENT CONCRETE CURB GUTTER



PLAIN CEMENT CONCRETE GUTTER



PLAIN OR MORTARED RUBBLE GUTTER

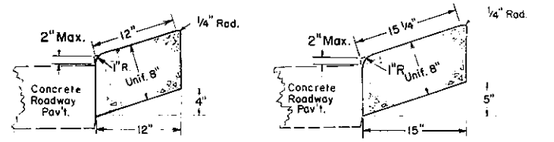
NOTES

1. All items shall conform to the requirements of Form 408.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

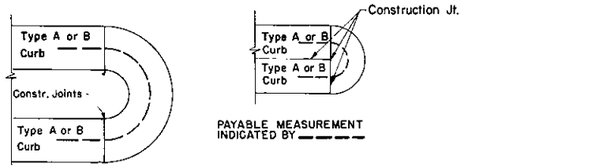
CURBS AND GUTTERS

Recommended Sept. 1, 1978	Approved Sept 1, 1978	Sht. 1 Of 1
B. D. Coughlin	James M. Shrubin	RC-64
Director, Bureau of Design	Deputy Chief Hwy. Engr.	

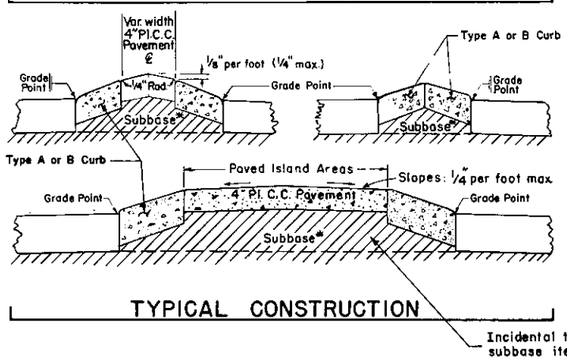


TYPE A | TYPE B

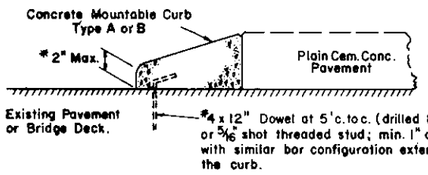
CONCRETE MOUNTABLE CURBS



END DETAILS

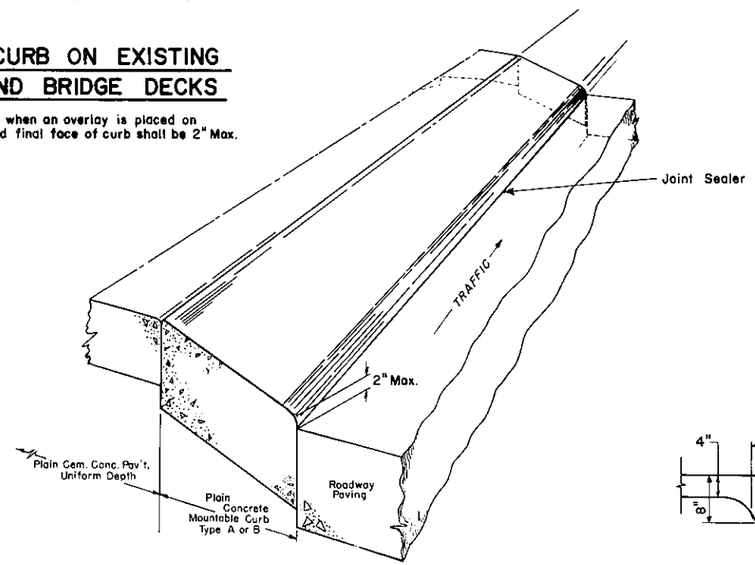


TYPICAL CONSTRUCTION



CONCRETE MOUNTABLE CURB ON EXISTING CONCRETE PAVEMENT AND BRIDGE DECKS

*Plans may provide for a deeper face at curb when an overlay is placed on the existing pavement, however this exposed final face of curb shall be 2" Max.

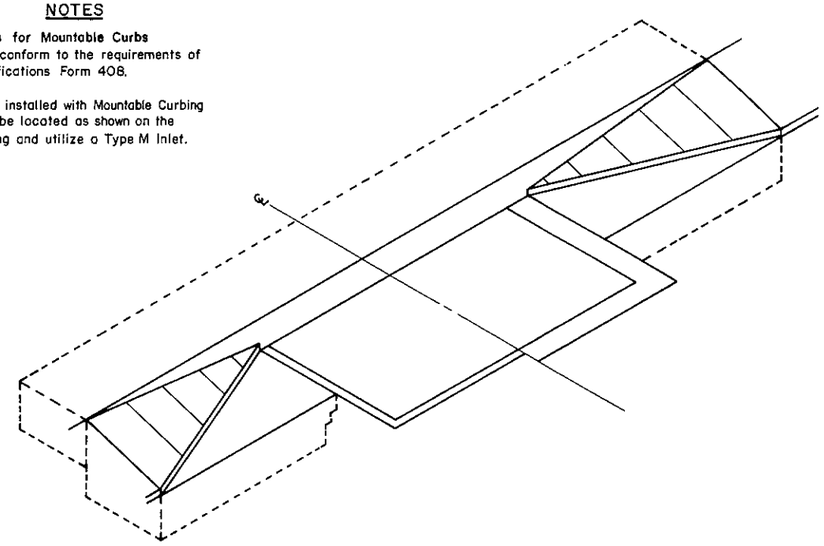


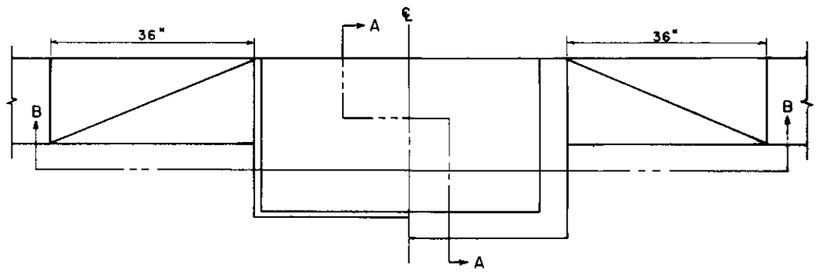
TYPICAL DIVISOR AREA

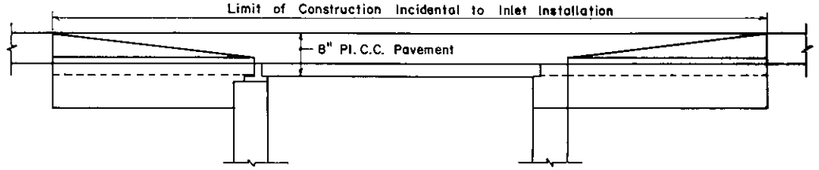
NOTES

(1) Joints for Mountable Curbs shall conform to the requirements of specifications Form 408.

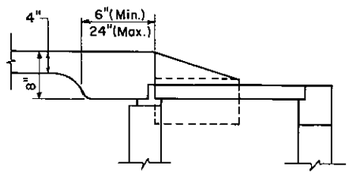
(2) Inlets installed with Mountable Curbing shall be located as shown on the drawing and utilize a Type M Inlet.







SECTION B-B



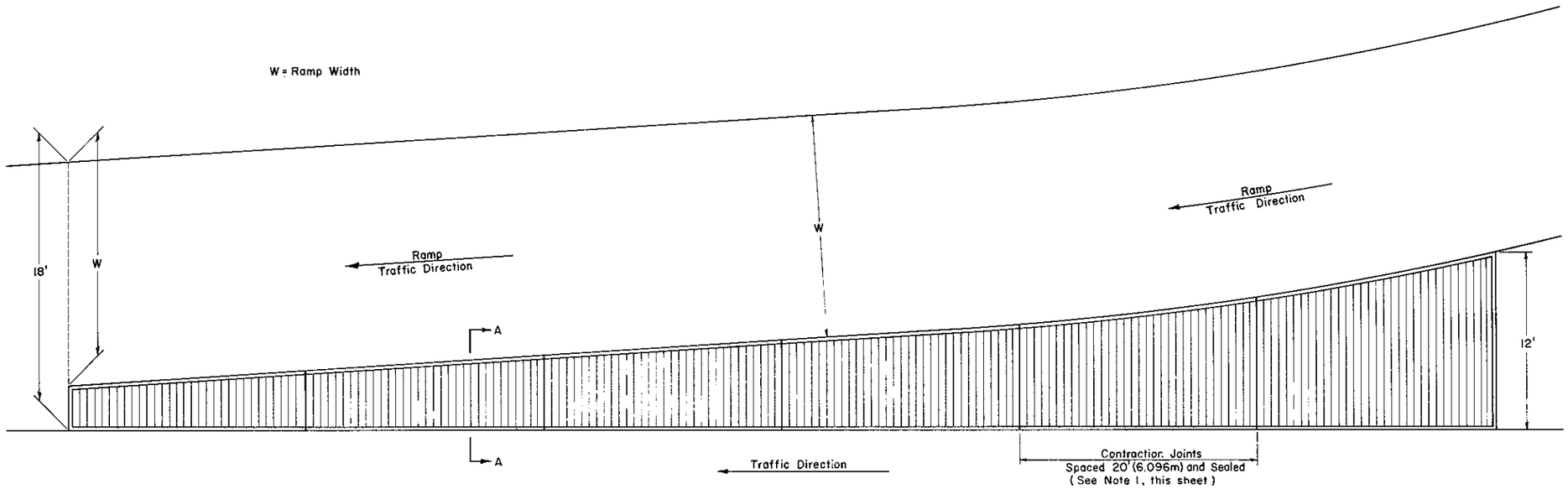
SECTION A-A

TREATMENT FOR CONCRETE MOUNTABLE CURBS AT INLETS

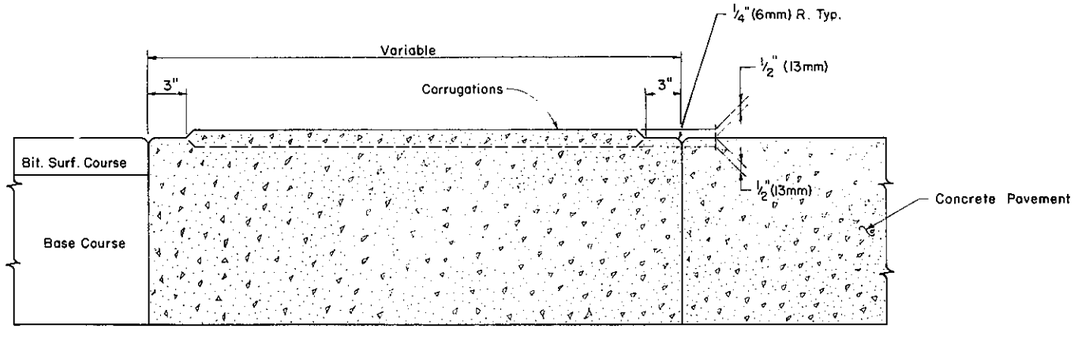
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

CONCRETE MOUNTABLE CURBS

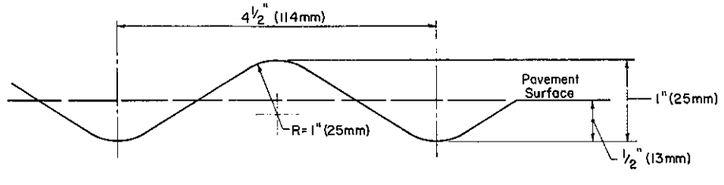
Recommended Sept 1, 1978	Approved Sept 1, 1978	Sht. 1 Of 1
B.D. Lumbis	James M. Sebastian	RC-65
Director, Bureau of Design	Deputy Chief Hwy. Engr.	



TRAFFIC SEPARATOR IN RAMP GORE AREA



SECTION A-A



CORRUGATION DETAIL

(Not to Scale)

NOTES

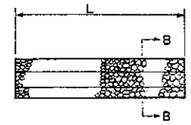
1. Contraction joints shall be spaced at approximately 20'(6.096m) intervals and shall be placed in line with adjacent pavement joints. They may be either hand-formed or sawed joints, but shall be 3/8"(10mm) wide and the depth equal to 1/4th. of the pavement depth.
2. The contraction joints and corrugations may be constructed at a skew to match the pavement joints.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

CONCRETE TRAFFIC SEPARATOR

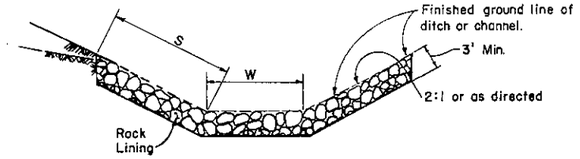
Recommended May 31, 1979	Approved May 31, 1979	Sht. 1 Of 1
B.D. Paulsis		
Director, Bureau of Design	Chief Hwy. Engineer	RC-66

TRACED BY
FINAL BY



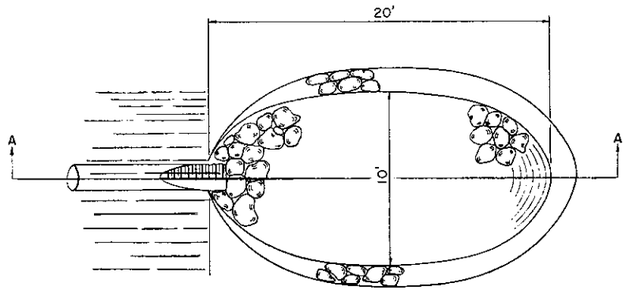
PLAN

S, L & W as shown on the drawings or as directed by the engineer.

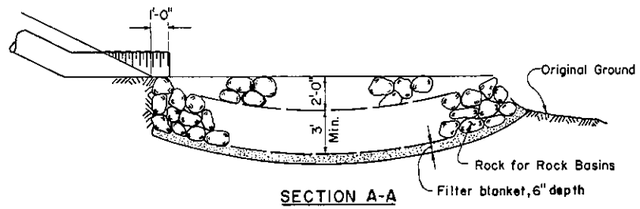


SECTION B-B

ROCK LINING



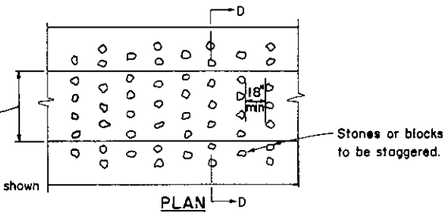
PLAN

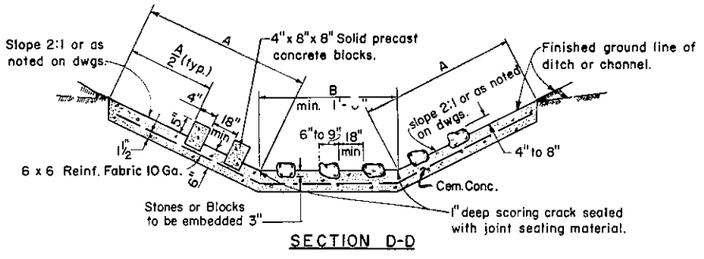


SECTION A-A

ROCK BASIN

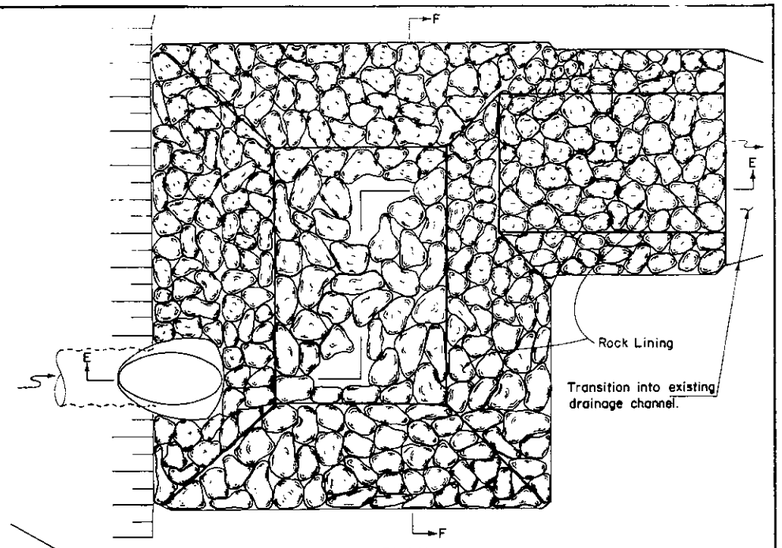
When bottom of ditch width is less than 36", a single staggered row of stones or blocks shall be used on the bottom of the ditch.



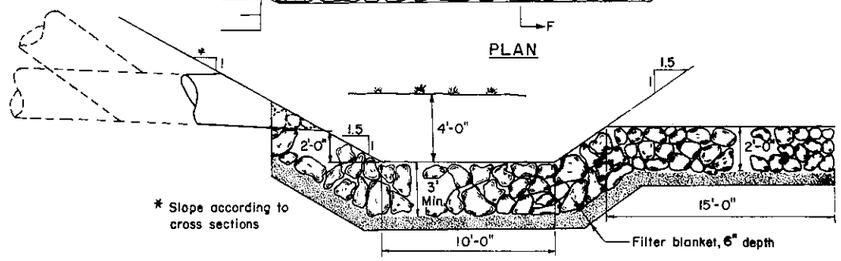


SECTION D-D

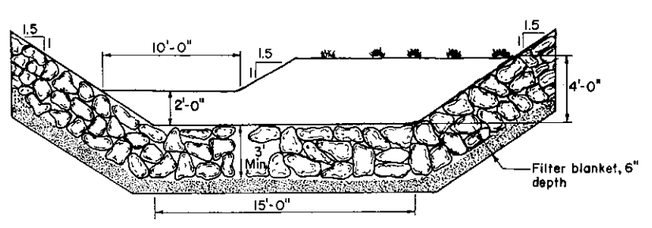
PAVED ENERGY DISSIPATOR



PLAN



SECTION E-E



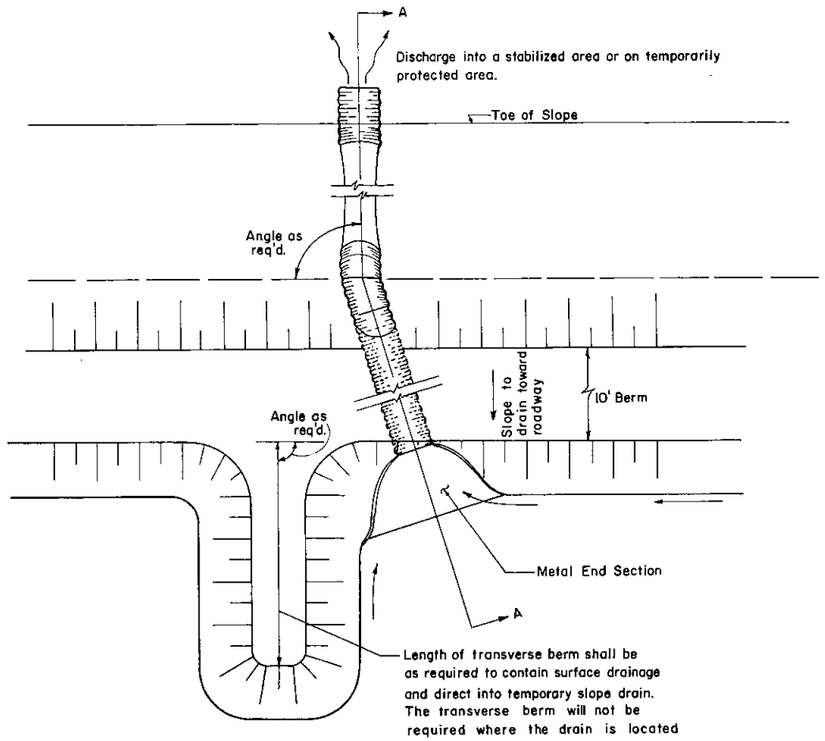
SECTION F-F

ROCK ENERGY DISSIPATOR

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

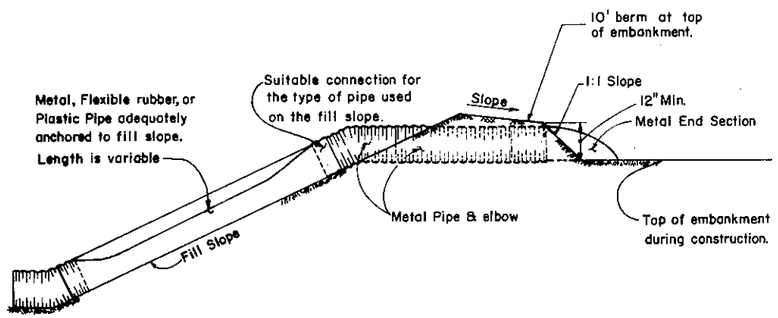
EROSION & SEDIMENT CONTROL

Recommended Sept. 1, 1978	Approved Sept. 1, 1978	Sht. 1 Of 4
L.D. Lowski	James M. Sabatini	RC-70
Director, Bureau of Design	Deputy Chief Hwy. Engr.	



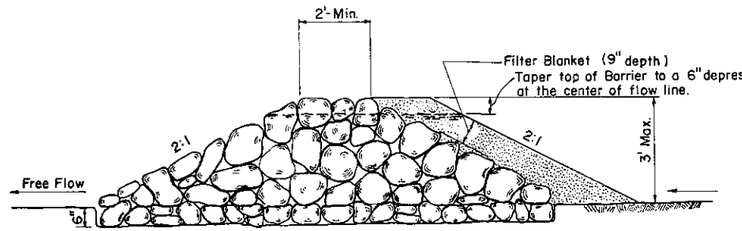
PLAN

SUGGESTED MIN. SIZES		
Drainage Area (acres)	Smooth Pipe Size	Corrugated Pipe Size
0 - 3	8"	12"
3 - 6	10"	15"
6 - 10	12"	18"

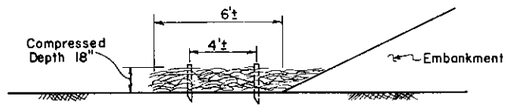


SECTION A-A

TEMPORARY SLOPE PIPE DRAIN

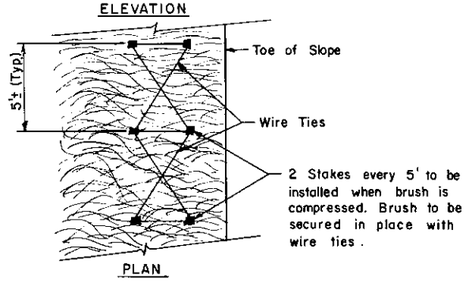


ROCK BARRIER



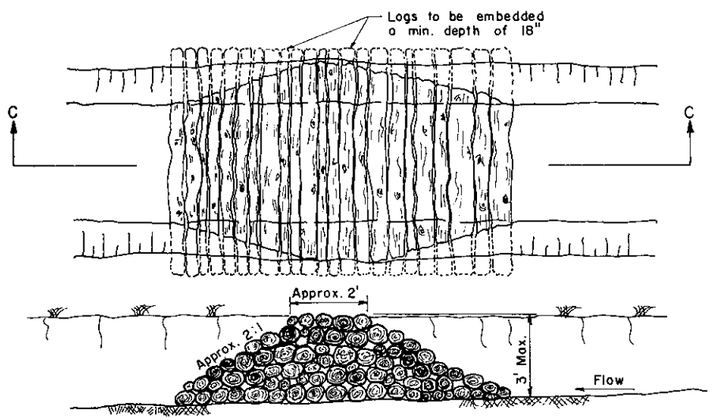
2" Maximum diameter brush from clearing operation to be placed at start of embankment fill or in drainage swale areas and compressed in place.

ELEVATION



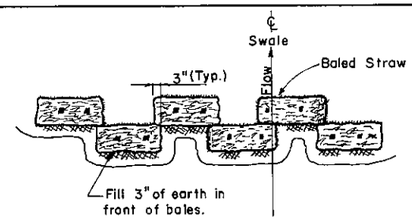
PLAN

BRUSH BARRIER

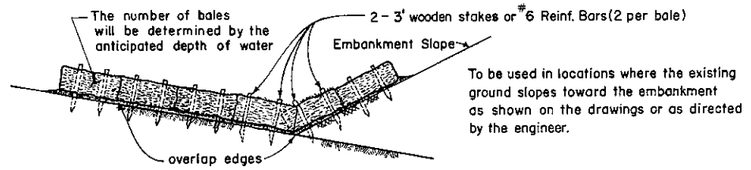


SECTION C-C

LOG BARRIER

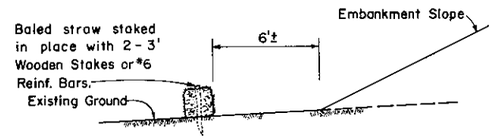


PLAN

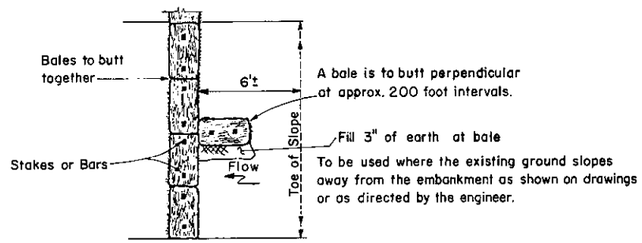


ELEVATION

DITCH CONDITION



ELEVATION



PLAN

TOE OF SLOPE CONDITION

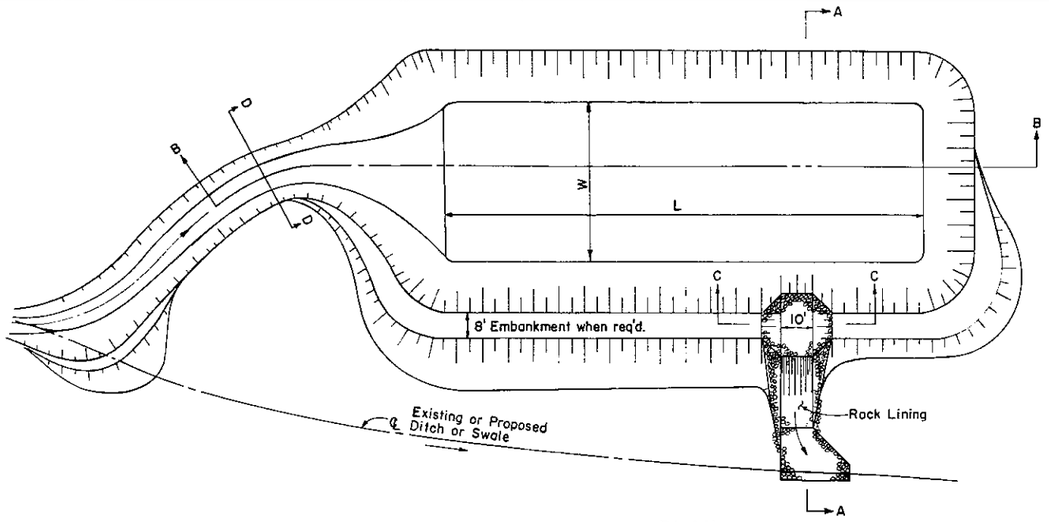
BALED STRAW BARRIER

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

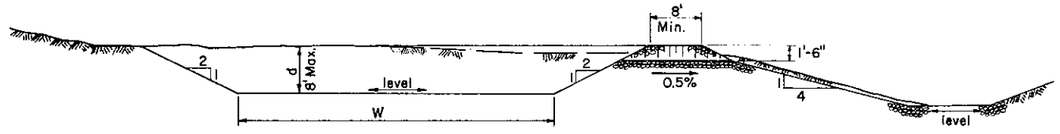
EROSION & SEDIMENT CONTROL

Recommended Sept. 1, 1978	Approved Sept. 1, 1978	Sht. 2 Of 4
B.D. Lewis	J. M. Sebastian	RC-70
Director, Bureau of Design	Deputy Chief Hwy. Engr.	

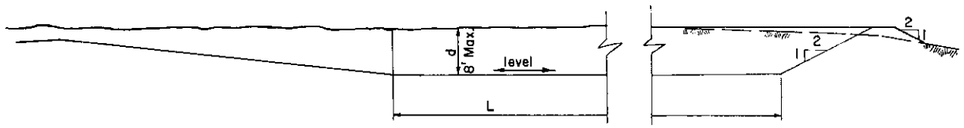
TRACED BY
FINAL BY



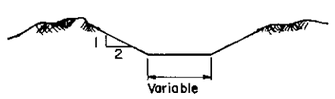
PLAN



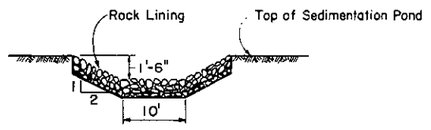
SECTION A-A



SECTION B-B

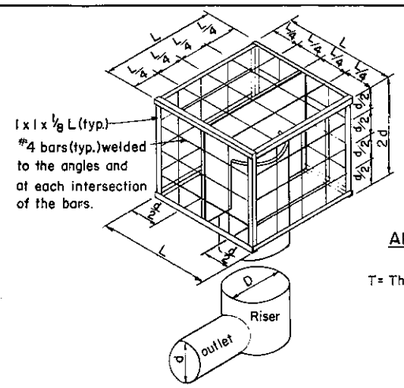


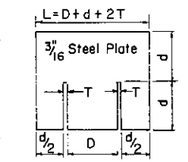
SECTION D-D



SECTION C-C

SEDIMENTATION POND - TYPE 2

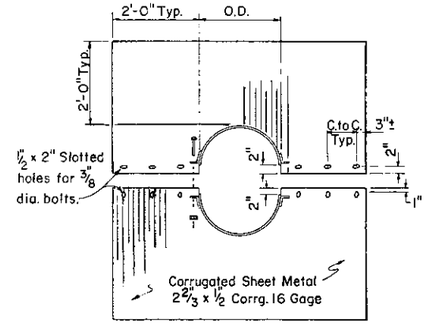




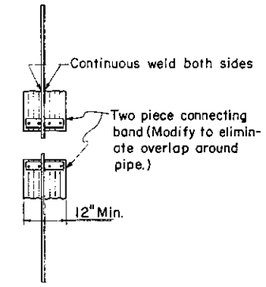
ANTI-VORTEX DEVICE

T= Thickness of riser pipe.

TRASH RACK AND ANTI-VORTEX DEVICE



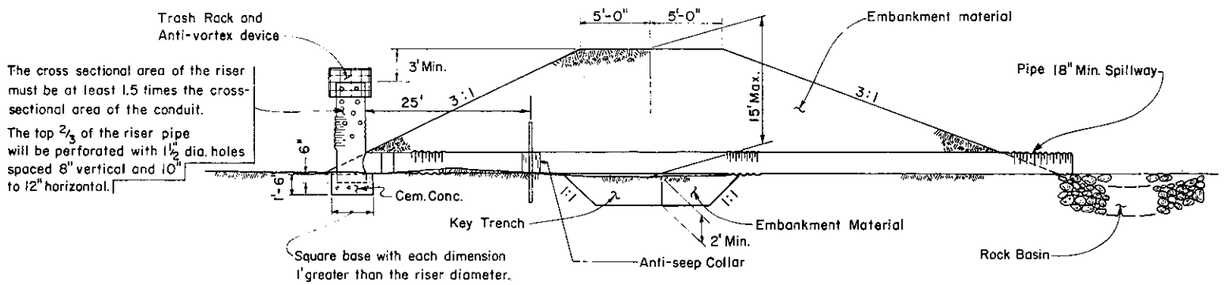
ELEVATION



END VIEW

The lap between the two half sections shall be caulked with bituminous mastic at the time of installation Unassembled collars shall be marked by painting or tagging to identify matching pairs.

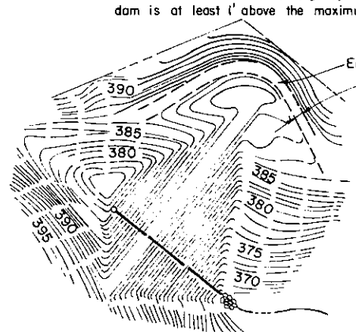
DETAIL OF ANTI-SEEP COLLAR



SEDIMENTATION POND - TYPE 1

NOTES:

- An emergency spillway with a min. bottom width of 8' must be provided for every Sedimentation Pond - Type 1.
- The emergency spillway must be placed in undisturbed ground and cannot be placed in embankment areas. The emergency spillway can go over the embankment if Rock Lining is used.
- The elevation of the emergency spillway must be such that the dam is at least 1' above the maximum design flow of the spillway.



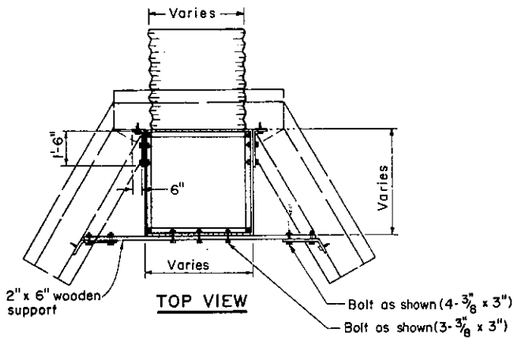
PLAN VIEW OF AN EMERGENCY SPILLWAY CUT INTO EXISTING GROUND

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

EROSION & SEDIMENT CONTROL

Recommended Sept 1, 1978	Approved Sept 1, 1978	Sht. 3 Of 4
B.D. Kowalski, Director, Bureau of Design	J. M. Sebastian, Deputy Chief Hwy. Engr.	RC-70

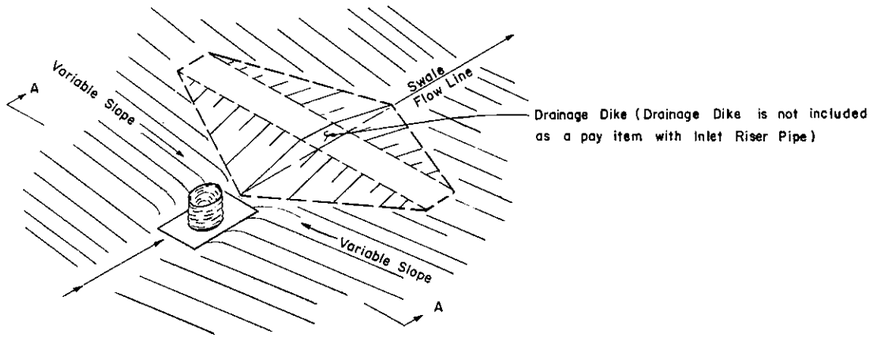
TRACED BY
FINAL BY



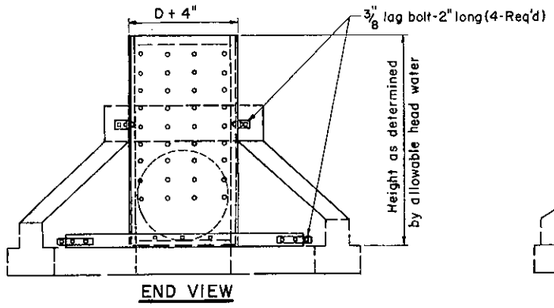
Notes:

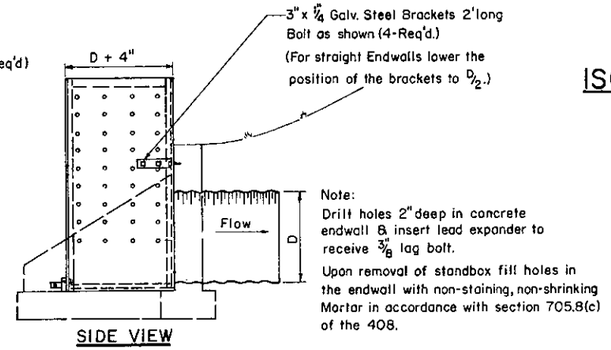
Upon establishment of suitable soil stabilization and at the direction of the engineer, the Endwall Standboxes shall be removed and shall become the property of the Contractor.

The Basin and/or area upstream from the Standbox shall be cleaned periodically and the sediment and debris disposed of in an area approved by the engineer.



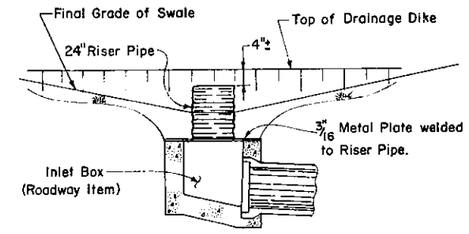
ISOMETRIC VIEW OF INLET RISER PIPE & DRAINAGE DIKE





Note:
Drill holes 2" deep in concrete endwall & insert lead expander to receive 3/8" lag bolt.
Upon removal of standbox fill holes in the endwall with non-staining, non-shrinking Mortar in accordance with section 705.8(c) of the 408.

ENDWALL STANDBOX

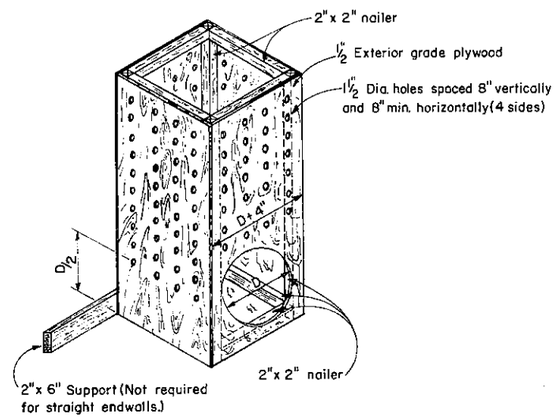


SECTION A-A

INLET RISER PIPE

Upon establishment of suitable soil stabilization and at the direction of the engineer, the Inlet Riser Pipe shall be removed and the frame and grate installed.

Upon removal the Inlet Riser Pipe shall become the property of the contractor and may be used at other locations as required.



ISOMETRIC OF PLYWOOD STANDBOX

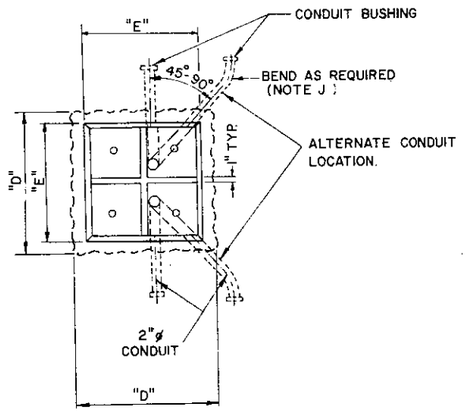
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

EROSION & SEDIMENT CONTROL

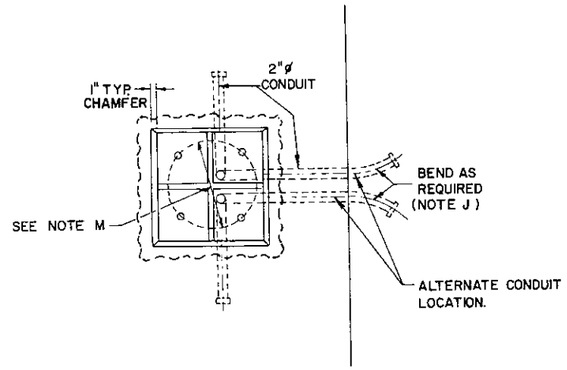
Recommended Sept 1, 1978	Approved Sept 1, 1978	Sht. 4 Of 4
B.D. Rowbie	J. M. Sebastian	RC-70
Director, Bureau of Design	Deputy Chief Hwy Engr.	

TRACED BY
FINAL BY

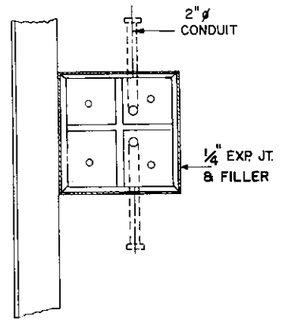
FORM 4237 REV 3-61



PLAN



PLAN



PLAN

NOTES:

A- 4 ANCHOR BOLTS REQUIRED.

B- TOP OF FORMS SHALL BE LEVEL IN BOTH DIRECTIONS.

C- ALL ANCHOR BOLT NUTS, STEEL FLAT OR SPRING LOCK WASHERS AND TOP 8" OF ANCHOR BOLTS SHALL BE GALVANIZED.

D- GROUND ROD 1/2"ø X 5' MIN., COPPER CLAD STEEL. MAX. RESISTANCE TO EARTH GROUND SHALL BE 25 OHMS.

E- SEE RC-83 FOR POLE DETAILS.

F- FOR LIGHTING POLE ANCHORAGES ON BRIDGES, SEE BRIDGE CONSTRUCTION STANDARD DRAWINGS.

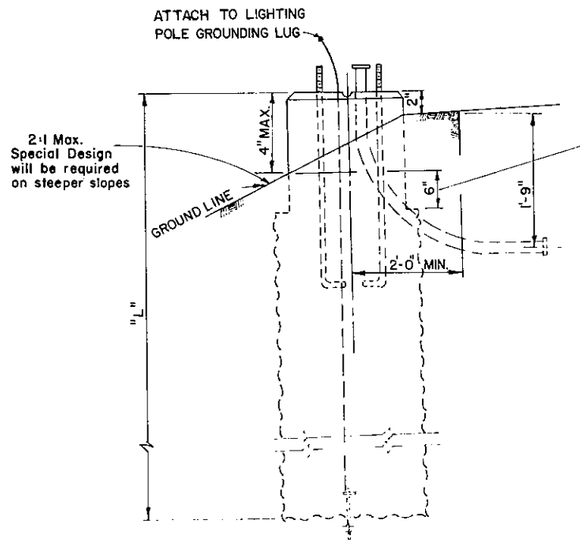
G- LEAVE 30 INCHES OF #4 GROUND WIRE COILED ABOVE FOUNDATION. (WIRE EXTENDS THROUGH CENTER OF FOUNDATION.)

H- TYPE FC FOUNDATIONS ARE DESIGNED FOR 30 FT. MAXIMUM ARM LENGTH, (SEE TABLE)

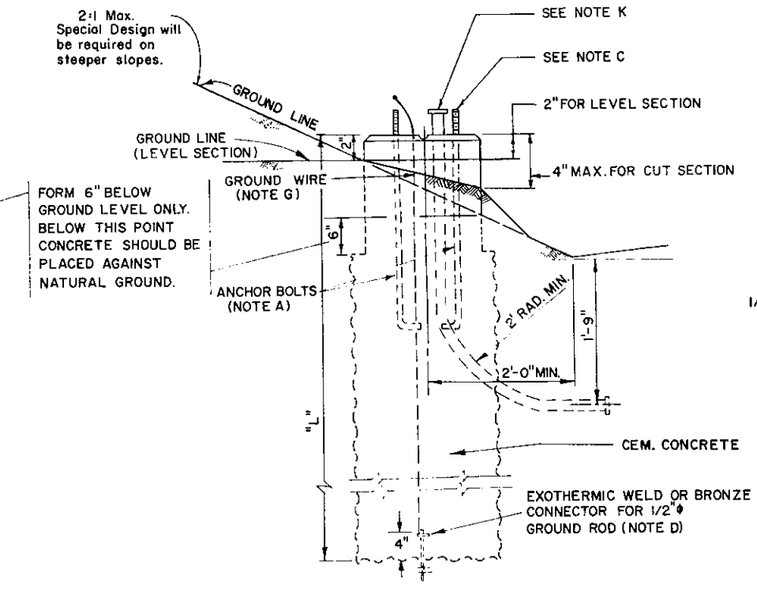
J- MINIMUM BEND RADIUS TO BE SIX TIMES CONDUIT DIAMETER, UNLESS OTHERWISE SPECIFIED.

K- TOP OF CONDUIT BUSHING NOT TO BE HIGHER THAN 2" (51mm) FROM THE TOP OF THE FOUNDATION.

M- TEMPLATE FOR SETTING ANCHOR BOLTS FOR TYPE "A" OR TYPE "S" LIGHTING POLES IS FURNISHED BY THE LIGHTING POLE MANUFACTURER.

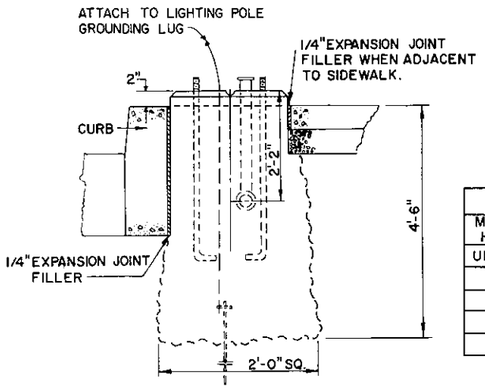


FOR FILL SECTION



FOR CUT OR LEVEL SECTION

TYPE - FC
(NOTE H)



FOR STREET LIGHTING

TYPE - P

30 FEET MAXIMUM MOUNTING HEIGHT.
15 FEET MAXIMUM ARM LENGTH.

FOUNDATION DIMENSIONS				
MOUNTING HEIGHT	"D" x "D"	"E" x "E"	AUGER DIAM.	"L"
UP TO 30'	2'-0" x 2'-0"	1'-8" x 1'-8"	2'-4"	6'-0"
35'	2'-6" x 2'-6"	2'-2" x 2'-2"	2'-10"	6'-0"
40'	2'-6" x 2'-6"	2'-2" x 2'-2"	2'-10"	6'-6"
45'	2'-6" x 2'-6"	2'-2" x 2'-2"	2'-10"	7'-0"
50'	2'-6" x 2'-6"	2'-2" x 2'-2"	2'-10"	7'-6"

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

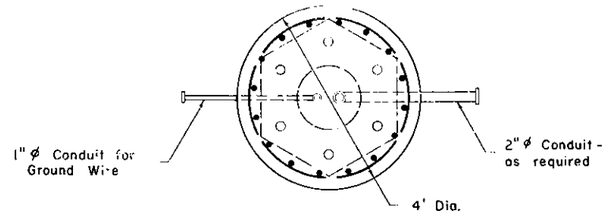
HIGHWAY LIGHTING FOUNDATIONS
CONVENTIONAL LIGHTING POLE

Recommended July 16, 1980
B.D. Lowdie
Director, Bureau of Design

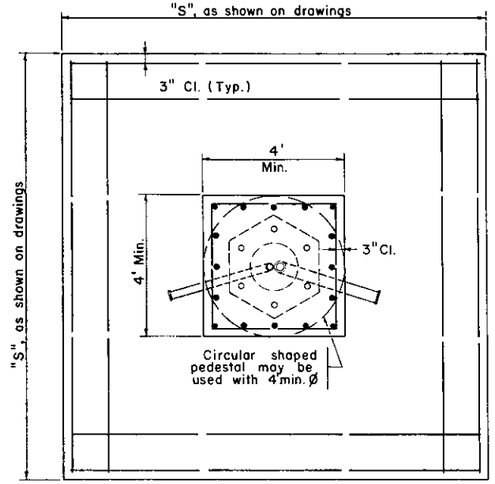
Approved July 16, 1980
David C. Wood
Deputy Sec. for Highway Admin.

Sht. 1 Of 2

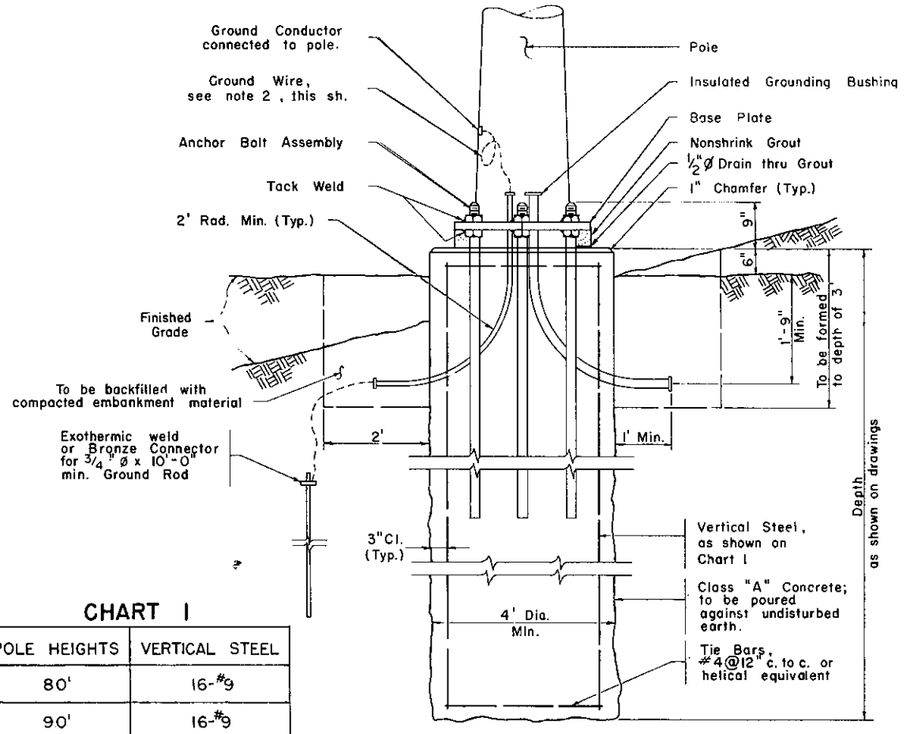
RC-80



PLAN



PLAN

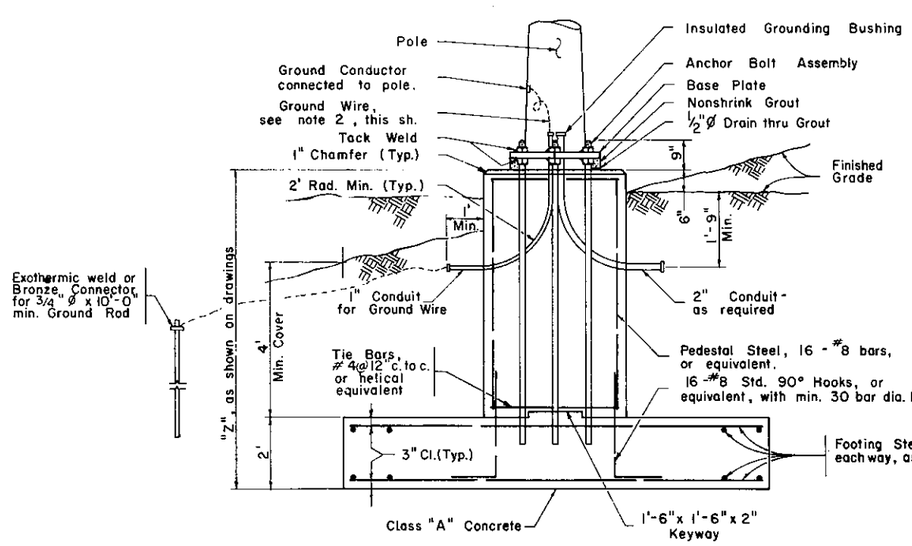


ELEVATION

CHART I

POLE HEIGHTS	VERTICAL STEEL
80'	16-#9
90'	16-#9
100'	16-#9
110'	16-#9
120'	16-#11

DRILLED CAISSON FOUNDATION



ELEVATION

SPREAD FOOTING FOUNDATION

NOTES

1. The materials and workmanship shall be in accordance with Forms 408 & 409.
2. A 30" length of #4 ground wire shall be left coiled above foundation. The wire extends through the 1" conduit in the center of the foundation.
3. The size of pedestal or drilled caisson shown is adequate to accomodate the preassembled anchor bolt assembly, supplied by the manufacturer, for bolt circle diameters up to and including 34". For bolt circle diameters greater than 34", the pedestal or drilled caisson will have to be modified accordingly.
4. For reinforcement bar fabrication details see Bridge Construction Standard Drawings.

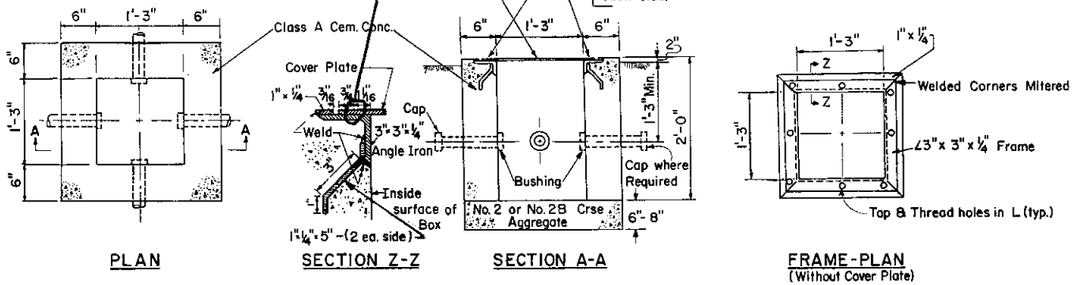
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

HIGHWAY LIGHTING FOUNDATIONS
HIGH MAST LIGHTING POLE

Recommended July 14, 1980
B.D. Kaufman
Director, Bureau of Design

Approved July 14, 1980
David Gilmore
Deputy Sec. for Highway Admin.

Sht. 2 Of 2
RC-80



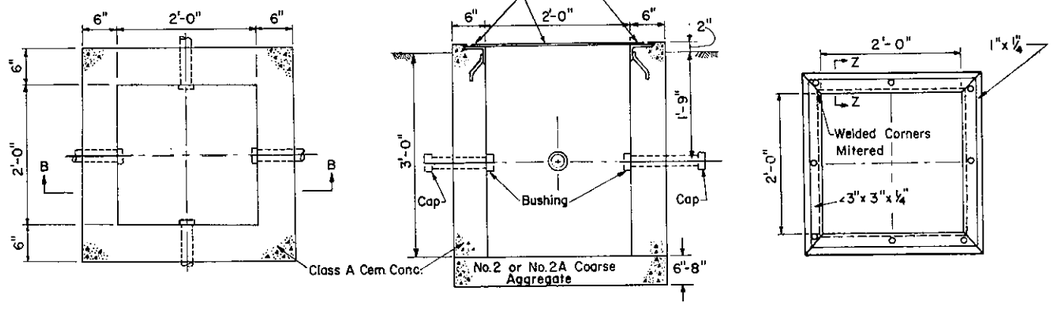
PLAN

SECTION Z-Z

SECTION A-A

FRAME-PLAN
(Without Cover Plate)

TYPE JB-1
1'-3" x 1'-3"



PLAN

SECTION B-B

FRAME-PLAN
(Without Cover Plate)

TYPE JB-2
2'-0" x 2'-0"

Notes:

JB-1 and JB-2 Shall be used in locations where they will be subject to loads no heavier than pedestrian traffic.

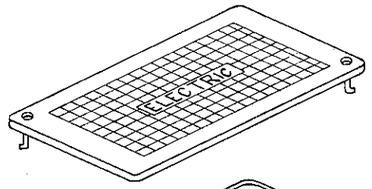
For other locations use JB-11 or JB-12 shown on RC-82.

Equivalent approved precast concrete junction boxes may be substituted for JB-1 and JB-2 shown.

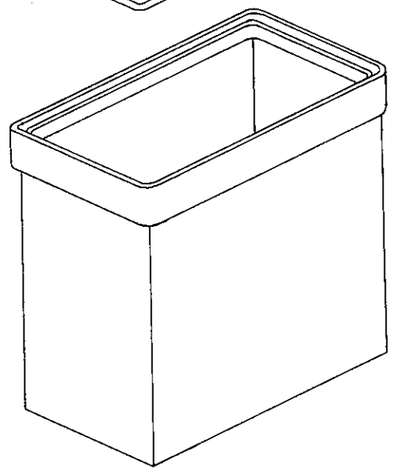
After installation, all exposed steel shall be painted with one coat of red lead and one coat approved bituminous paint.

Bulletin No. 26

REINFORCED PLASTIC MORTAR



COVER
(Checkered lid)



BOX
(Open bottom)

TYPE JB-1	12" x 22" x 24" (305mm x 559mm x 610mm)
TYPE JB-2	23" x 34" x 24" (584mm x 838mm x 610mm)

See concrete Type details, this sheet, for required drainage aggregate.

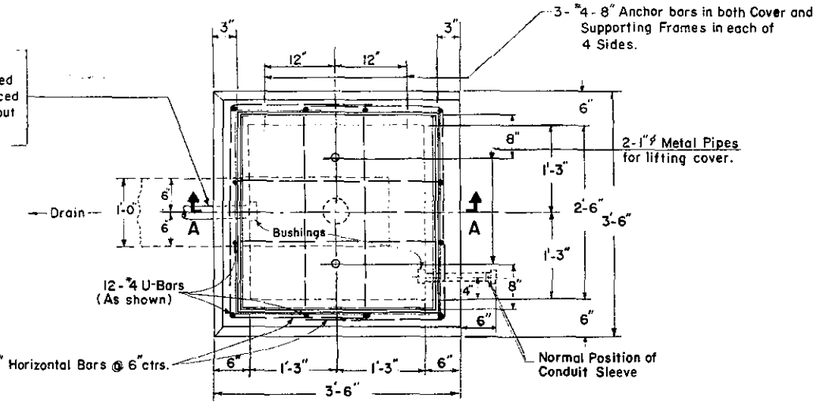
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

HIGHWAY LIGHTING

JUNCTION BOXES - LIGHT DUTY

Recommended July 16, 1980 R.D. Gamble Director, Bureau of Design	Approved July 16, 1980 David Edmond Deputy Sec. for Highway Admin.	Sht. 1 Of 1 RC-81

NOTE:
Normal Position of Conduit:
When two or more are indicated on same side they will be spaced 6" on centers symmetrical about ℄ of Box.

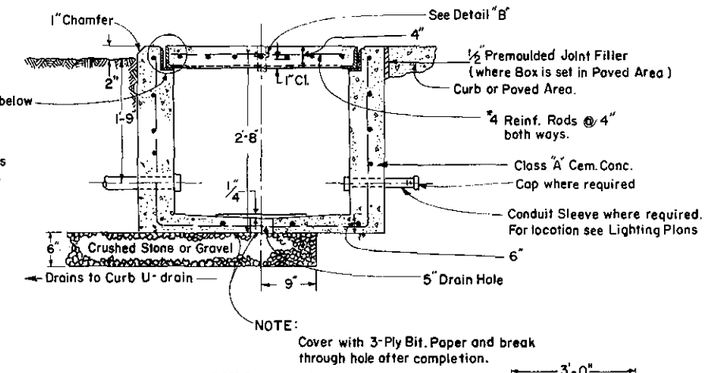


PLAN

NOTE:
Where Junction Box is in Sidewalk Area, top to conform with Sidewalk Slope. At all other locations top to be level.

NOTE:
For location, size, and Number of Conduits for each Junction Box see Lighting Plans.

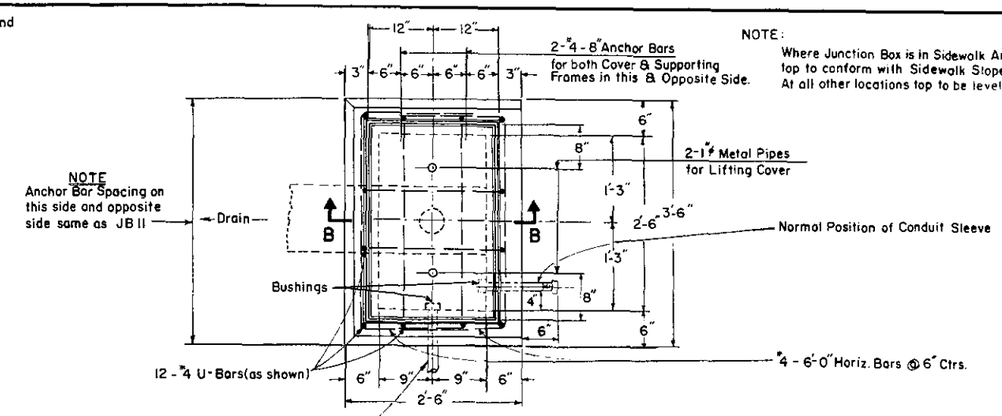
NOTE:
Provide two (2) Cu. Ft. of No. 2B Aggregate for Drain when no Under-drain is available.



SECTION A-A
JUNCTION BOX JB-11
2'-6" x 2'-6"

NOTE:
Where Junction Box is in Sidewalk Area, top to conform with Sidewalk Slope. At all other locations top to be level

NOTE
Anchor Bar Spacing on this side and opposite side same as JB 11

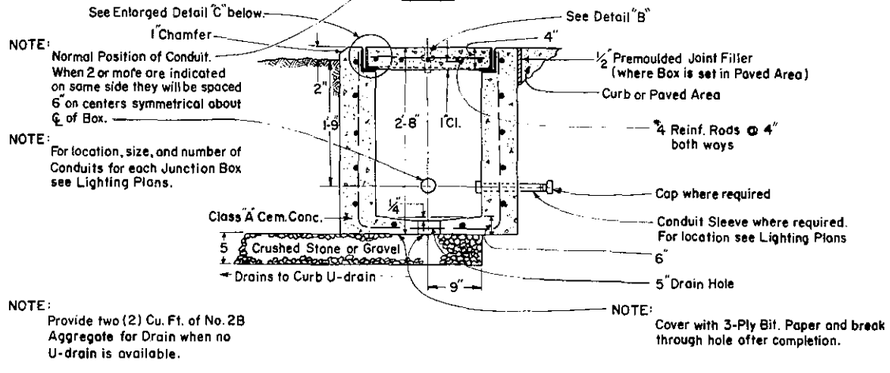


PLAN

NOTE:
Normal Position of Conduit.
When 2 or more are indicated on same side they will be spaced 6" on centers symmetrical about ℄ of Box.

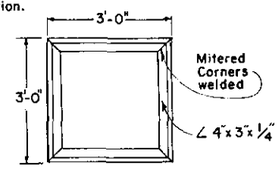
NOTE:
For location, size, and number of Conduits for each Junction Box see Lighting Plans.

NOTE:
Provide two (2) Cu. Ft. of No. 2B Aggregate for Drain when no U-drain is available.

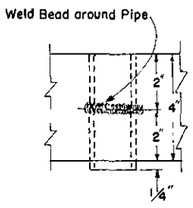


SECTION B-B
JUNCTION BOX JB-12
1'-6" x 2'-6"

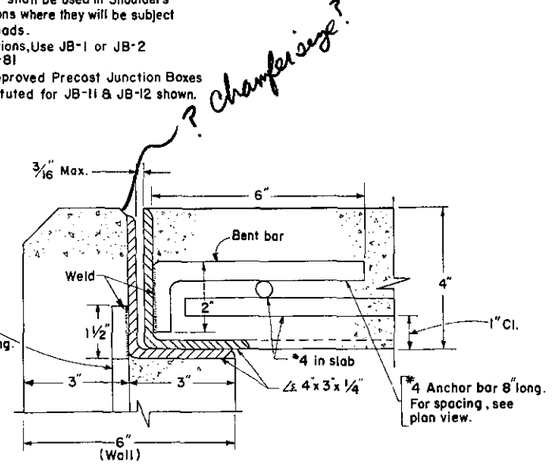
NOTES:
1. JB-11 & JB-12 shall be used in Shoulders or other locations where they will be subject to Vehicular Loads.
2. For other locations, Use JB-1 or JB-2 shown on RC-81
3. Equivalent Approved Precast Junction Boxes may be substituted for JB-11 & JB-12 shown.



∠-FRAME PLAN
(Steel or Aluminum) No Scale



DETAIL "B"



ENLARGED DETAIL "C"
COVER FRAME & SUPPORTING FRAME

- Structural Steel shall conform to ASTM A36 designation.
- Structural Aluminum shall conform to ASTM-B221 Alloy 6061-T6 designation.
- All concrete to be Class "A" Cement Concrete, or better, and shall meet the requirements of Form 408 Specifications, Section 704.1(g).
- After installation, all exposed steel shall be painted with one coat of approved primer and one coat of approved bituminous paint.

Bulletin No. 26

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

HIGHWAY LIGHTING

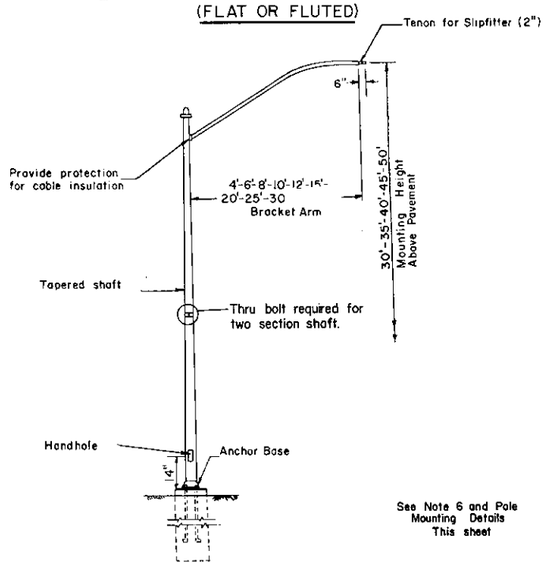
JUNCTION BOXES HEAVY DUTY

Recommended July 16, 1980	Approved July 16, 1980	Sht. 1 Of 1
B. D. Loudis, Director, Bureau of Design	David Adams, Deputy Sec. for Highway Admin.	RC-82

FORM 4037 REV 3-81

ROUND ALUMINUM and STEEL POLES AND OCTAGONAL STEEL POLES

(FLAT OR FLUTED)



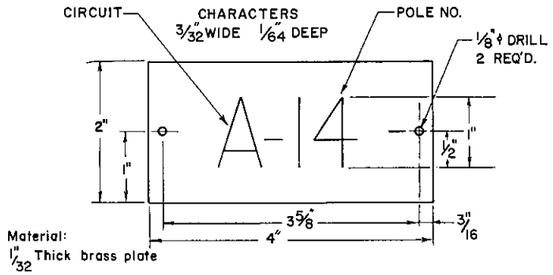
TYPE A

TYPE S

GENERAL NOTES

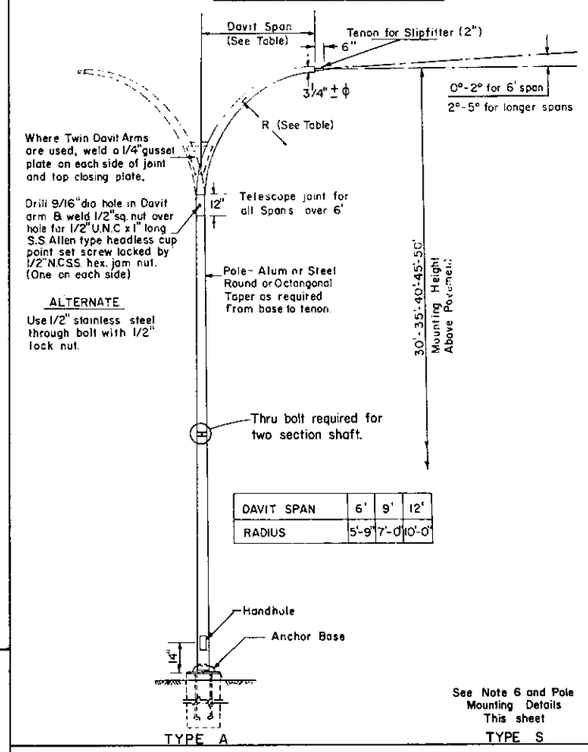
1. See RC-80 for details on pole foundations.
2. Manufactures certification of compliance with load tests outlined in Form 408 is required for all poles.
3. Where steel or aluminum bases are in contact with concrete, a caulking compound shall be used which will be an approved aluminum impregnated gray mastic type, meeting the test requirements of the Federal Specification TT-C598(2).
4. Identification plates shall be provided for all poles.
5. Approved Materials for Poles:

   Aluminum and Steel as per Form 408.
6. Type "S" Pole shall be certified by the Federal Highway Administration to meet latest AASHTO requirments for breakaway supports. Breakaway bases include slip base, breakaway couplings, frangible bases, rivited sleeve, anchor clips, etc.



IDENTIFICATION TAG DETAIL

DAVIT-TYPE POLES



DAVIT SPAN	6'	9'	12'
RADIUS	5'-9"	7'-0"	10'-0"

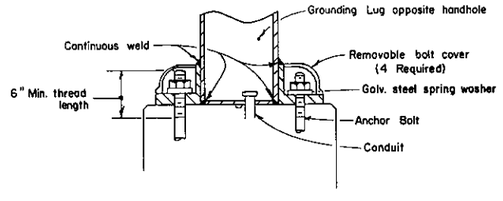
ALTERNATE

Use 1/2" stainless steel through bolt with 1/2" lock nut.

TYPE A

TYPE S

POLE MOUNTING DETAILS



TYPE A, LIGHTING POLE

Mounting of type S, Lighting Poles, shall be in accordance with manufacturer's recommendations. Washers, flat or spring type, when required are to be placed as recommended and threaded parts torqued as specified.

TYPE S, LIGHTING POLE
(See Note 6)

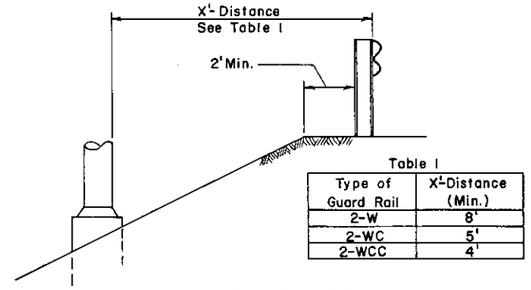


Table 1

Type of Guard Rail	X'-Distance (Min.)
2-W	8'
2-WC	5'
2-WCC	4'

WEAK POST GUARD RAIL

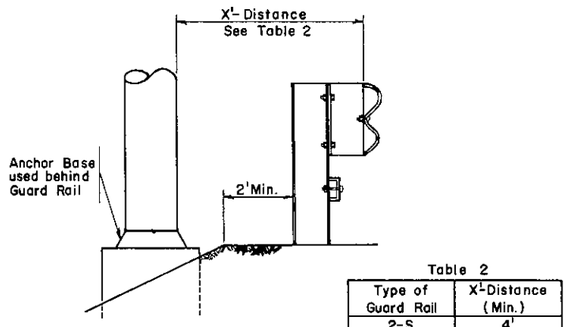


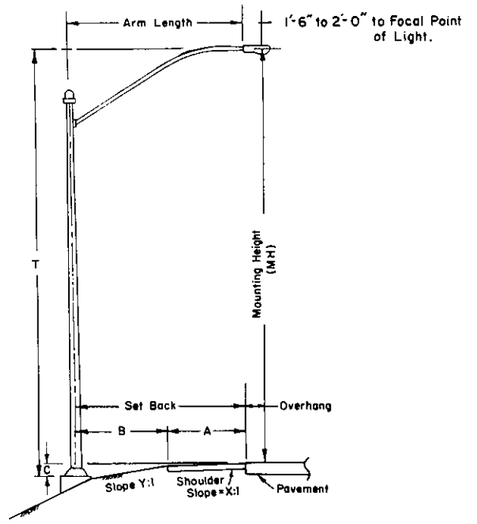
Table 2

Type of Guard Rail	X'-Distance (Min.)
2-S	4'
2-SC	2'

STRONG POST GUARD RAIL

GUARD RAIL CLEARANCES

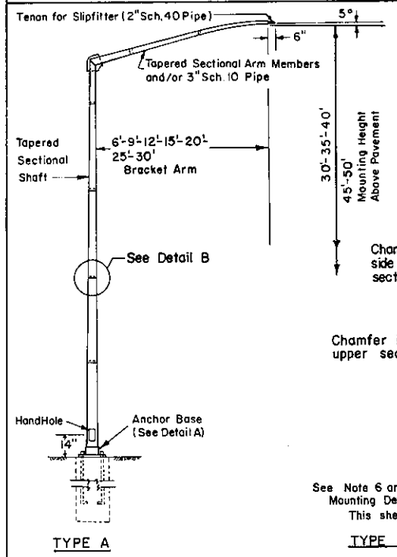
TERMINOLOGY



$C = \frac{A}{X} + \frac{B}{Y}$

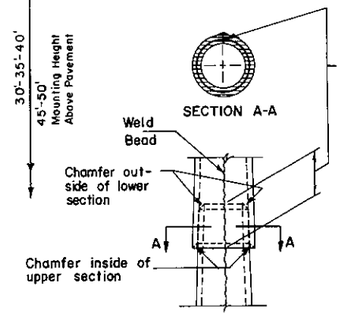
$T = MH + C$

Negative "C" dimension indicates elevation of foundation is above elevation of roadway.



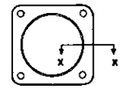
TYPE A

SECTIONAL STEEL POLES

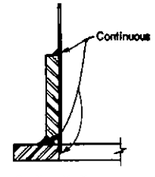


DETAIL B

Longitudinal weld beads of multi-sectional poles shall be ground smooth at overlap.



DETAIL A



Section X-X
Anchor Base

See Note 6 and Pole Mounting Details This sheet

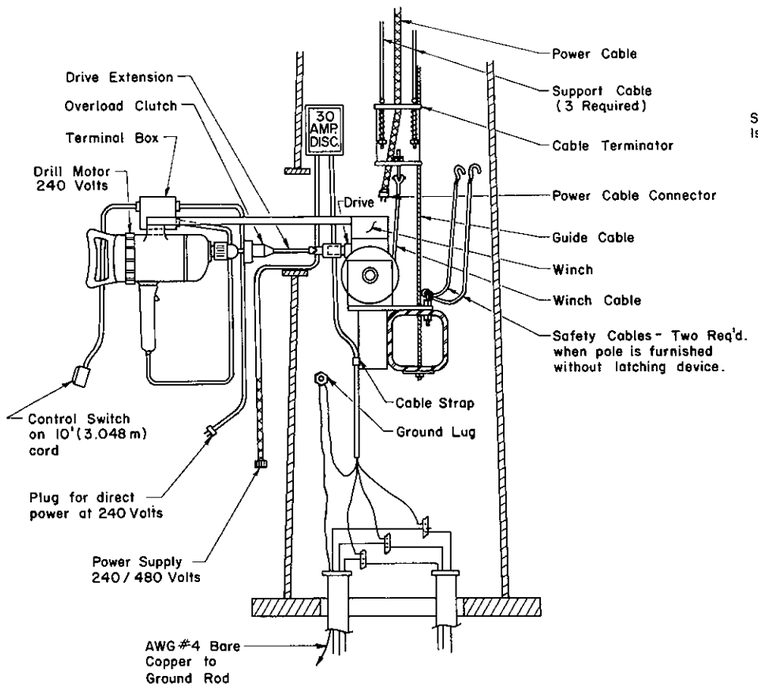
TYPE S

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

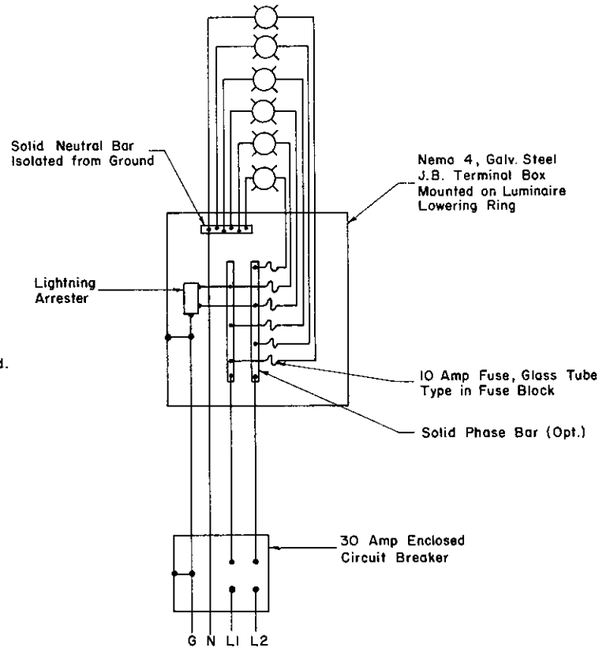
HIGHWAY LIGHTING

CONVENTIONAL LIGHTING POLE DETAILS

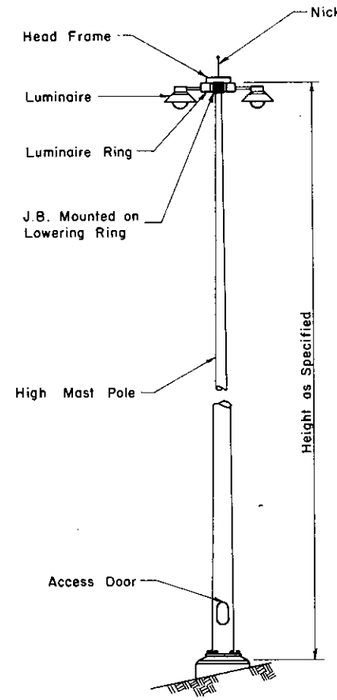
Recommended July 14, 1980	Approved July 16, 1980	Sht. 1 Of 2
B.O. Reversbie	David Edmond	RC-83
Director, Bureau of Design	Deputy Secretary for Hwy. Admin.	



TYPICAL LOWER SECTION MECHANISM



TYPICAL CIRCUIT SCHEMATIC



TYPICAL HIGH MAST POLE

NOTES

1. Head frame and luminaire assemblies shall be completely sealed to prevent intrusion of bird life.
2. Circuit breaker disconnect shall be 2 pole, rated for 240/480 volt system, and in NEMA 1 enclosure.
3. The lightning rod grounding conductor shall be grounded directly on the pole shaft with lugs provided by the manufacturer of lightning rod.
4. All miscellaneous hardware shall be stainless steel.
5. Wiring from J.B. to luminaire shall be in wireway provided in luminaire ring or in sealtite flexible conduit.
6. Pole identification tag as detailed on RC-83, sheet 1 of 2, shall be affixed to each high mast pole.

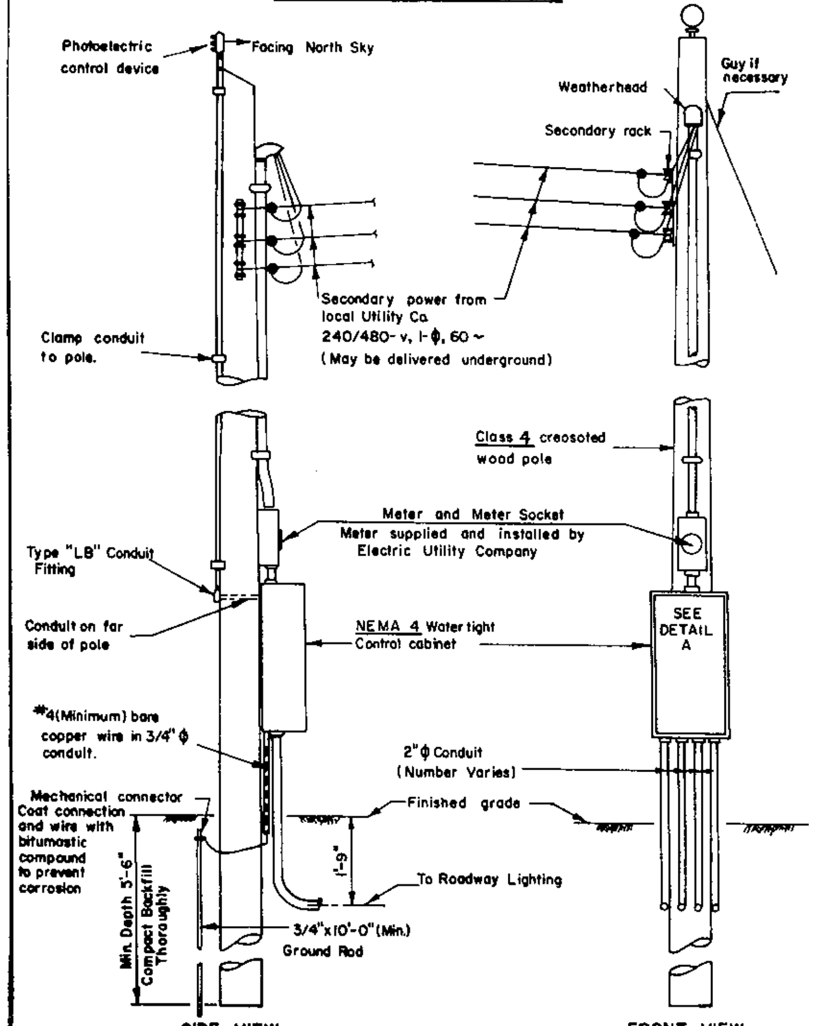
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

HIGHWAY LIGHTING

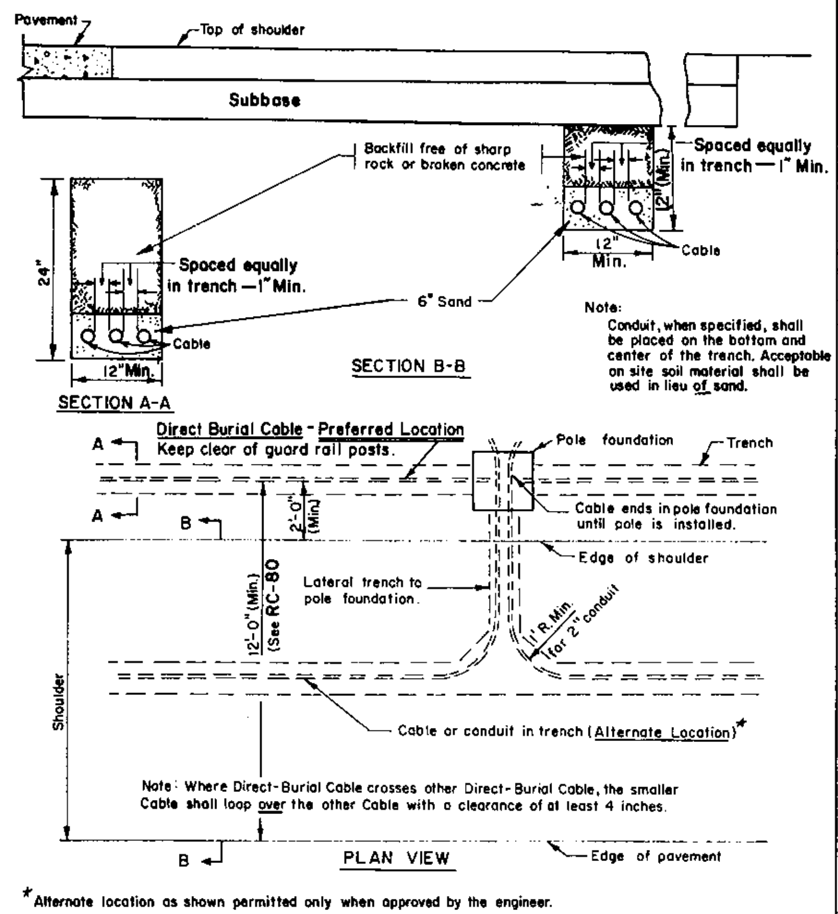
HIGH MAST LIGHTING POLE DETAILS

Recommended July 16, 1980	Approved July 16, 1980	Sht. 2 Of 2
B.D. Kowalski	David E. Sumi	RC-83
Director, Bureau of Design	Deputy Sec. for Highway Admin.	

TYPICAL TERMINAL POLE EQUIPMENT ARRANGEMENT FOR POWER SUPPLY

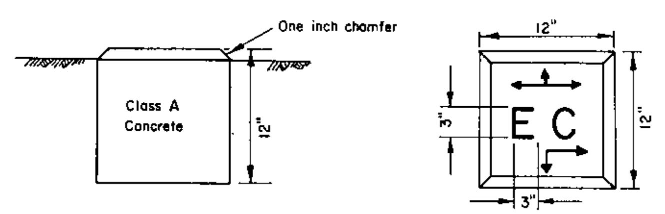


DIRECT-BURIAL CABLE & CONDUIT



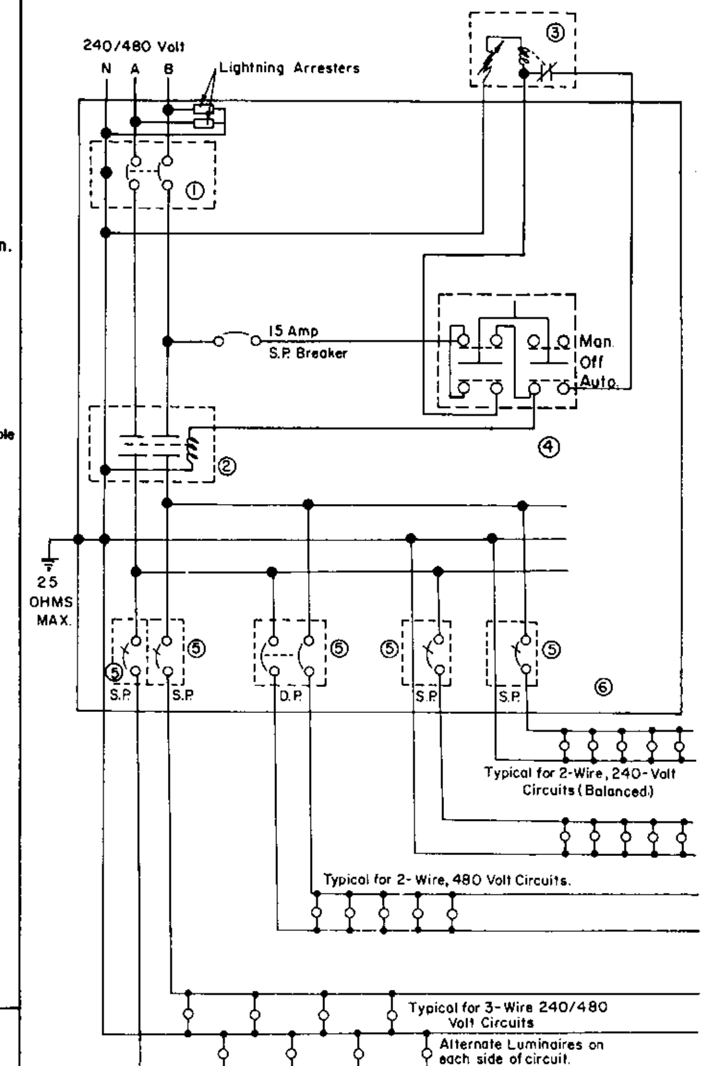
*Alternate location as shown permitted only when approved by the engineer.

CABLE & CONDUIT MARKER



Note: Directional arrows as required. Arrow and letter depth 1/2 inch.

CONTROL CABINET SCHEMATIC WIRING DIAGRAM (TYPICAL)

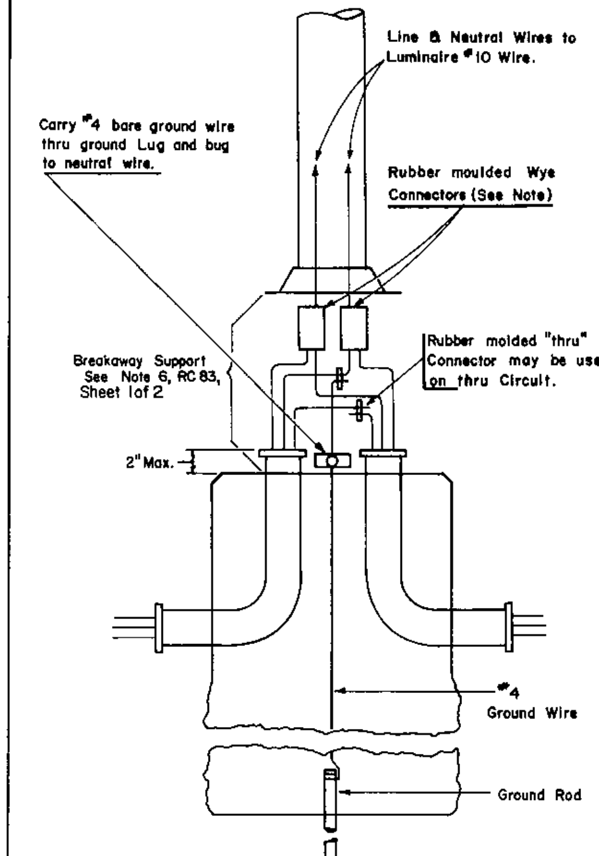


M-Manual
A-Automatic
1-Main Circuit Breaker or Fused Disconnect
2-Control Contactor
3-Photoelectric Cell
4-Selector Switch
5-Distribution Breakers (10,000 A.I.C.)
6-Control Cabinet
SP-Single Pole
DP-Double Pole

Notes:
1- Items 2, 3, & 4 not required if each Luminaire has photoelectric control element.

DETAIL A

WIRING DETAIL BREAKAWAY BASE



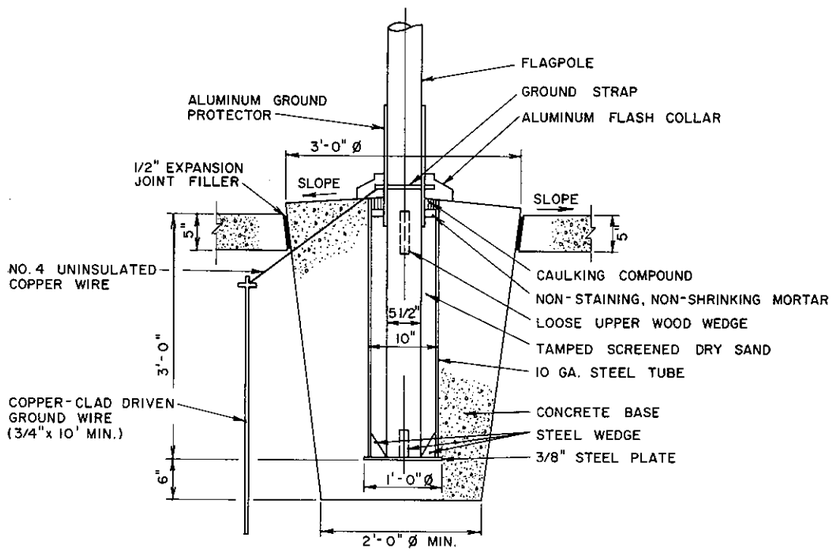
NOTE: Rubber molded connectors optional for use in anchor base poles.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

HIGHWAY LIGHTING

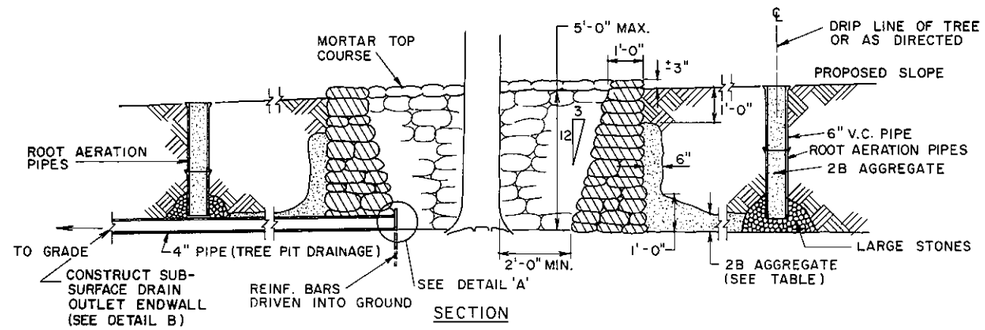
LIGHTING & ELECTRICAL DETAILS

Recommended	Approved July 16, 1980	Sht. 1 Of 1
B.D. Kocuskie, Director, Bureau of Design	David S. Sims, Deputy Sec. for Highway Admin.	RC-84



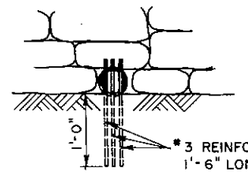
FLAGPOLE SETTING DETAIL

NO SCALE

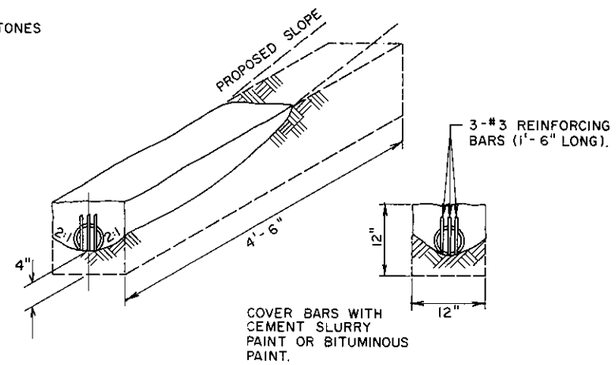


SECTION

TYPE A TREE WALL

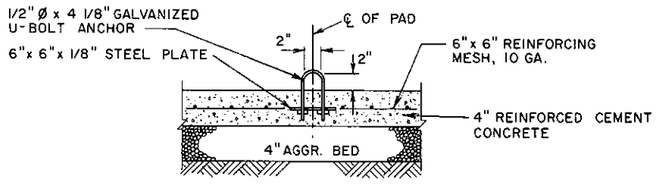


DETAIL 'A'

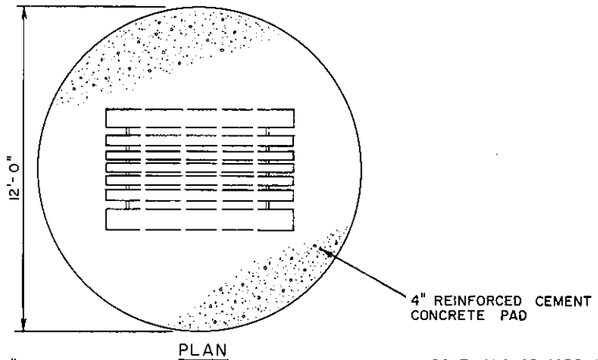


4" SUBSURFACE DRAIN OUTLET ENDWALL

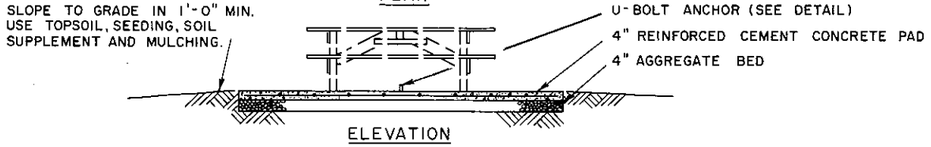
DETAIL 'B'



DETAIL OF U-BOLT ANCHOR



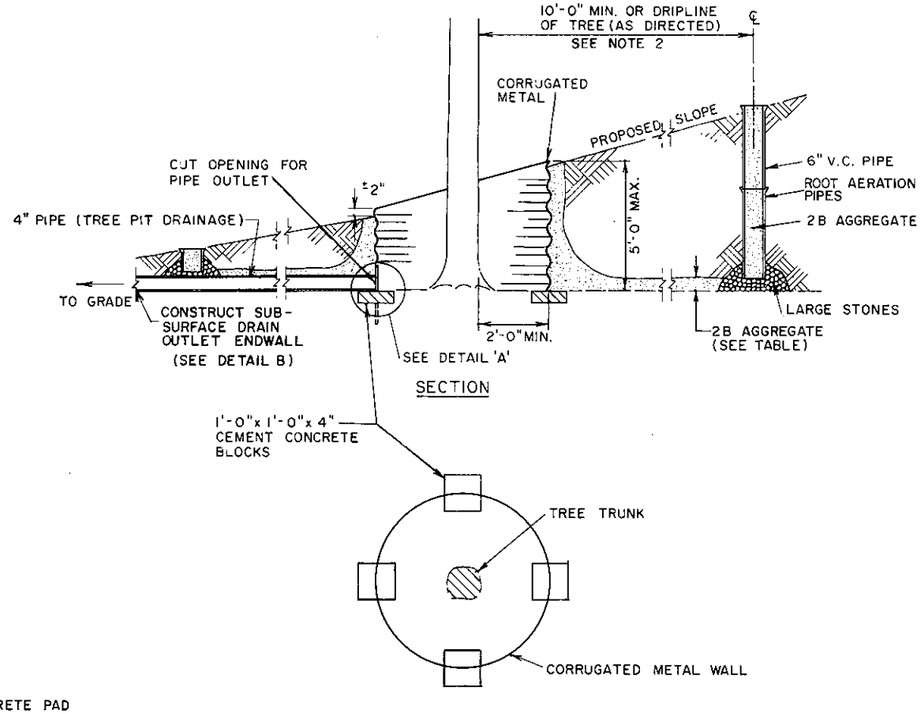
PLAN



ELEVATION

TABLE PAD

NO SCALE



SECTION

PLAN VIEW

TYPE C TREE WALL

CORRUGATED METAL

NOTES

1. TREE GRATES SHALL BE USED WHERE DESIGNATED.
2. TREE DRIPLINE SHALL BE DEFINED AS THE FURTHEREST EXTENSION OF THE TREES BRANCHES.
3. NON-CIRCULAR TYPE A TREE WALLS MAY BE ARRANGED AS DIRECTED IN ORDER TO PROTECT CLOSE GROUPINGS OF TREES OR TREE ROOT AREAS NOT ENTIRELY COVERED WITH EMBANKMENT.

AGGREGATE LAYER TABLE	
AGGREGATE LAYER	AMOUNT OF EMBANKMENT AROUND TREE
NONE	LESS THAN 6 INCHES
4 INCHES	6 INCHES TO 1 FOOT
6 INCHES	1 FOOT TO 3 FEET
12 INCHES	GREATER THAN 3 FEET

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

TREE WALLS & MISC. DETAILS FOR ROADSIDE REST AREAS

Recommended Nov. 15, 1977
B.D. Rowshie
Director, Bureau of Design

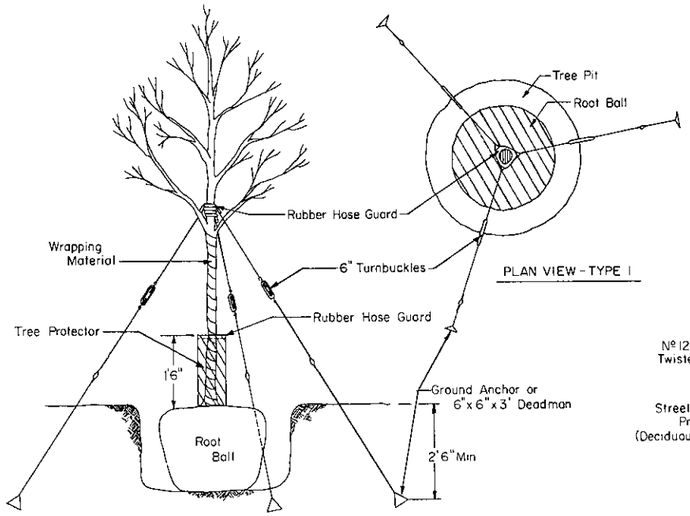
Approved Nov. 15, 19
J. H. Sullivan
Deputy Chief Hwy. Engr.

Sht. 1 Of 1

RC-90

TRACED BY
FINAL BY

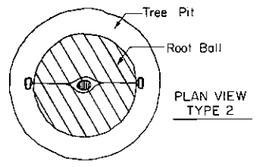
BRACING DETAILS



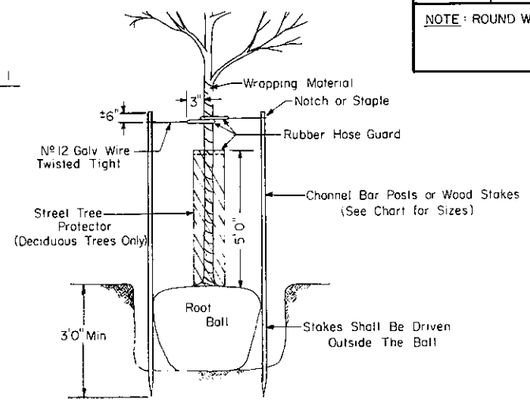
PLAN VIEW - TYPE 1

TYPE 1 BRACING

DECIDUOUS TREES OVER 3½" CALIPER
EVERGREEN TREES OVER 8' HIGH
(NOT FOR STREET TREES, SLOPE PLANTING, OR REST AREAS)



PLAN VIEW TYPE 2

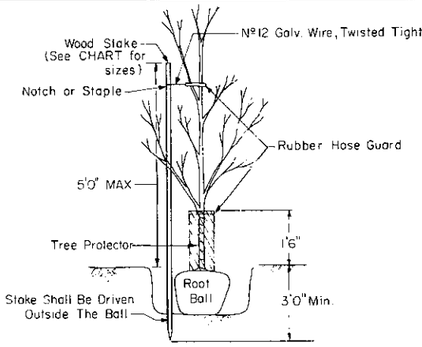


TYPE 2 BRACING

DECIDUOUS TREES 1½" TO 3½" CALIPER
EVERGREEN TREES 4' TO 8' HIGH
(FOR ALL STREET TREES & REST AREAS OVER 1½" CALIPER)

TABULATION OF BRACE POST REQUIREMENTS					
TYPE OF BRACING	SIZE OF MATERIAL DECIDUOUS	SIZE OF MATERIAL EVERGREEN	MIN. LENGTH	BRACE POST TYPE	REQ. SIZE (SEE NOTE)
2	———	4'-6' HT.	6'6"	CHANNEL BAR	1¼ lb. POST H2-1
				WOOD	2"x2" FULL DIM.
2	1½" – 2½" CAL.	6'-8' HT.	8'0"	CHANNEL BAR	3 lb. POST H2-2
				WOOD	2"x2" FULL DIM.
2	2½" – 3½" CAL.	———	11'0"	CHANNEL BAR	3 lb. POST H2-2
				WOOD	3"x3" FULL DIM.
2	OVER 3½" CAL.	———	12'6"	CHANNEL BAR	3 lb. POST H2-3
				WOOD	3"x3" FULL DIM.
3	5' HT.-1½" CAL.	———	8'0"	WOOD	2"x2" FULL DIM.

NOTE: ROUND WOOD STAKES MAY BE SUBSTITUTED AS FOLLOWS:
2"x2" = 2" DIA. ROUND STAKE
3"x3" = 3" DIA. ROUND STAKE



TYPE 3 BRACING

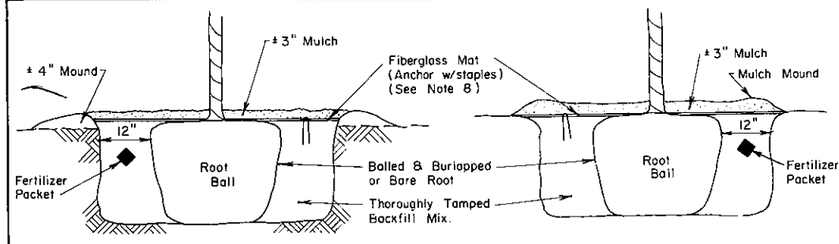
DECIDUOUS TREES
5' HIGH TO 1½" CALIPER

GENERAL NOTES

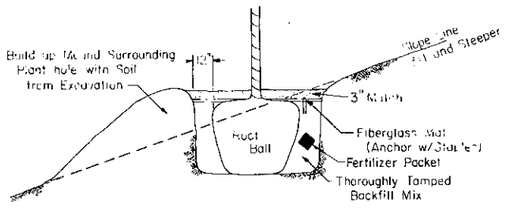
1. MOUNDS SHALL BE USED FOR ALL TREE PLANTING EXCEPT FOR REST AREAS AND OTHER HIGH MAINTENANCE AREAS, AS DIRECTED.
   MOUNDS SHALL CONSIST OF MATERIAL FROM THE EXCAVATION, FREE OF ALL STONES AND FOREIGN MATERIAL TWO INCHES (2") OR LARGER IN ANY DIMENSION.
2. WHERE MOUNDS ARE USED, THE TOP OF THE ROOT BALL SHALL BE SET ONE TO TWO INCHES (1"-2") HIGHER THAN THE SURROUNDING GROUND.
3. GUYS SHALL BE ATTACHED TO THE TREE ABOVE SUBSTANTIAL BRANCHES AT A POINT NOT LESS THAN ONE-HALF (½) THE HEIGHT OF THE TREE. THE DISTANCE ON THE GROUND FROM THE TREE TO THE GUY SHALL BE APPROXIMATELY EQUAL TO ONE-HALF (½) THE HEIGHT OF THE TREE FOR TYPE 1 BRACING.
4. TREE PROTECTOR DIAMETER SHALL BE AS FOLLOWS:
   3" FOR TREES UNDER 2" CALIPER
   6" FOR TREES 2" TO 4" CALIPER
   12" FOR TREES OVER 4" CALIPER
   TOP OF PROTECTOR SHALL BE LINED WITH A RUBBER HOSE GUARD.
5. BACKFILL MIX IN WET SOIL CONDITIONS, AS DETERMINED BY THE DEPARTMENT, SHALL NOT CONTAIN PEAT.
6. FIBERGLASS MAT FOR TREE PITS SHALL BE ANCHORED WITH A MINIMUM OF THREE (3) U-SHAPED STAPLES, EQUALLY SPACED AROUND THE TREE.
7. ROOT CONTACT FERTILIZER PACKETS SHALL BE EQUALLY SPACED AROUND THE BALL OR ROOTS IN THE QUANTITY SHOWN ON THE CHART. PACKETS SHALL BE SET 6" TO 8" DEEP.
8. FIBERGLASS MAT SHALL BE ELIMINATED FROM THE PIT FOR TREES TO BE PLANTED IN UNMOWED AREAS. MULCHING SHALL CONSIST OF CRUSHED NO. 2 GRADATION AGGREGATE.

REFERENCE: FORM NO. 408/76 - SECTIONS 805,806,808,703 AND 941.

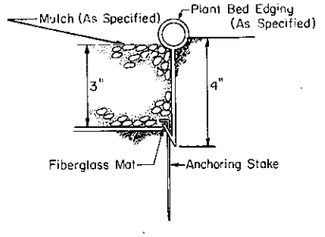
PLANTING DETAILS



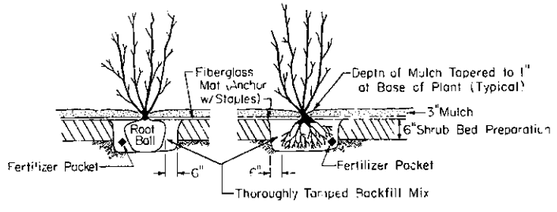
TREE PLANTING DETAILS
(See General Notes)



SLOPE PLANTING
DECIDUOUS AND EVERGREEN TREES
(Use Type 2 or Type 3 Bracing As Req'd)



PLANT BED EDGING



BALLED & BURLAPPED OR CONTAINER — BARE ROOT

SHRUB PLANTING AND
SHRUB BED PREPARATION

4 OZ., 8 YR ROOT CONTACT FERTILIZER PACKET SCHEDULE	
EVERGREEN AND DECIDUOUS TREES	NUMBER OF PACKETS
8'-10' HT. AND WHIPS	1
1" – 2" CAL.	2
2"-2½" CAL.	3
2½"-3" CAL.	4
3"-3½" CAL.	4
3½"-4" CAL.	5
4" - 5" CAL.	6
FLOWERING TREES	NUMBER OF PACKETS
5'-10' HT.	2
SHRUBS	NUMBER OF PACKETS
12"-24" SPD. OR HT.	1
24"-36" SPD. OR HT.	2
3'-5' HT..	3
EVERGREEN TRANSPLANTS	NUMBER OF PACKETS
18"-30" HT.	1
18"-30" HT. REFORESTATION, TYPE 'B'	1

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

BRACING & PLANTING DETAILS

Recommended June 1, 1976	Approved June 1, 1976	Sht. 1 of 1
B.D. Rawlins	Robert R. Monroe	RC-91
Director, Bureau of Design	Deputy Chief Hwy. Engr.	