OS-299 (8-72)

TRANSMITTAL LETTER

CHANGE #5 to PUB. 72, MARCH 1977 EDITION

DATE
JULY 16, 1980

SUBJECT:

REVISIONS TO STANDARDS FOR ROADWAY CONSTRUCTION, RC 0-100
CHANGE #5 to PUB. 72, MARCH, 1977 EDITION

INFORMATION AND SPECIAL INSTRUCTIONS: The attached revisions and additions should be inserted into your Standards:

RC#	SHEET	CHANGE DESCRIPTION
RC-11	Sheet 1 of 2	Pen & ink change; change date to July 16, 1980.
	Sheet 2 of 2	Added notes for additional excavation. Modified detail C-C. Added Class 4 Excavation.
RC-23	Sheet 1 of 2	Notes added to include Type E, skewed joints for new construction as well as re-construction.
	Sheet 2 of 2	Pen & ink change; change date to July 16, 1980.
RC-24	Sheet 1 of 1	Added notes 4 and 5 concerning location of pavement relief joint. Added note 6 for joint details reference.
RC-25	Sheet 1 of 3	New drawings to include detail for 2 foot extension of pavement for flexible pavement construction.
	Sheet 2 of 3	Modifications to details to reflect requirements for pavement extension, when re-constructing shoulders.
	Sheet 3 of 3	Removed corrugation detail. Pavement relief joint cross-section detail added.
RC-27	Sheet 1 of 2	Add to index; drawings previously added.
	Sheet 2 of 2	
RC-80	Sheet 1 of 2	Eliminated Type T transformer base and anchor bolt table. Notes K and M added.
	Sheet 2 of 2	High mast pole elevation detail removed. It is included on RC-83, sheet 2 of 2.
RC-81	Sheet 1 of 1	Removed JB-4 wood junction box and added drawings for Reinforced Plastic Mortar boxes.
RC-82	Sheet 1 of 1	Removed reference to red lead; changed to approved primer.
RC-83	Sheet 1 of 2	Added "thru" bolt detail for two section shafts. Pole mounting detail was added. Notes changed to remove references to thickness dimensions.
	Sheet 2 of 2	Pen & ink change; date changed to July 16, 1980.
RC-84	Sheet 1 of 1	Remove luminaire drawing. Type "LB" conduit coding changed to allow metal or plastic. Removed Type T transformer base from detail of breakaway base.

It is desired that the new features of these standards be incorporated immediately for the preparation of plans. However, no additional compensation will be allowed for work involved to conform to these standards and coordination with the issuance of the new Form 408/76 supplements must be checked.

All projects let after October 1, 1980 shall contain these corrected drawings.

CANCEL AND DESTROY THE FOLLOWING:

DRAWING	DATE	DRAWING	DATE
INDEX SHEET			
RC-11, 1 of 2	Jan. 31, 1977	RC-81, 1 of 1	Dec. 1, 1971
2 of 2	Jan. 31, 1977	RC-82, 1 of 1	Dec. 1, 1971
RC-23, 1 of 2	May 31, 1979	RC-83, 1 of 2	May 1, 1978
2 of 2	May 31, 1979	2 of 2	May 1, 1978
RC-24, 1 of 1	May 31, 1979	RC-84, 1 of 1	June 1, 1976
RC-25, 1 of 3	May 31, 1979		
2 of 3	May 31, 1979		
3 of 3	May 31, 1979		
RC-80, 1 of 2	June 1, 1976		
2 of 2	June 1, 1976		

[redacted]

APPROVED FOR ISSUANCE BY:

David C. Sims

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

OS 209 (8-72)
GC-0810-3500-0030

TRANSMITTAL
LETTER

Pub. 72 Change #4
March 1977 Edition

DATE
June 29, 1979

5-30-79

SUBJECT:
REVISIONS TO STANDARDS FOR ROADWAY CONSTRUCTION, RC-0-100
CHANGE #4, TO MARCH 1977 EDITION.

INFORMATION AND SPECIAL INSTRUCTIONS: The attached revisions and additions should be inserted into your standards:

Sheet		Change Description
Index Sheet	-	Revised to include the new sheets and dates.
RC-20, 1 of 2	-	Redrawn to show new joint configuration.
2 of 2	-	Redrawn to show new joint configuration.
RC-21, 1 of 1	-	Redrawn to show new joint spacing and reinforcement.
RC-22, 1 of 4	-	Redrawn to reflect the addition of 6" and 7" overlay.
2 of 4	-	Joint type added.
3 of 4	-	Joint type added and note change (Notes 1, 2, 3, & 4)
4 of 5	-	This sheet was eliminated.
4 of 4	-	Changed Table 3 (Added 6" & 7")
RC-23, 1 of 2	-	Changed the notes and eliminated the 10' section of RCC Pavement and the reference to the Pavement Relief Joint.
2 of 2	-	Removed the notes referring to outdated ST drawings.
RC-24, 1 of 1	-	The Pavement Relief Joint has been redesigned and designated to be used only on reconstruction projects.
RC-25, 1 of 3	-	Redrawn to show only Types 1 & 3 Shoulders. Added note for shoulder rounding and made minor changes to the notes.
2 of 3	-	Changed Notes 1 & 6 to clarify the pay items.
3 of 3	-	New sheet for Concrete Shoulders.
RC-26, 1 of 3	-	Pen and ink change. Change the date on the drawing to May 31, 1979.
2 of 3	-	Changed Detail A to joint detail. Also changed the notes and tiebolts and underdrain.
3 of 3	-	New sheet for joint repair.
RC-27, 1 of 2	-	New sheet for Plain Cement Concrete Pavement.
2 of 2	-	New sheet for Plain Cement Concrete Ramps.
RC-31, 1 of 1	-	Added Diminsion for 4" Subsurface Drain Outlet Endwall.
RC-34, 1 of 6, 2 of 6, 3 of 6, 4 of 6, & 6 of 6	-	Pen and ink change. Change the dates on these drawings to May 31, 1979.
5 of 6	-	Added Note 10.
RC-41, 1 of 1	-	Pen and ink change. Change the 3" dimension on Section D-D to 6".
RC-43, 1 of 1	-	Pen and ink change. Change the 6" dimension for Mattress Type Gabions to 9".
RC-57, 1 of 2	-	Added the detail for the plate slot.
2 of 2	-	Pen and ink change. Change the date on the drawing to May 31, 1979.
RC-66, 1 of 1	-	Changed the corrugation detail.

It is desired that the new features of these standards be incorporated immediately in the preparation of plans. However, no additional compensation will be allowed for work

involved to comform to these standards and coordination with the issuance of the new 408/76 supplements must be checked.

All projects let after October 1, 1979 shall contain these corrected drawings.

CANCEL AND DESTROY THE FOLLOWING:

Drawing	Date	Drawing	Date
Index Sheet		RC-25, 1 of 2	Jan, 31, 1977
RC-20, 1 of 2	Dec. 1, 1971	2 of 2	Jan 31, 1977
2 of 2	Dec. 1, 1971	RC-26, 2 of 3	Jan. 31, 1977
RC-21, 1 of 1	Aug. 20, 1975	3 of 3	Jan. 31, 1977
RC-22, 1 of 5	Nov. 15, 1977	RC-34, 5 of 6	Nov. 15, 1977
2 of 5	Nov. 15, 1977	RC-57, 1 of 2	June 1, 1976
3 of 5	Nov. 15, 1977	RC-66, 1 of 1	June 1, 1976
4 of 5	Nov. 15, 1977		
5 of 5	Nov. 15, 1977		
RC-23, 1 of 1	Jan. 31, 1977		
2 of 2	Jan. 31, 1977		
RC-24, 1 of 1	Nov. 15, 1977		

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APPROVED FOR ISSUANCE BY:

David C. Sims

David C. Sims, P. E.
Chief Highway Engineer

OS 295 (8 72)
CO-0830-3500-0030

TRANSMITTAL LETTER

Pub. 72 Change #3
March 1977 Edition

DATE
September 1, 1978

SUBJECT:

REVISIONS TO STANDARDS FOR ROADWAY CONSTRUCTION, RC-0-100
CHANGE #3, TO MARCH 1977 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.
RC-52 (1 of 6)	- Changed sheet No. Also sheet references where necessary.
(2 of 6)	- Changed sheet No.
(3 of 6)	- Changed sheet No.
(4 of 6)	- Changed sheet No. Revised Cable Anchorage Detail. Also revised Concrete Footing to show foundation anchor plate instead of the 4" section of foundation post.
(5 of 6)	- Changed sheet No. Revised Base Plate A. B, and C. Shortened by 1" the B.C.T. Terminal Post. Added Foundation Post and Foundation Anchor Plate.
(6 of 6)	- Re-issue of this sheet. Shortened Rub Rail. Also removed 15° position drawings and incorporated them with the existing drawings.
RC-60 (2 of 2)	- Added a chart for Drive Anchor Blades.
RC-63 (1 of 2) & (2 of 2)	- New sheets added to show Permanent Barricades for both aluminum and wood panels.
RC-64 (1 of 1)	- Permanent Barricades - Types A and B removed from this sheet.
RC-65 (1 of 1)	- Subbase under raised median is now indicated as incidental to subbase item. Also Joint Sealer added to Typical Divisor Area.
RC-70 (1 of 4)	- Rock lining is shown 3' minimum instead of 2'6", because the max. size rock in the spec. gradation is 3'.

The drawing dates on RC-70 (2 of 4), (3 of 4), and (4 of 4) and RC-60 (1 of 2) shall be changed to September 1, 1978, as a pen and ink change.

It is desired that the new features of these standards be incorporated immediately in the preparation of plans. However, no additional compensation will be allowed for work involved to conform to these standards and coordination with the issuance of the new 408/76 supplement must be checked.

All projects let after December 31, 1978, shall contain these corrected drawings.

CANCEL AND DESTROY THE FOLLOWING:

Drawing	Date	Drawing	Date
Index Sheet			
		RC-65 (1 of 1)	June 1, 1976
RC-52 (1 of 6)	May 1, 1978	RC-70 (1 of 4)	June 1, 1976
(2 of 6)	May 1, 1978		
(3 of 6)	May 1, 1978		
(4 of 6)	May 1, 1978		
(5 of 6)	May 1, 1978		
RC-60 (2 of 2)	January 31, 1977		
RC-64 (1 of 1)	June 1, 1976		

[redacted]

APPROVED FOR ISSUANCE BY:

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

CC-0830-3500-0030

TRANSMITTAL LETTER

Pub. 72, Change #2
To March 1977 Edition

DATE
May 1, 1978

SUBJECT:

REVISIONS TO STANDARDS FOR ROADWAY CONSTRUCTION, RC-0-100
CHANGE #2, TO MARCH 1977 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.
RC-30 (1 of 1)	- A note was added to allow for extra depth pavement base drain when required.
RC-50 (1 of 1)	- Removed Type 2 Strong Post End Treatment and replaced it with the Breakaway Cable Terminal End Treatment. Revised the minimum treatment length of guard rail from 125' to 150'. Also dimensioned the maximum placement of the first guard rail post from the edge of the sloped parapet.
RC-51 (1 of 3)	- On the Typical Installation, the distance from the toe of slope to rear of post was revised to 2' minimum.
(2 of 3)	- The distance from the toe of slope to the rear face of the post is revised from 1' minimum to 2' minimum. The distance from the edge of the shoulder to the face of the guard rail is revised from 5'9" to 4'9" Typical. Added "30 inches max." to the TYPICAL END POST DETAIL G.
(3 of 3)	- Removed "Min." from the 1" height of Conc. footing above the existing ground.
RC-52 (1 of 5) & (2 of 5)	- Revised 1' Min. to 2' Min. behind guard rail posts and changed post designation to W6x9 with the addition of note 5. Also change sheet nos. where necessary.
(3 of 5)	- Removed Terminal Section-Double and changed post designation in Table of Post Bolt Lengths.
(4 of 5) & (5 of 5)	- New Breakway Cable Terminal drawing.
RC-53 (1 of 2)	- On the Typical Installation, the distance from the toe of the slope to the rear face of the post was revised to 2' minimum.
(2 of 2)	- Revised the placement of all guard rail to 2' Min. behind the guard rail post.
RC-54 (1 of 3)	- Eliminated Type 2 Strong Post End Treatment and replaced with Breakaway Cable Terminal End Treatment. Also revised the placement of guard rail as previously indicated. On tables 1 and 2, the last column was revised to measure the distance from the obstruction to the back of rail.
(2 of 3)	- Changed the 5'9" Typical placement of guard rail to 4'9".
(3 of 3)	- The end treatment for Median Treatment at Dual Structures was changed to the Breakaway Cable Terminal End Treatment.
RC-55 (1 of 1)	- Revised sheet references to comply with RC-52 drawing change.
RC-56 (1 of 1)	- Added a note to allow the internal splice plate to be threaded as an alternate to tack welding hex nuts.
RC-83 (1 of 2)	- Revised guard rail clearances at lighting poles to comply with minimum design clearances for different types of weak and strong post guard rail. Design Manual Chapter 7 - Lighting - will be changed to comply with this criteria in a future change.
(2 of 2)	- Added a new sheet to RC-83 for standard high mast lighting poles.

It is desired that the revisions to these standards be incorporated immediately in the preparation of plans. No additional compensation will be allowed for work involved to conform to these standards.

All projects let after December 31, 1978 shall contain these revised drawings.

CANCEL AND DESTROY THE FOLLOWING:

Drawing	Date
Index Sheet	
RC-30 (1 of 1)	Nov. 15, 1977
RC-50 (1 of 1)	June 1, 1976
RC-51 (1 of 3)	June 1, 1976
(2 of 3)	
(3 of 3)	
RC-52 (1 of 4)	June 1, 1976
(2 of 4)	
(3 of 4)	
(4 of 4)	
RC-53 (1 of 2)	June 1, 1976
(2 of 2)	
RC-54 (1 of 3)	June 1, 1976
(2 of 3)	
(3 of 3)	
RC-55 (1 of 1)	June 1, 1976
RC-56 (1 of 1)	June 1, 1976
RC-83 (1 of 1)	March 7, 1973

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APPROVED FOR ISSUANCE BY:

David C. Sims

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

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

TRANSMITTAL LETTER

Pub. 72 Change #1
March 1977 Edition

DATE
November 15, 1977

SUBJECT:

REVISIONS TO STANDARDS FOR ROADWAY CONSTRUCTION - RC-0-100 Change #1, March 1977 Edition

INFORMATION AND SPECIAL INSTRUCTIONS: The attached revisions and additions should be inserted into your standards:

SHEET	CHANGE DESCRIPTION
Index Sheet	- Revised the dates on the drawings which had revisions.
RC-10 (1 of 1)	- Revised the extra depth pipe underdrain title to correspond with RC-30, Subsurface Drains.
RC-13 (1 of 1)	- Revised the sections showing subgrade drains to correspond to RC-30.
RC-22 (1 thru 4)	- Pen and ink change. Change the date on these drawings to Nov. 15, 1977.
(5 of 5)	- Revised the wording of note 5 from Pipe Foundation Underdrain to Pavement Base Drain..
RC-24 (1 of 1)	- Revised the wording of Pipe Foundation Underdrain in notes to read Pavement Base Drain.
RC-30 (1 of 1)	- Major revision: Pipe Foundation Underdrain, Type A or B, with Type I or II backfill is revised to Pavement Base Drain. Its location reflects the primary purpose which is to collect and drain the surface water penetrating the surface between the edge of the pavement and shoulder. Also minor revisions to subgrade drains and combination storm sewer and underdrain. Stone Foundation Underdrain, Types A and B have been removed.
RC-31 (1 of 1)	- Revised the title - Pipe Underdrain Outlet End Wall to read: Subsurface Drain Outlet End Wall.
RC-32 (1 of 1)	- Removed all references to Bituminous Coated Galvanized Pipe and added limits for coarse aggregate pipe trench backfill.
RC-33 (1 of 1)	- Removed the reference to Bituminous Coating in note 1.(General Notes)
RC-34 (1 of 6)	- Date change only.
(2 thru 4)	- Revised note 3 on each drawing to clarify Bulletin No. 15 procedure.
(5 of 6)	- Added details for expanded inlet boxes (Type 1, 2 and 3) for intermediate sizes between the standard inlet box and the Modified Type I and Modified Type II inlet box.
(6 of 6)	- Moved Modified Type I and Type II inlet boxes from sheet 5 to sheet 6.
RC-40 (1 of 1)	- Removed references to Bituminous Coated Galvanized Pipe.
90 (1 of 1)	- Revised Detail B to read: Subsurface Drain Outlet Endwall.

It is desired that the revisions to these standards be incorporated immediately in the preparation of plans. No additional compensations will be allowed for work involved to conform to these standards.

All projects let after June 30, 1978 shall contain these revised drawings.

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CANCEL AND DESTROY THE FOLLOWING:

Index Sheet	Date
RC-10 (1 of 1)	Oct. 1. 1974
RC-13 (1 of 1)	Aug. 20, 1975
RC-22 (5 of 5)	June 1, 1976
RC-24 (1 of 1)	June 1, 1976
RC-30 (1 of 1)	June 1, 1976
RC-31 (1 of 1)	Dec. 1, 1971
RC-32 (1 of 1)	Dec. 1, 1971
RC-33 (1 of 1)	Mar. 7, 1973
RC-34 (1 thru 5)	June 1, 1976
RC-40 (1 of 1)	Jan. 31, 1977
RC-90 (1 of 1)	June 1, 1976

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APPROVED FOR ISSUANCE BY:

David C. Sims

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

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

TRANSMITTAL LETTER

Pub. 72 - 1977 Edition

DATE: March 21, 1977

SUBJECT:

STANDARDS FOR ROADWAY CONSTRUCTION RC-0-100

INFORMATION AND SPECIAL INSTRUCTIONS:

This is a 1977 printing of the Roadway Construction Standard Drawings. This new printing includes all previous changes and revisions prior to January 1977. Also included is a new revision dated January 31, 1977 as described below:

SHEET	CHANGE DESCRIPTION
Index Sheet	Revised to include new dates and titles.
RC-11 (1 of 2)	Redrawn to include 2 sheets.
(2 of 2)	Added Metal and Concrete Cribbing Details. Added Class 3 Excavation for Metal Plate Pipe and Metal Plate Pipe Arch Culverts with Endwalls.
RC-23 (1 of 2)	Added a note for construction practice at bridge approach slabs when the highway has 3 and 4 lanes.
(2 of 2)	Date change only.
RC-25 (1 of 2)	Title and date change only.
(2 of 2)	A new drawing added to the standards showing Type 4, 5, 6, and 7 shoulders. This drawing shall be used to assist in the design for maintenance type contracts.
RC-26 (1 of 2) & (2 of 2)	New drawings added to the Standard Drawings. These drawings shall be used to assist in performing the necessary maintenance operations for either slabjacking or concrete patching.
RC-35 (1 of 1)	A new drawing showing details for permanent drainage dikes.
RC-39 (1 of 2)	Date change only.
(2 of 2)	Added details for a structural steel manhole cover and frame. Revised the cast iron manhole cover and frame. The Type A and B Modified Manhole was revised to one Modified Manhole.
RC-40 (1 of 1)	Added a note for the crosswall location spacing for Cement Concrete Paving for Stream Beds.
RC-60 (1 of 2)	Redrawn into 2 sheets. Eliminated Type 3 Right-of-Way Fence and replaced it with Type 5. The braces on Type 2 and Type 5 Right-of-Way Fence have been repositioned and dimensioned. Also revised the ground to bottom of fence clearance.

SHEET	CHANGE DESCRIPTION
RC-60 (2 of 2)	Added details showing Right-of-Way Fence positioning at structures. Added the use of Drive Anchors as alternates for concrete footings. Note that the positioning of the Right-of-Way Fence is 2 feet inside of the Right-of-Way Line.
RC-61 (1 of 1)	Added a detail for Removable Fence Sections at Structures. These are to be used as required to permit access for bridge inspection or other necessary entrance.

Please note that the Standard Drawings will begin to introduce metric conversions for dimensions on the drawings. The metric conversions will be applied to new sheets as they are added to the Standards, or the conversions will be partial, applying only to the areas where a revision requires redrawing. All the metric measurements will be equivalent dimensions and will be located in parenthesis following the English dimension.

It is desired that the new revisions to these standards be incorporated immediately in the preparation of plans. No additional compensation will be allowed for work involved to conform to these standards.

All projects let after June 30, 1977 shall contain the revised drawings herein.

CANCEL AND DESTROY THE FOLLOWING:

	Date
Index Sheet	
RC-11 (1 of 1)	3-07-73
RC-23 (1 of 2)	10-01-74
(2 of 2)	
RC-25 (1 of 1)	8-20-75
RC-39 (1 of 2)	8-20-75
(2 of 2)	
RC-40 (1 of 1)	6-01-76
RC-60 (1 of 1)	6-01-76
RC-61 (1 of 1	6-01-76

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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)	July 16, 1980	CLASSIFICATION OF EARTHWORK FOR STRUCTURES
RC-12	June 1, 1976	BACKFILL AT STRUCTURES
RC-13	Nov. 15, 1977	PAY LIMIT OF SUBBASE & SUBGRADE
PAVEMENTS		
RC-20 (2 Sheets)	May 31, 1979	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)	July 16, 1980	BRIDGE APPROACH SLAB
*RC-24	July 16, 1980	PAVEMENT RELIEF JOINT
*RC-25 (3 Sheets)	July 16, 1980	SHOULDERS
RC-26 (3 Sheets)	May 31, 1979	CONCRETE PAVEMENT MAINTENANCE
*RC-27 (2 Sheets)	~~July 16, 1980~~ May 31, 1979	PL. CEM. CONC. PAVEMENT
DRAINAGE		
RC-30	May 1, 1978	SUB SURFACE DRAINS
RC-31	May 31, 1979	ENDWALLS
RC-32	Nov. 15, 1977	SLOPE PIPE FITTINGS & CONNECTORS
RC-33	Nov. 15, 1977	END SECTIONS FOR PIPE CULVERTS
RC-34 (6 Sheets)	May 31, 1979	INLETS
RC-35	Jan. 31, 1977	DRAINAGE DIKE
RC-39 (2 Sheets)	Jan. 31, 1977	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	GABION

STANDARD DRAWING NO.	DATE	DESCRIPTION
GUARD RAIL & MEDIAN BARRIERS		
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. 1, 1978	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 (2 Sheets)	May 31, 1979	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 No. 5 July 16, 1980

TRACED BY
FINAL BY

INDEX OF STANDARDS FOR ROADWAY CONSTRUCTION

THE INDEX MAY NOT BE REVISED (OR ISSUED) FOR EVERY REVISION TO THE DRAWINGS. IT SHOULD BE KEPT UP TO DATE BY THE INDIVIDUAL AS REVISED DRAWINGS ARE RELEASED

STANDARD DRAWING NO.	DATE	DESCRIPTION
EARTHWORK		
RC-10	Nov. 15, 1977	CLASSIFICATION OF EARTHWORK
RC-11 (2 Sheets)	Jan. 31, 1977	CLASSIFICATION OF EARTHWORK FOR STRUCTURES
RC-12	June 1, 1976	BACKFILL AT STRUCTURES
RC-13	Nov. 15, 1977	PAY LIMIT OF SUBBASE & SUBGRADE
PAVEMENTS		
RC-20 (2 Sheets)	May 31, 1979	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 31, 1979	BRIDGE APPROACH SLAB
RC-24	May 31, 1979	PAVEMENT RELIEF JOINT
RC-25 (3 Sheets)	May 31, 1979	SHOULDERS
RC-26 (3 Sheets)	May 31, 1979	CONCRETE PAVEMENT MAINTENANCE
DRAINAGE		
RC-30	May 1, 1978	SUB SURFACE DRAINS
RC-31	May 31, 1979	ENDWALLS
RC-32	Nov. 15, 1977	SLOPE PIPE FITTINGS & CONNECTORS
RC-33	Nov. 15, 1977	END SECTIONS FOR PIPE CULVERTS
RC-34 (6 Sheets)	May 31, 1979	INLETS
RC-35	Jan. 31, 1977	DRAINAGE DIKE
RC-39 (2 Sheets)	Jan. 31, 1977	STANDARD MANHOLES
RC-40	Nov. 15, 1977	SLOPE PROTECTION
RC-41	June 1, 1976	SPECIAL MORTARED STONE SLOPE WALL
RC-42	June 1, 1976	REINF. CEM. CONC. SLOPE WALL
RC-43	Mar. 7, 1973	GABION

STANDARD DRAWING NO.	DATE	DESCRIPTION
GUARD RAIL & MEDIAN BARRIERS		
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. 1, 1978	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 (2 Sheets)	May 31, 1979	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)	June 1, 1976	HIGHWAY LIGHTING - FOUNDATIONS
RC-81	Dec. 1, 1971	HIGHWAY LIGHTING - JCT. BOXES - LT. DUTY
RC-82	Dec. 1, 1971	HIGHWAY LIGHTING - JCT. BOXES - HVY. DUTY
RC-83 (2 Sheets)	May 1, 1978	HIGHWAY LIGHTING - LIGHTING POLE DETAILS
RC-84	June 1, 1976	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

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EARTHWORK		
RC-10	Nov. 15, 1977	CLASSIFICATION OF EARTHWORK
RC-11 (2 Sheets)	Jan. 31, 1977	CLASSIFICATION OF EARTHWORK FOR STRUCTURES
RC-12	June 1, 1976	BACKFILL AT STRUCTURES
RC-13	Nov. 15, 1977	PAY LIMIT OF SUBBASE & SUBGRADE
PAVEMENTS		
RC-20 (2 Sheets)	Dec. 1, 1971	PAVEMENT JOINTS
RC-21	Aug. 20, 1975	REINF. FOR R.C.C. PAV'T.
RC-22 (5 Sheets)	Nov. 15, 1977	CONTINUOUSLY REINF. CONC. PAV'T
RC-23 (2 Sheets)	Jan. 31, 1977	BRIDGE APPROACH SLAB
RC-24	Nov. 15 1977	PAVEMENT RELIEF JOINT
RC-25 (2 Sheets)	Jan. 31, 1977	SHOULDERS
RC-26 (2 Sheets)	Jan. 31, 1977	CONCRETE PAVEMENT MAINTENANCE
DRAINAGE		
RC-30	May 1, 1978	SUB SURFACE DRAINS
RC-31	Nov. 15, 1977	ENDWALLS
RC-32	Nov. 15, 1977	SLOPE PIPE FITTINGS & CONNECTORS
RC-33	Nov. 15, 1977	END SECTIONS FOR PIPE CULVERTS
RC-34 (6 Sheets)	Nov. 15, 1977	INLETS
RC-35	Jan. 31, 1977	DRAINAGE DIKE
RC-39 (2 Sheets)	Jan. 31, 1977	STANDARD MANHOLES
RC-40	Nov. 15, 1977	SLOPE PROTECTION
RC-41	June 1, 1976	SPECIAL MORTARED STONE SLOPE WALL
RC-42	June 1, 1976	REINF. CEM. CONC. SLOPE WALL
RC-43	Mar. 7, 1973	GABION

STANDARD DRAWING NO.	DATE	DESCRIPTION
GUARD RAIL & MEDIAN BARRIERS		
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. 1, 1978	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 (2 Sheets)	June 1, 1976	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	BARRICADES, CURBS, & GUTTERS
RC-65	Sept. 1, 1978	CONCRETE MOUNTABLE CURBS
RC-66	June 1, 1976	CONCRETE TRAFFIC SEPARATOR
RC-67 (2 Sheets)	Oct. 1, 1974	ANTI-GLARE SCREEN
POLLUTION CONTROL		
RC-70 (4 Sheets)	Sept. 1, 1978	EROSION & SEDIMENT CONTROL
HIGHWAY LIGHTING		
RC-80 (2 Sheets)	June 1, 1976	HIGHWAY LIGHTING - FOUNDATIONS
RC-81	Dec. 1, 1971	HIGHWAY LIGHTING - JCT. BOXES - LT. DUTY
RC-82	Dec. 1, 1971	HIGHWAY LIGHTING - JCT. BOXES - HVY. DUTY
RC-83 (2 Sheets)	May 1, 1978	HIGHWAY LIGHTING - LIGHTING POLE DETAILS
RC-84	June 1, 1976	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

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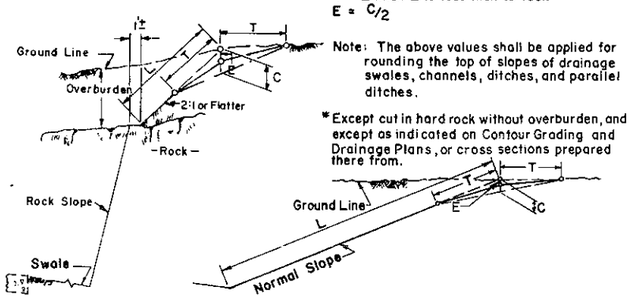
FORM 4237 REV 3-41

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

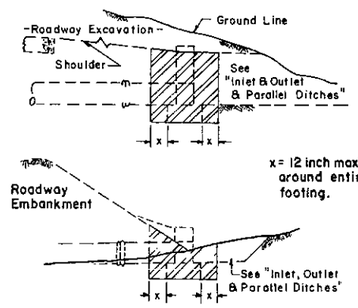
Note: The above values shall be applied for rounding the top of slopes of drainage swales, channels, ditches, and parallel ditches.

*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

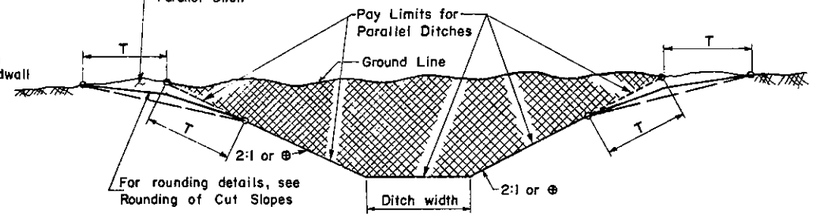


x = 12 inch maximum around entire endwall footing.

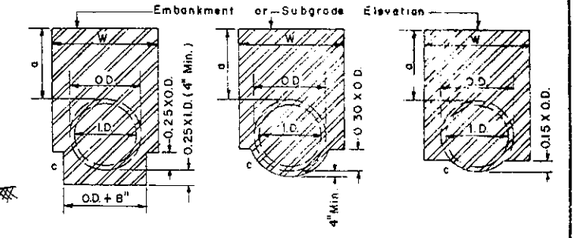
EXCAVATION FOR ENDWALLS

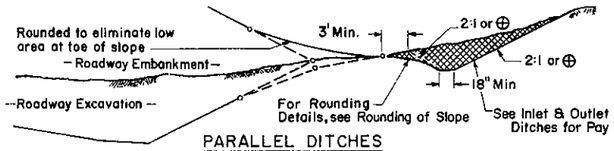
Slope⊕ As indicated on the construction cross-sections.
Classification is shown for ditch bottom widths of less than 8 feet.
When ditch width is 8 feet or more, all excavation is Class I.

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

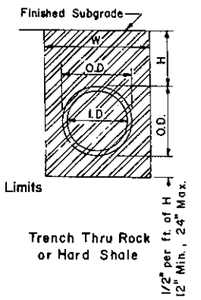


INLET AND OUTLET DITCHES

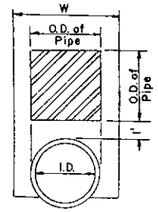




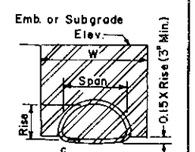
PARALLEL DITCHES



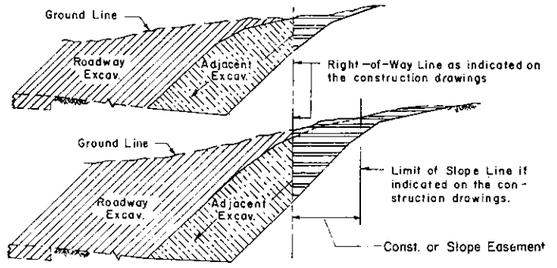
Trench Thru Rock or Hard Shale



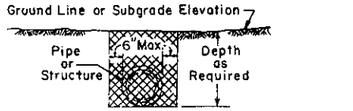
Imperfect Trench



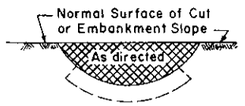
Class C Bedding for Pipe Arch



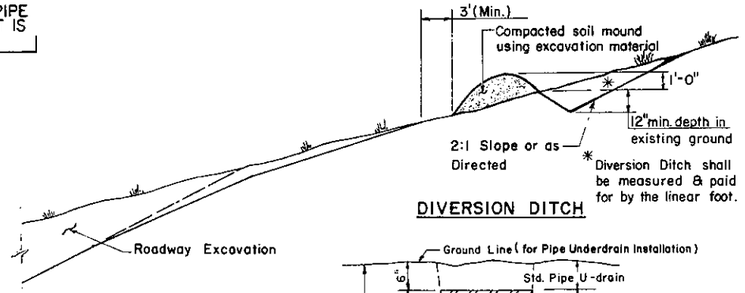
EXCAVATION ADJACENT TO ROADWAY IN LIEU OF COMMON BORROW EXCAVATION



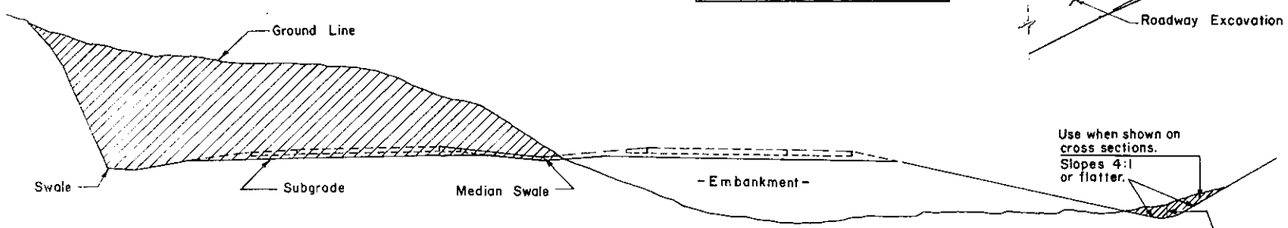
EXCAVATION FOR REMOVAL OF EXISTING PIPE OR STRUCTURE WHERE NO REPLACEMENT IS REQUIRED



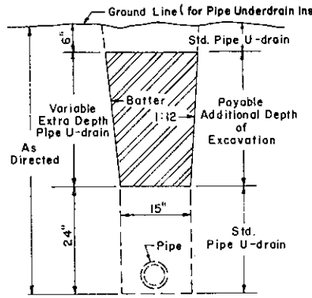
SPILLWAYS



DIVERSION DITCH



ROADWAY SECTION SHOWING CLASS 1 EXCAVATION



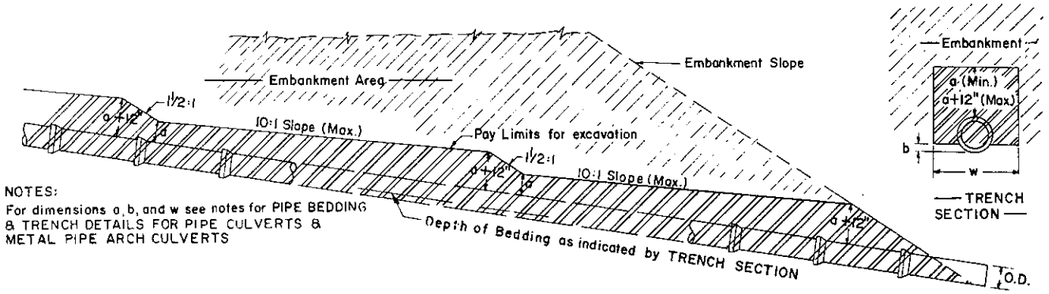
EXTRA DEPTH PIPE UNDERDRAIN

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



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

control amount of pay limit

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)

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

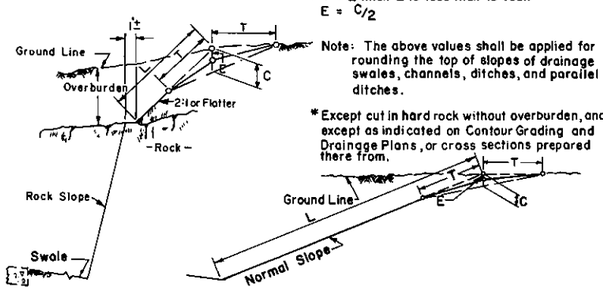
Recommended Nov. 15, 1977	Approved Nov. 15, 1977	Sht. 1 Of 1
Director, Bureau of Design	Deputy Chief Hwy. Engr.	RC-10

FORM 4237 REV 3-61

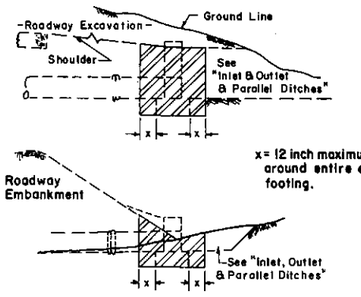
L = Length of slope.
* T = 10 feet where L is 10 feet or more.
* T = L when L is less than 10 feet.
E = C/2

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.



ROUNDING OF CUT SLOPES

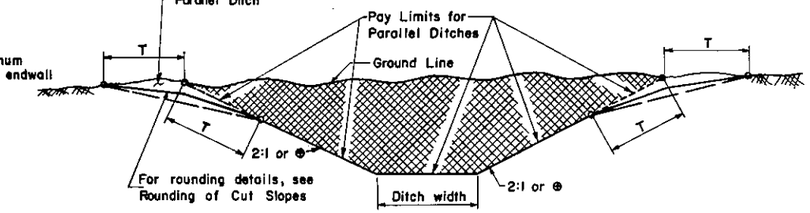


x = 12 inch maximum around entire endwall footing.

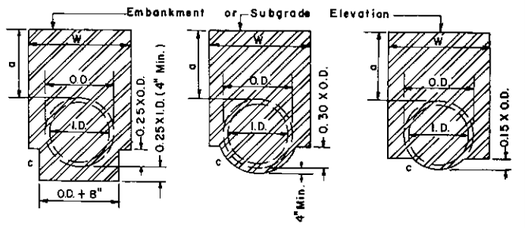
EXCAVATION FOR ENDWALLS

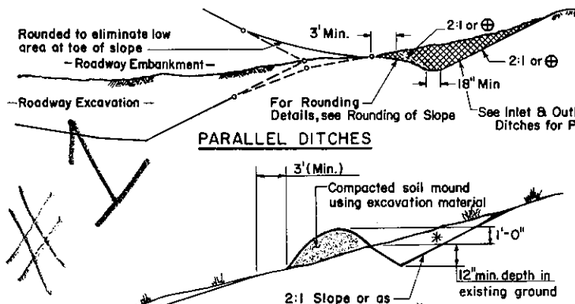
Slopes ⊕ As indicated on the construction cross-sections.
Classification is shown for ditch bottom widths of less than 8 feet.
When ditch width is 8 feet or more, all excavation is Class I.

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

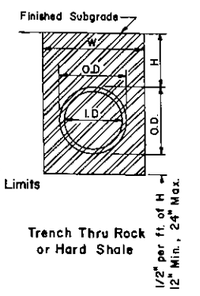


INLET AND OUTLET DITCHES

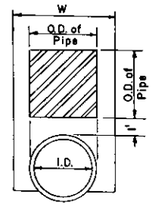




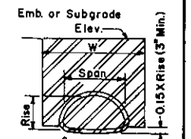
PARALLEL DITCHES



Trench Thru Rock or Hard Shale



Imperfect Trench

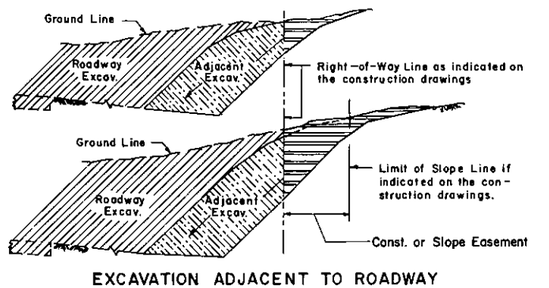


Class C Bedding for Pipe Arch

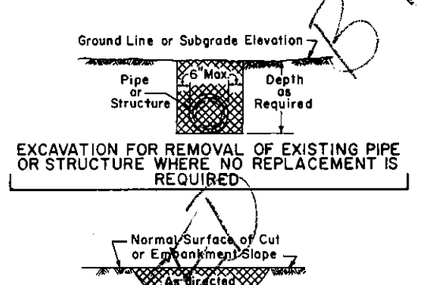
DIVERSION DITCH

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 – 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

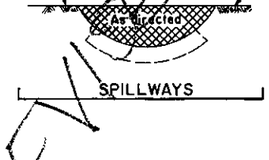
EXCAVATION FOR PIPE BEDDING & TRENCH DETAILS FOR PIPE CULVERTS & METAL PIPE ARCH CULVERTS



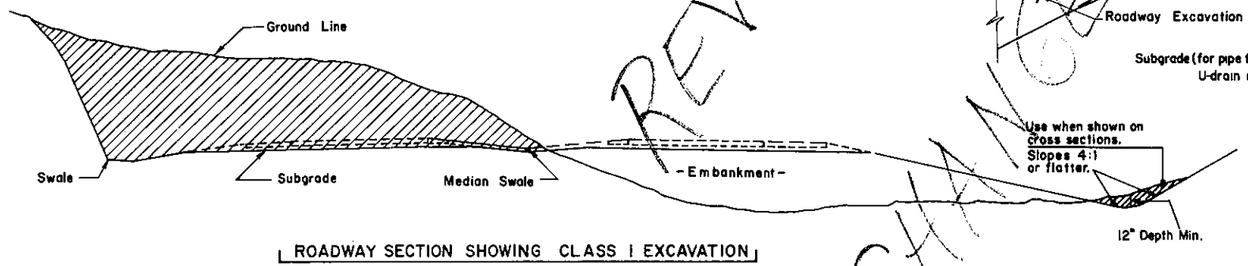
EXCAVATION ADJACENT TO ROADWAY IN LIEU OF COMMON BORROW EXCAVATION



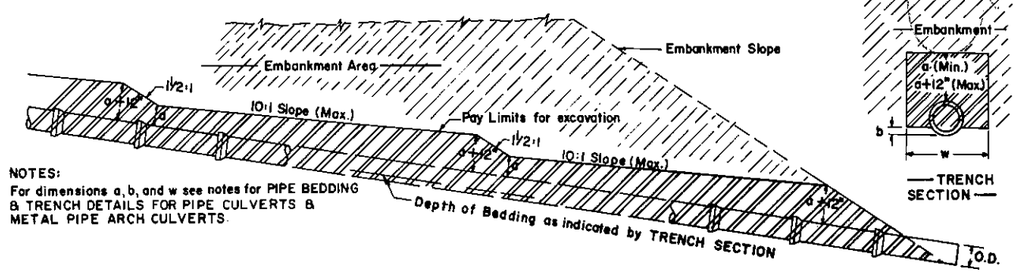
EXCAVATION FOR REMOVAL OF EXISTING PIPE OR STRUCTURE WHERE NO REPLACEMENT IS REQUIRED



SPILLWAYS

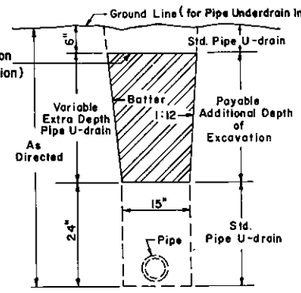


ROADWAY SECTION SHOWING CLASS I EXCAVATION



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)



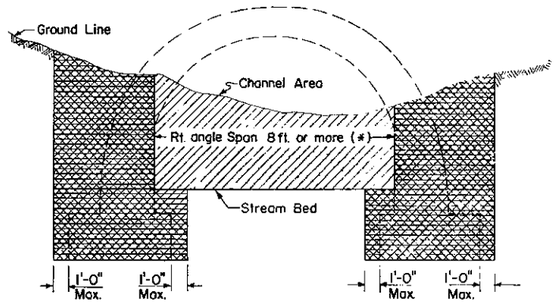
EXTRA DEPTH UNDERDRAIN

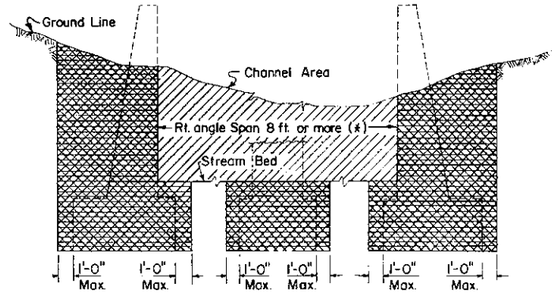
CLASS 1 EXCAV.
CLASS 2 EXCAV.
CLASS 4 EXCAV.
COMMON BORROW EXCAV.
EITHER CLASS 1 or COMMON BORROW EXCAV.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

CLASSIFICATION OF EARTHWORK

Recommended Oct 1, 1974	Approved Oct 1, 1974	Sht. 1 Of 1
B.O. Austin Director, Bureau of Design	R.R. Master Deputy Chief Hwy. Engr.	RC-10

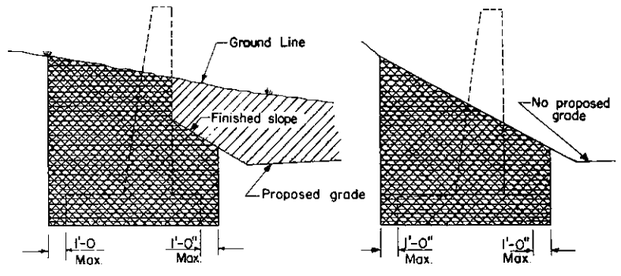




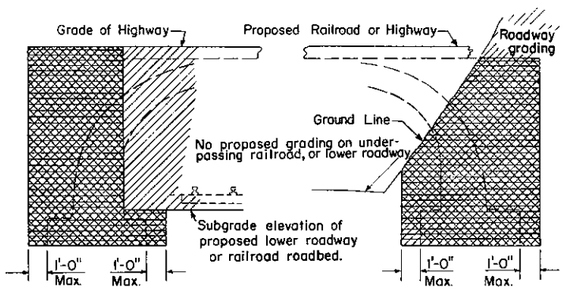
STRUCTURES OVER STREAMS

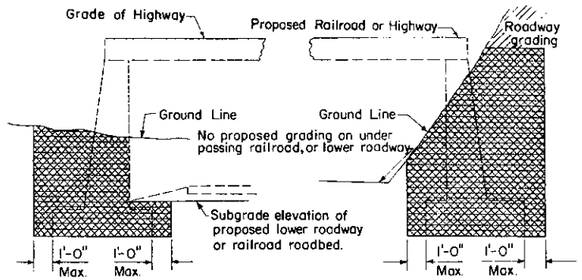
INCLUDING METAL PLATE ARCH WITH FOOTING

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

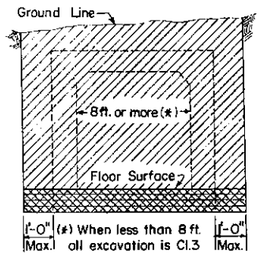


WING WALLS & RETAINING WALLS

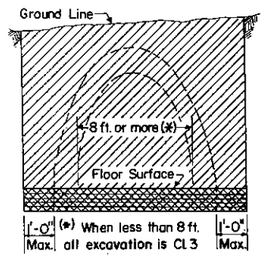




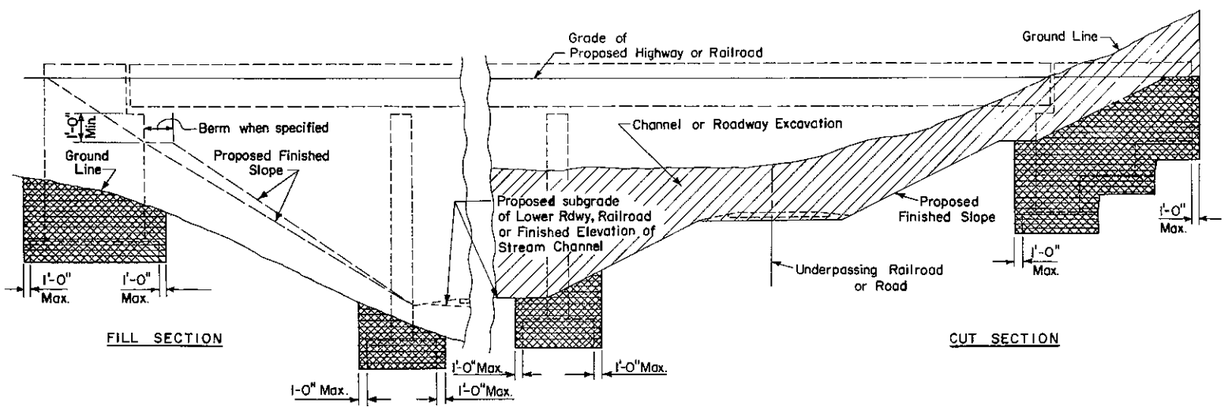
GRADE SEPARATION STRUCTURES



R.C. BOX CULVERTS



R.C. TIED ARCH CULVERTS



TYPICAL STRUCTURE ELEVATION

CLASS 1 EXCAV. →

ROADWAY ITEM
(To be included in Roadway quantities)

CLASS 3 EXCAV. →

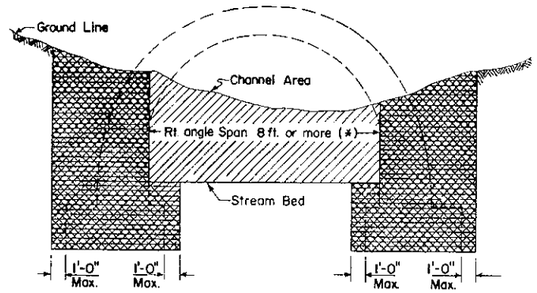
STRUCTURE ITEM
(To be included in Structure quantities)

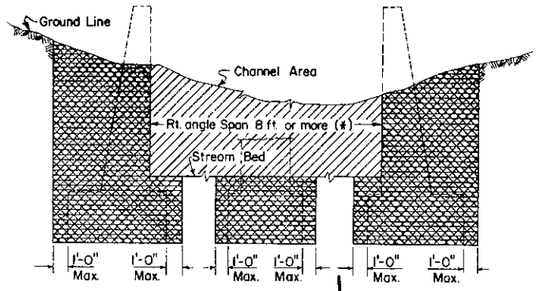
NOTE: Special situations involving excavation not entirely covered by this drawing must be defined on the design drawing by sketches and/or described in the Special Provisions.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

CLASSIFICATION OF EARTHWORK FOR STRUCTURES

Recommended July 16, 1971	Approved July 16, 1971	Sht. 1 Of 2
Director, Bureau of Design	Deputy Sec. for Highway Admin.	RC-11

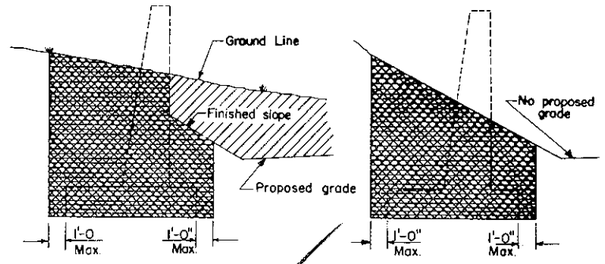




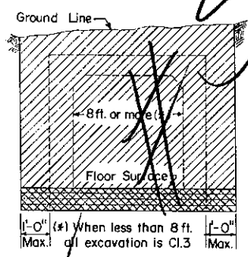
STRUCTURES OVER STREAMS

INCLUDING METAL PLATE ARCH WITH FOOTING

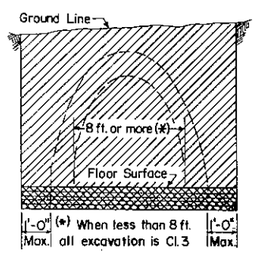
* When right angle span is less than 8' all excavation is Class 3.



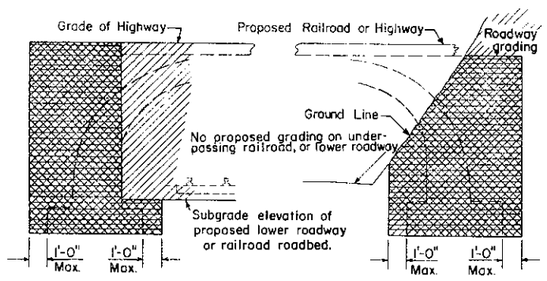
WING WALLS & RETAINING WALLS

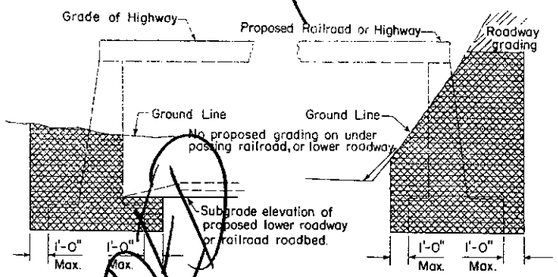


R.C. BOX CULVERTS

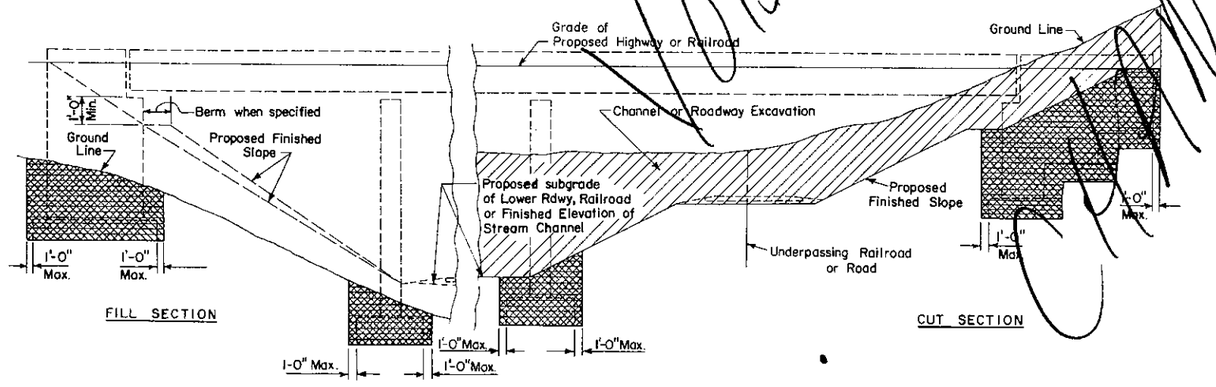


R.C. TIED ARCH CULVERTS





GRADE SEPARATION STRUCTURES



TYPICAL STRUCTURE ELEVATION

CLASS 1 EXCAV. →

ROADWAY ITEM
(To be included in Roadway quantities)

CLASS 3 EXCAV. →

STRUCTURE ITEM
(To be included in Structure quantities)

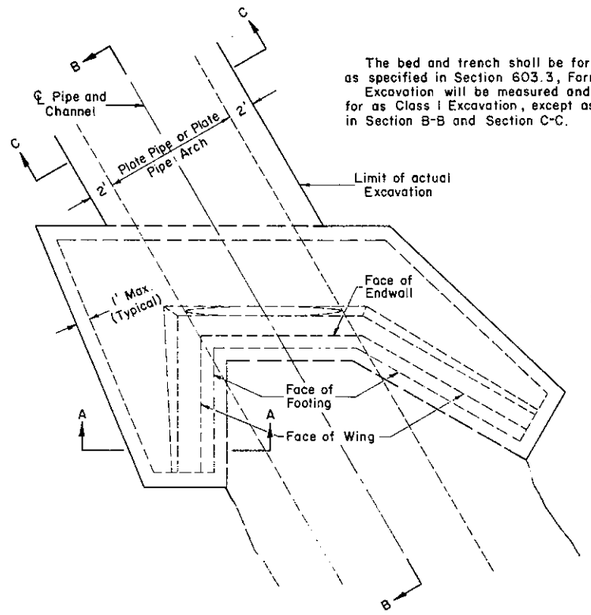
NOTE: Special situations involving excavation not entirely covered by this drawing must be defined on the design drawing by sketches and/or described in the Special Provisions.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

CLASSIFICATION OF EARTHWORK FOR STRUCTURES

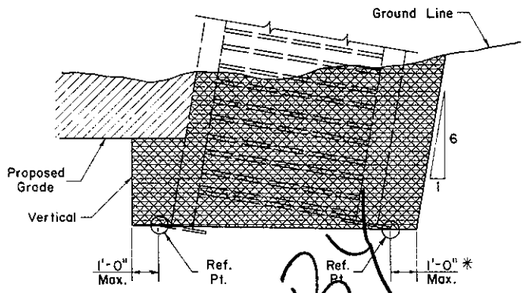
Recommended Jan. 31, 1977	Approved Jan. 31, 1977	Sht. 1 Of 2
Director, Bureau of Design	Deputy Chief Hwy. Engr.	RC-11

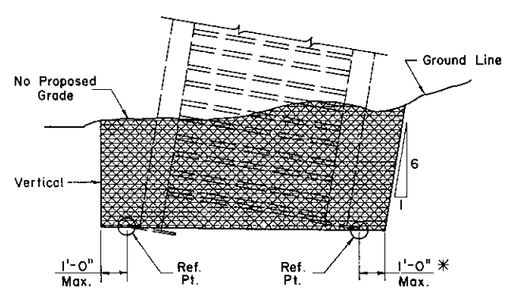
TRACED BY
FINAL BY



PLAN

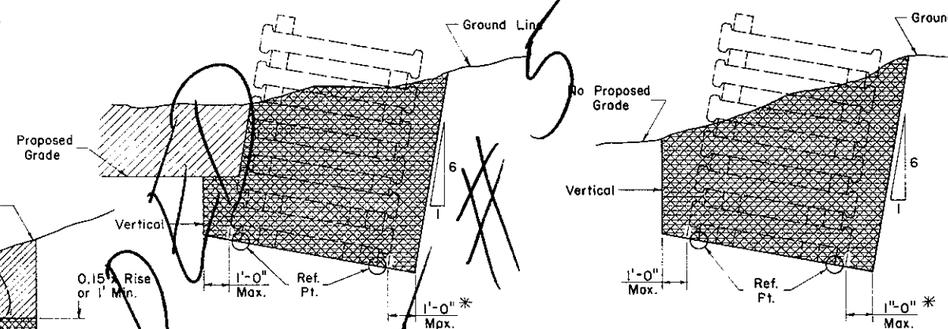
The bed and trench shall be formed as specified in Section 603.3, Form 408. Excavation will be measured and paid for as Class 1 Excavation, except as noted in Section B-B and Section C-C.





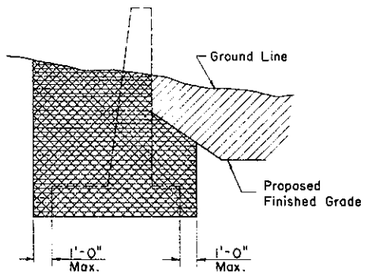
METAL CRIBBING

* 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.

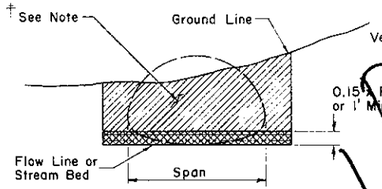


CONCRETE CRIBBING

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

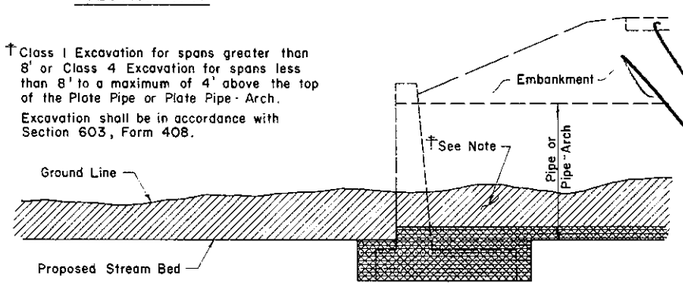


SECTION A-A



SECTION C-C

† Class 1 Excavation for spans greater than 8' or Class 4 Excavation for spans less than 8' to a maximum of 4' above the top of the Plate Pipe or Plate Pipe-Arch.
Excavation shall be in accordance with Section 603, Form 408.



SECTION B-B

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

CLASS 1 EXCAV. — ROADWAY ITEM
(To be included in Roadway quantities)

CLASS 3 EXCAV. — STRUCTURE ITEM
(To be included in Structure quantities)

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

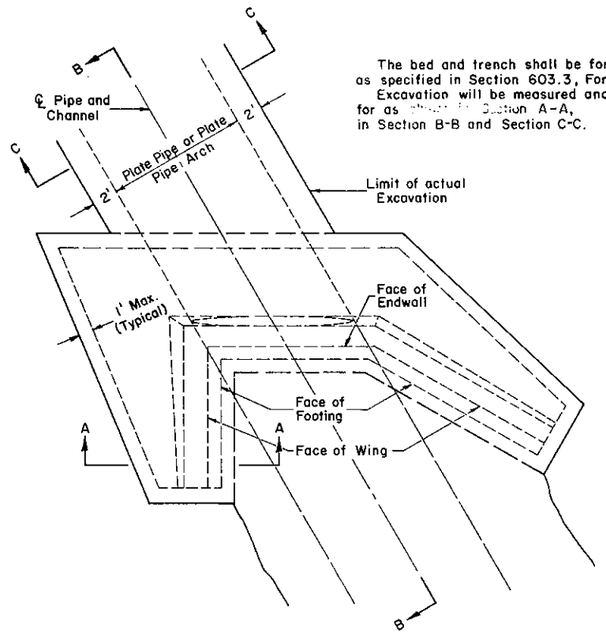
CLASSIFICATION OF EARTHWORK FOR STRUCTURES

Recommended Jan. 31, 1977
S.O. Lambie
Director, Bureau of Design

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

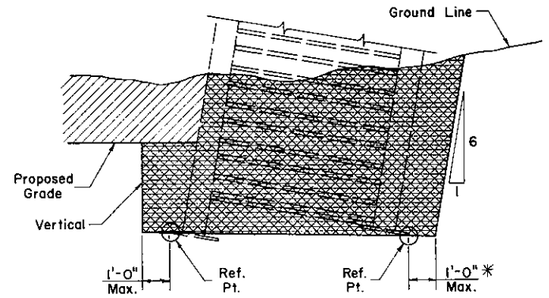
Sht. 2 Of 2
RC-11

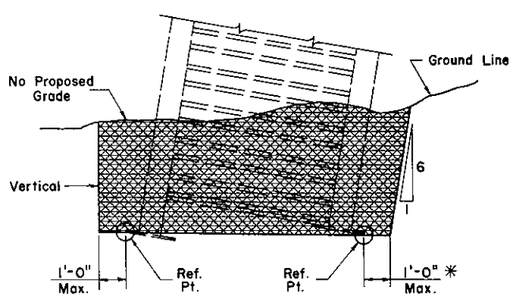
VOID CHANGE



PLAN

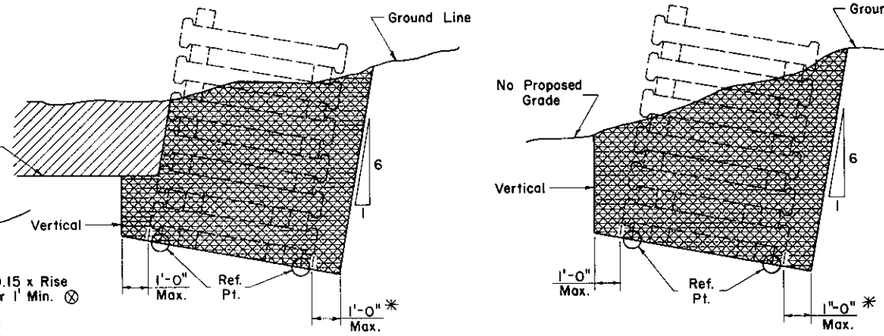
The bed and trench shall be formed as specified in Section 603.3, Form 408. Excavation will be measured and paid for as shown for Section A-A, in Section B-B and Section C-C.





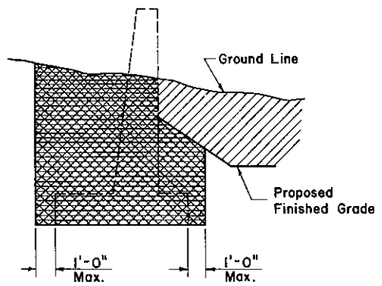
METAL CRIBBING

* 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.

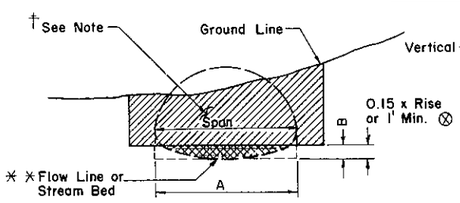


CONCRETE CRIBBING

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

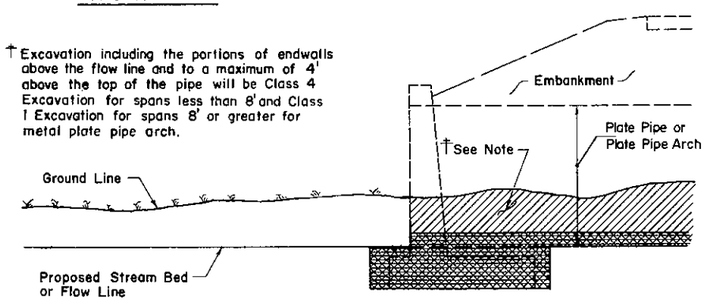


SECTION A-A



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.

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

CLASS 1 or 4 EXCAV.

ROADWAY ITEMS
(To be included in Roadway quantities)

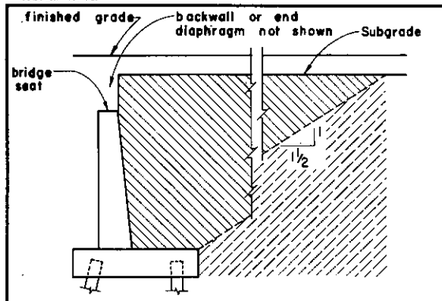
CLASS 3 EXCAV.

STRUCTURE ITEMS
(To be included in Structure quantities)

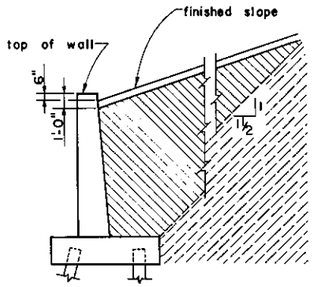
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

CLASSIFICATION OF EARTHWORK FOR STRUCTURES

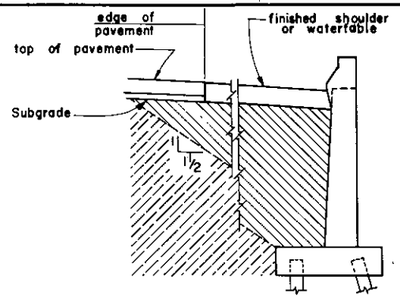
Recommended July 16, 1980	Approved July 16, 1980	Sht 2 Of 2.
Director, Bureau of Design	Deputy Sec for Highway Admin	RC-11



ABUTMENT

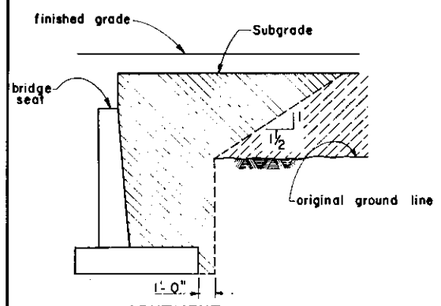


FLARED WING



U WING

TYPICAL CROSS SECTIONS - ABUTMENTS ON FILL



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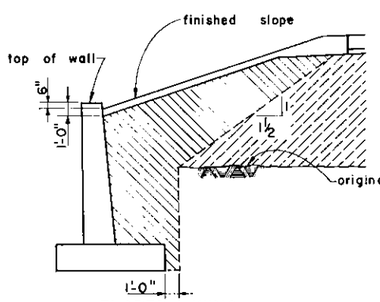

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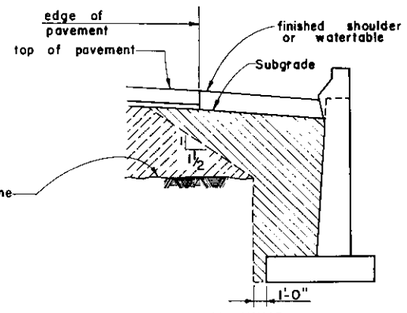
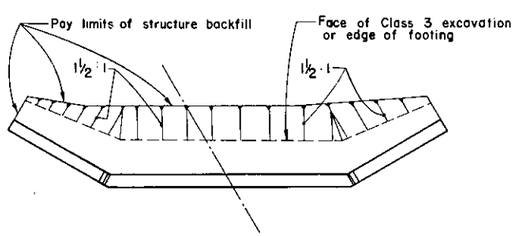
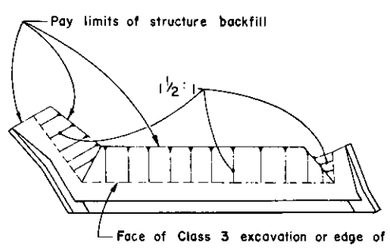


U WING

TYPICAL CROSS SECTIONS - ABUTMENTS IN CUT



PLAN - ABUTMENT WITH FLARED WINGS



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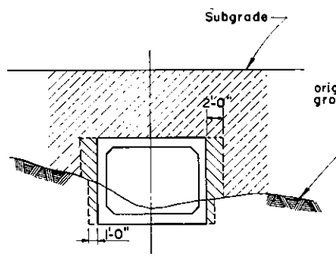
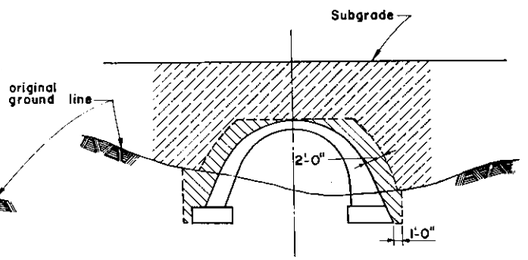
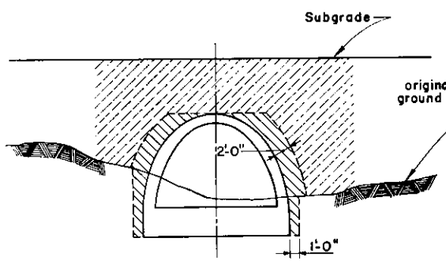


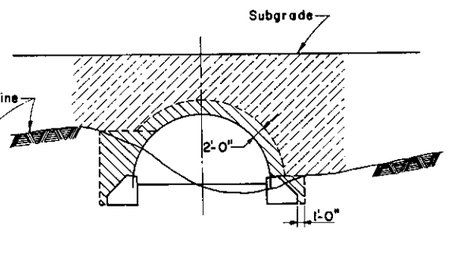
R. C. BOX CULVERT



R. C. ARCH CULVERT



R. C. TIED ARCH CULVERT



METAL PL. ARCH CULVERT

LEGEND

Structure Backfill

Embankment Material

BACKFILL & EMBANKMENT CONSTRUCTION AT STRUCTURES

NOTES

- Backfill and embankment shall be placed in accordance with this Standard Drawing unless otherwise shown on the structure drawings.
- 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.
- Structure backfill will be measured and paid for as Selected Borrow Excavation - Structure Backfill
- Backfill limits at retaining walls and wingwalls for culverts shall be treated the same as flared abutment wingwalls.
- Backfill construction at R. C. Box Culverts with the top slab at roadway grade shall be treated the same as abutments.
- 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.
- Structure backfill and adjoining embankment shall be placed simultaneously unless otherwise permitted by the engineer.
- Structure backfill quantities are shown on the structure drawings.
- 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.
- Drainage details are not shown, see structural drawings for drainage, weep holes, etc.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

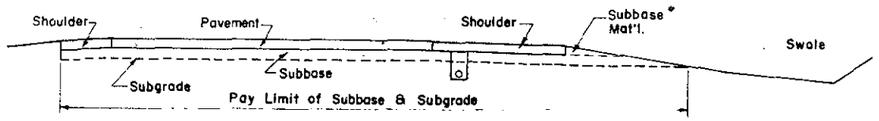
BACKFILL AT STRUCTURES

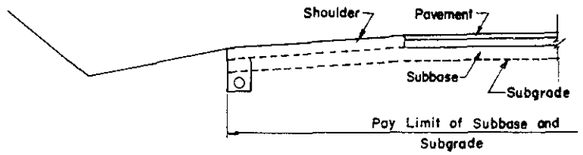
Recommended June 1, 1976
Chief Bridge Engineer

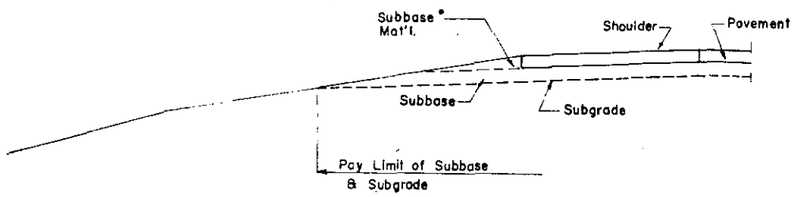
Approved June 1, 1976
Deputy Chief Hwy. Engr.

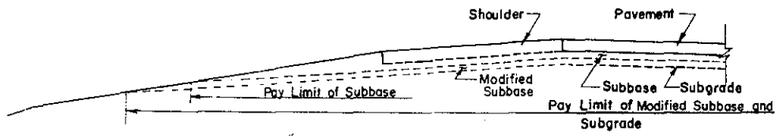
Sht. 1 Of 1

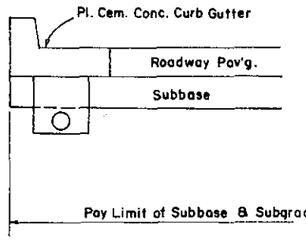
RC-12

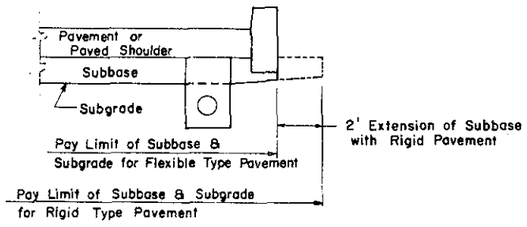


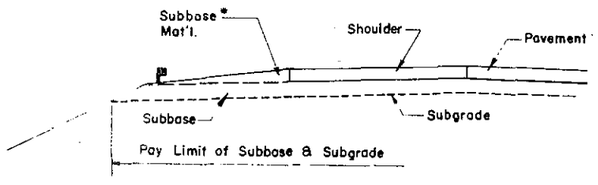












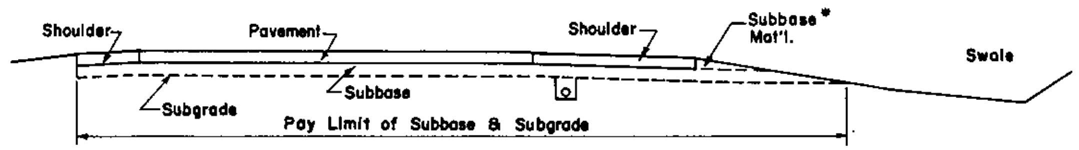
* The payment for this area of subbase will be considered incidental to the shoulder.

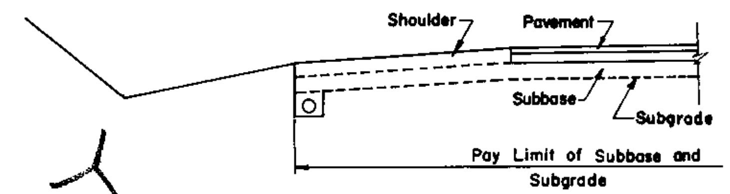
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

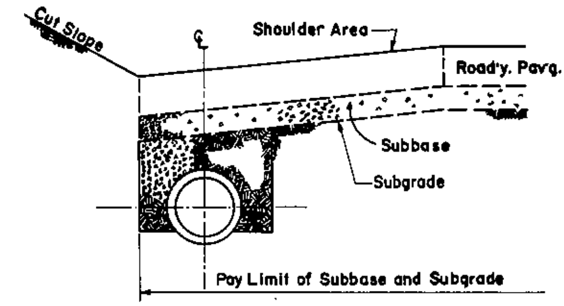
PAY LIMIT OF SUBBASE AND SUBGRADE

Recommended Nov. 15, 1977	Approved Nov. 15, 1977	Sht. 1 Of 1
B.O. Reynolds	J. R. Sebastian	
Director, Bureau of Design	Deputy Chief Hwy. Engr.	RC-13

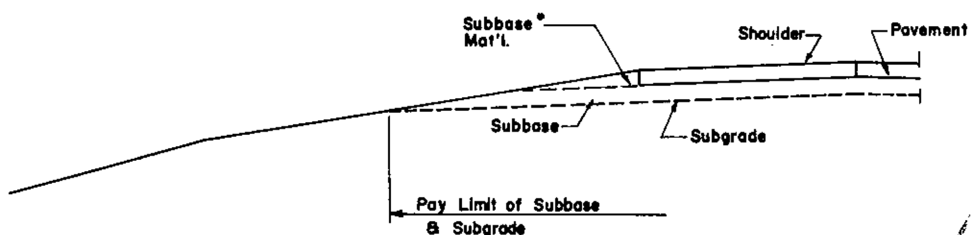
FORM 4237 REV 7-68

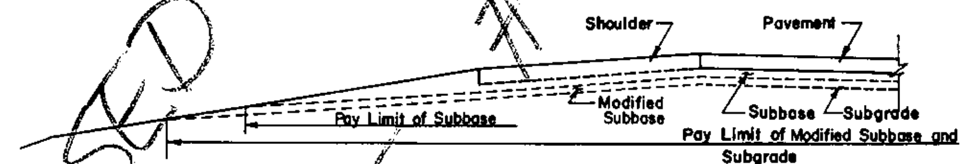




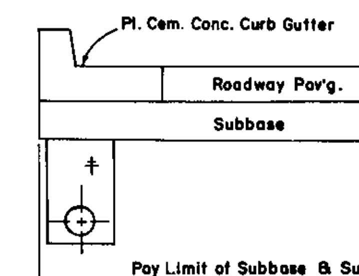


COMBINATION STORM SEWER & U'DRAIN

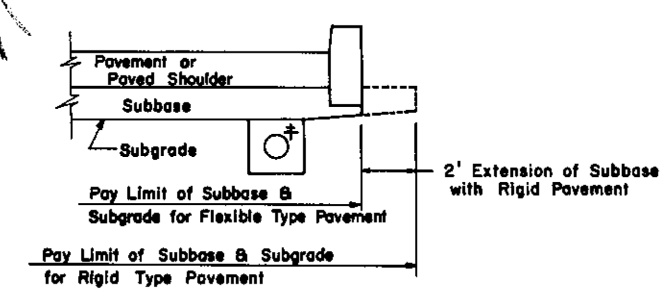


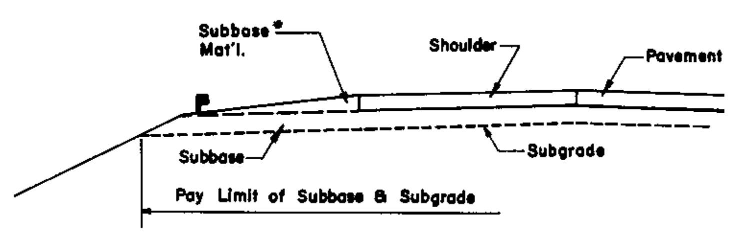


REVISED BY CHANGE #1



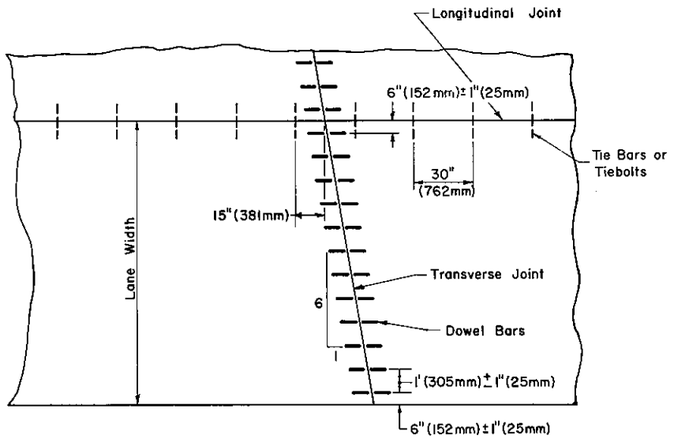
† For position of underdrain see RC-30.



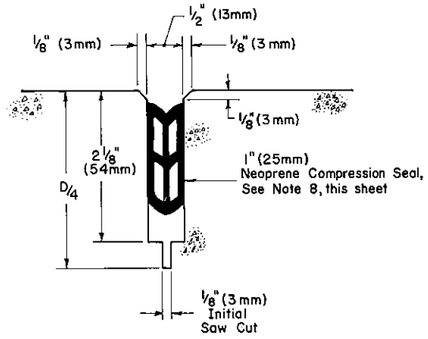


* The payment for this area of subbase will be considered incidental to the shoulder.

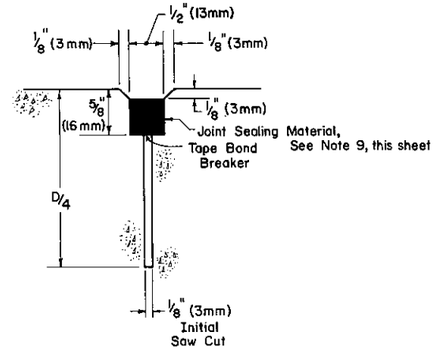
Commonwealth of Pennsylvania DEPARTMENT OF TRANSPORTATION BUREAU OF DESIGN		
PAY LIMIT OF SUBBASE AND SUBGRADE		
Recommended Aug. 20, 1975 B.O. Ronshie Director, Bureau of Design	Approved Aug. 20, 1975 R.P. Miner Deputy Chief Hwy. Engr.	Sht. 1 Of 1 RC-13



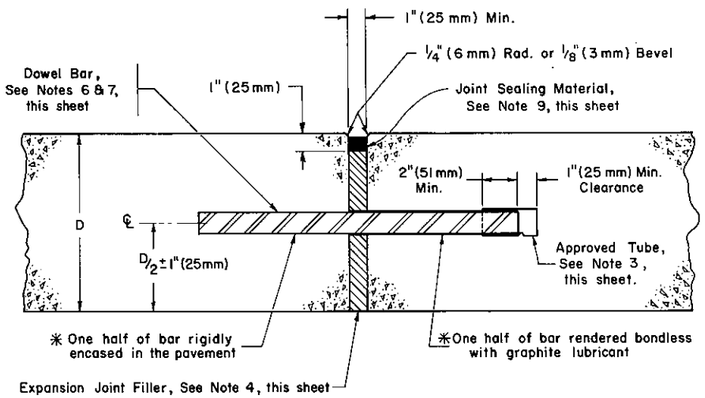
TYPICAL LAYOUT



Detail A

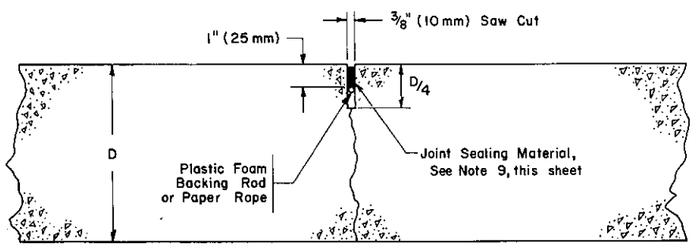


Detail B



TYPE E

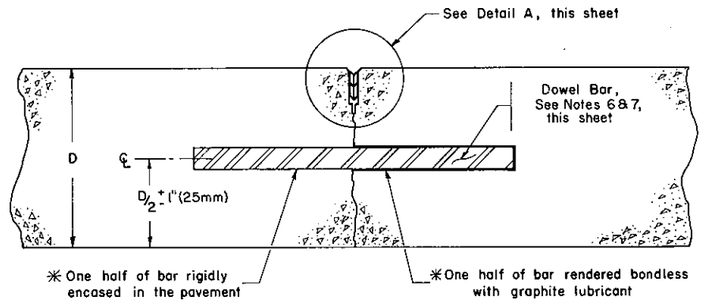
Expansion



TYPE P

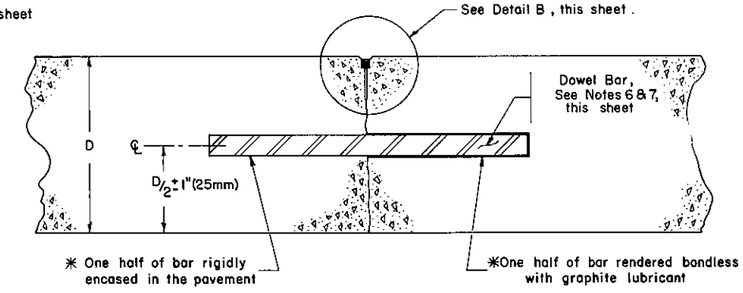
Pl. Cem. Conc. Pav't

* See Note 2, this sheet



TYPE D

Doweled R.C.C. Pav't.



TYPE R

Ramps

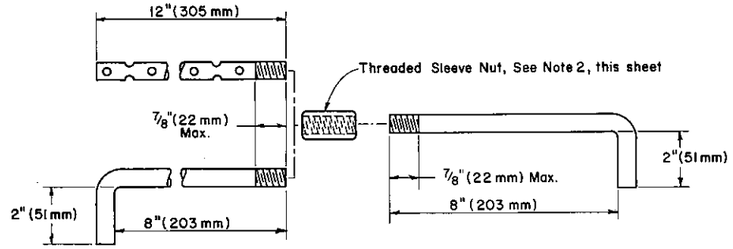
NOTES

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) drawing to the Bureau of Materials, Testing and Research for approval. The drawing must show all the 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 1/8" (3mm) 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.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

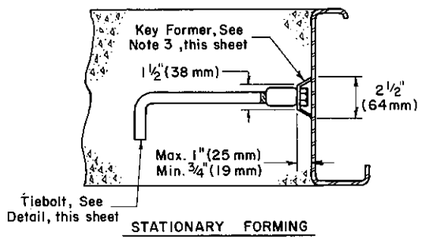
CEMENT CONCRETE PAVEMENT JOINTS

Recommended May 31, 1979	Approved May 31, 1979	Sht. 1 Of 2
Director, Bureau of Design	Chief Hwy. Engr.	RC-20

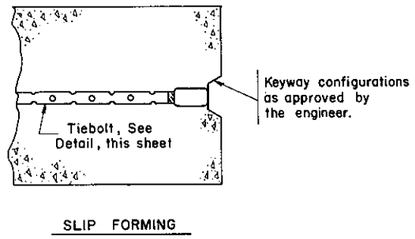


TIEBOLT DETAIL

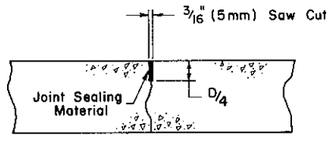
Tiebolts shall be 9/16" (14mm) Ø bar with rolled threads or 5/8" (16 mm) Ø bar with cut threads.
The assembled tiebolt shall withstand a minimum pull-out or yielding load of 15,000 pounds (66,725 N).
Only Tiebolts which are supplied by an approved manufacturer as listed in Bulletin No. 15 will be permitted.



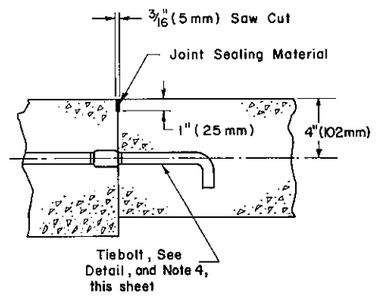
STATIONARY FORMING



SLIP FORMING

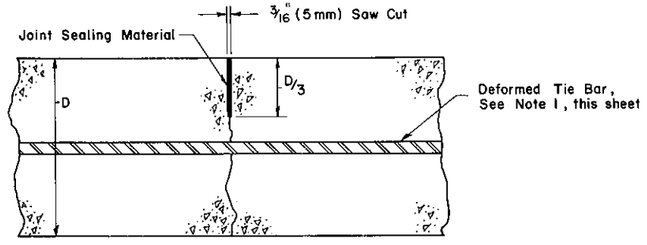


TRANSVERSE JOINT



Construction

LONGITUDINAL JOINT



Contraction

TYPE L

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"(76 mm)	± 1/2"(13mm)
7"(178mm)	4	3 1/4"(83mm)	± 1/2"(13 mm)
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 2 7/32" (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.

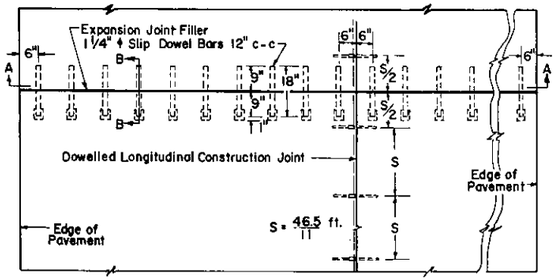
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

CEMENT CONCRETE PAVEMENT JOINTS

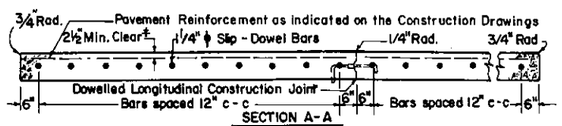
Recommended May 31, 1979
B. D. Lourkie
Director, Bureau of Design

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

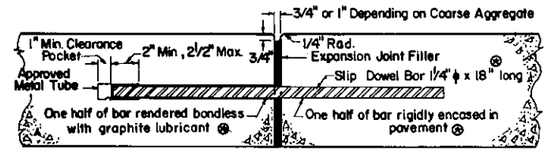
Sht. 2 Of 2
RC-20



PLAN OF 8, 9, OR 10 INCH UNIFORM DEPTH PAVEMENT



SECTION A-A



SECTION B-B

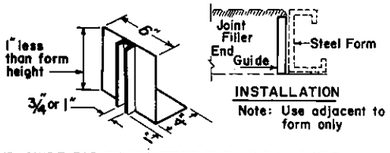
Expansion joint Filler shall have a minimum thickness of 1 inch if slag is used as a coarse aggregate and 3/4 of an inch if stone or gravel is used. It shall be cut to conform to the cross section of the pavement, except that the width shall be 3/4 of an inch less than the depth of the pavement, and shall be furnished in strips equal to the width of the pavement slab. The top surface shall be smooth, and holes punched for the slip-dowel bars (load transfer units) shall provide a snug fit without loss in thickness of the material.

A removable steel joint shield conforming to the crown of the pavement slab shall be used over transverse expansion joints. It shall be not thinner than 12 gauge, U.S. Std., and of sufficient stiffness to retain its shape. It shall be formed to provide a snug fit over the joint material and shall extend downward for a distance sufficient to prevent displacement or bending of the joint material from its vertical position. The ends of the joint shield shall be bevelled as may be necessary to clear mechanical finishing equipment.

An approved metal tube shall be placed over the graphited end of all slip-dowel bars. This tube shall provide a snug fit for a distance of 2 inches and shall provide a minimum 1 inch clearance pocket assured by means of a positive spacing device.

Steel end guides shall be not thinner than 16 gauge, U. S. Std., and shall be used at each end of the joint

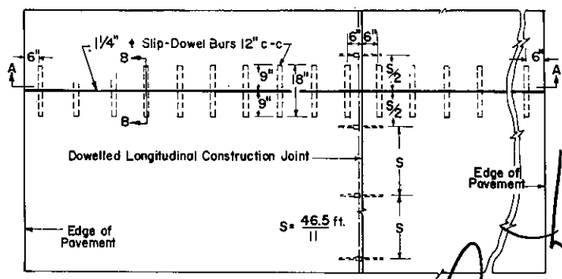
Transverse expansion joints shall be placed in ramp pavements and at other locations where pavement expansions and contractions can not be handled by the pavement relief joint. These locations shall be shown on the construction drawings. Transverse expansion joints in ramp pavements shall be placed at intervals of not over 279 feet. (See DETAIL-A)



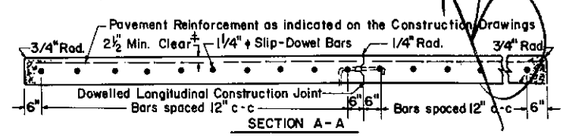
END GUIDE FOR TRANSVERSE EXPANSION JOINTS

TRANSVERSE EXPANSION JOINTS

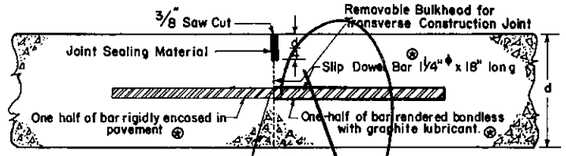
⊛ Plastic coated dowel bars supported on approved baskets may be used as an alternate method of load transfer device. The requirements for slip dowel bars in the general notes shall also apply to the plastic coated dowel bars. The requirements for lubricating & bonding the slip dowel bars do not apply to Plastic coated dowel bars.



PLAN OF 8, 9, OR 10 INCH UNIFORM DEPTH PAVEMENT

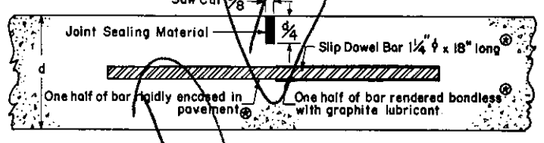


SECTION A-A



SECTION B-B

TRANSVERSE CONSTRUCTION JOINT



SECTION B-B

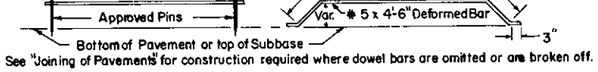
TRANSVERSE CONTRACTION JOINT

Joints shall be placed at intervals of not over 46½ feet and at 46½ feet from expansion joint or pavement relief joints.

‡ Reinforcement Clearance Requirement:

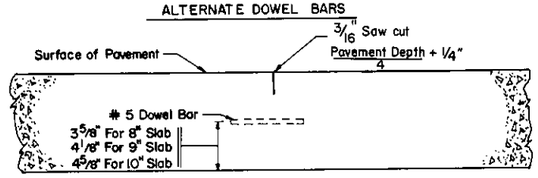
Pav't Depth	Min.	Max.
8"	2½"	3½"
9"	2½"	4"
10"	2½"	4"

TRANSVERSE CONSTRUCTION & CONTRACTION JOINTS

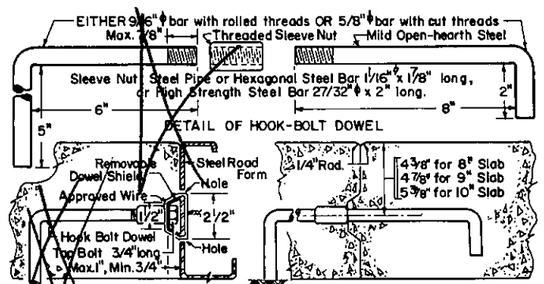


See "Joining of Pavements" for construction required where dowel bars are omitted or are broken off.

ALTERNATE DOWEL BARS

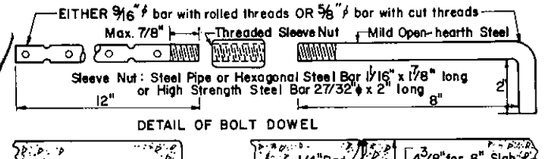


FOR CONSTRUCTION OF TWO LANES AT ONE TIME



The assembled dowel shall withstand a minimum load of 15,000 pounds.
The 5" leg of the dowel will extend into the subgrade for all pavement depths.
The dowel shield shall stop 6" to 8" each side of all transverse joints.
The removable dowel shield, either steel or iron not thinner than 16 gauge U.S. Std. shall be securely wired to the steel forms. Holes in the shield shall be punched so as to permit the placing of the hook bolt dowels in the shield at the required spacings.
Two holes shall be provided in the roadway forms 2½" apart vertically, for wiring the dowel bar shield in the slab, with a maximum horizontal spacing of 3 feet between sets of holes.

HOOK-BOLT DOWEL & REMOVABLE DOWEL SHIELD FOR CONSTRUCTION OF ADJOINING SUCCESSIVE LANES



Keyway and bolt dowel configurations as approved by the Department.

The assembly dowel shall withstand a minimum load of 15,000 lbs.
Manual placing of dowel assemblies will not be permitted.

BOLT DOWEL ASSEMBLY FOR USE WITH SLIP FORM PAVING EQUIPMENT

DOWELLED LONGITUDINAL CONSTRUCTION JOINTS

GENERAL NOTES

TRANSVERSE CONTRACTION, CONSTRUCTION, & EXPANSION JOINTS

Slip-dowel bars of the size, spacing and position shown on this drawing shall be used as load transfer units in all transverse expansion and construction joints. The center of bars shall be located vertically at least 3½ inches below the finish pavement surface or 3½ inches above the theoretical bottom of pavement or between these limits as desired.

The perimeter of the free end of all slip-dowel bars in expansion and construction joints shall be a true circle and free from burrs.

One-half the length of each bar shall be rendered bondless by a coating of graphite lubricant, and this half of the bars in a transverse joint assembly may be placed all on one side of the joint or may be placed alternately on either side of said joint. The uncoated half of the bar shall be rigidly encased in the pavement.

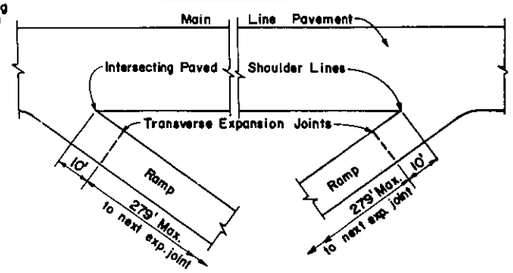
This Standard does not indicate details for the method of supporting the slip dowel bars required as load transfer units in all transverse expansion and transverse construction joints. A drawing (22 inches by 36 inches) showing necessary assembly details for supporting the bars in correct vertical and horizontal position for expansion and for construction joint assemblies shall be prepared by the manufacturer or his representative, and it shall be submitted to and be approved by the Chief Engineer prior to furnishing assemblies on any purchase order or for use on any contract.

The Transverse expansion joints shall not be used in main line pavements unless specifically shown on the drawings, however they shall be used in ramp pavements and will be placed at normal intervals of not over 279 feet.

PAVEMENT WIDENING

Transverse expansion joints shall be placed opposite existing expansion joints except that they shall not be closer than 46½ feet. Transverse contraction and construction joints shall be placed opposite existing construction joints, cleft-type joints or cracks except that they shall not be closer than 24 feet to adjacent transverse expansion or construction joints.

DETAIL - A



LOCATION OF FIRST TRANSVERSE EXPANSION JOINT IN RAMP PAVEMENT

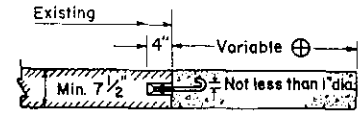
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

PAVEMENT JOINTS

Recommended Dec. 1, 1971
R R Moser
Location & Design Engr.

Approved Dec. 1, 1971
W J Raver
Deputy Chief Hwy. Engr.

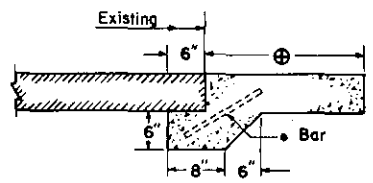
Sht. 1 of 2
RC-20



Expansion anchor bolts ⅝ inch in diameter and 11 inches long with 90° to 180° bends, shall be placed in accordance with Dowelled Longitudinal Construction Joint requirements shown on RC-20.

The design and quality of the bolts and the number of lead slugs or swedging units used shall be approved by the Department.

EXPANSION ANCHOR BOLT METHOD



Concrete for underpinning shall be the same mix as, and shall be placed integral with, the new pavement.

Excavation made to greater dimensions than those shown for underpinning shall be replaced with concrete, and backfilling with other material will not be permitted.

Corner breaks shall be repaired by the underpinning method

The underpinning method should not be used if it will interfere with subbase drainage.

UNDERPINNING METHOD

⊕ Payable width of pavement, subgrade, and excavation

Either method shall be used to join new pavement. Only the underpinning method shall be used where the depth of existing pavement or concrete base is less than 7½ inches.

Where dowel bars are broken off or are omitted from dowelled longitudinal construction joints, either an expansion anchor bolt or underpinning shall be used.

Premoulded expansion joint filler shall be cut to the cross section of the new pavement. Two sections of filler, if satisfactorily lapped or clipped together, may be used with the underpinning method.

No separate or additional payment will be allowed for materials or labor involved in joining pavement by either method.

Adequate subbase drainage must be provided when the underpinning method is used.

* This bar (#4 × 1'-6" long) is required only in underpinning where dowel bars are broken off or omitted from longitudinal construction joints.

JOINING OF PAVEMENTS

PATCHES

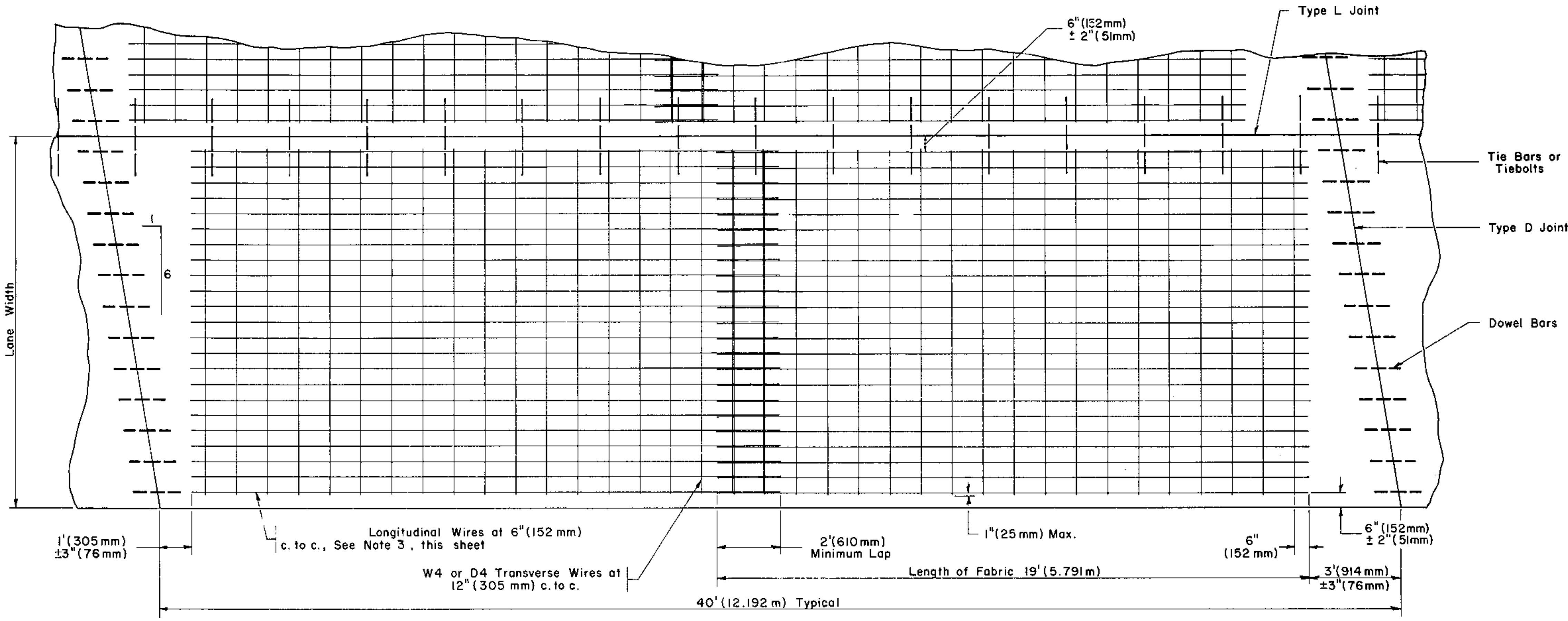
1. The minimum width of patch will be a single lane width.
2. The side of the patch adjacent to a longitudinal joint shall be dowelled or underpinned as per widening.
3. The sides of the patch in the transverse direction shall be doweled only
4. A saw cut 2 inches deep will be made along each side of the patch that is not bound by a joint.
5. The depth of the patch will equal that of the existing concrete except the minimum will be 8 inches.
6. Reinforcement will be replaced in kind if not noted otherwise

VOIDED BY CHANGE #A

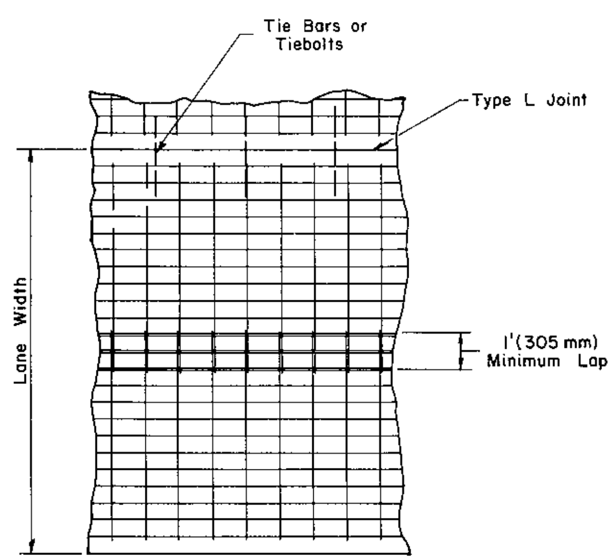
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

PAVEMENT JOINTS

Recommended Dec. 1, 1971	Approved Dec. 1, 1971	Sht. 2 of 2
R.R. Mace	W.J. Rover	RC-20
Location & Design Engineer	Deputy Chief Hwy. Engr.	



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 $2\frac{1}{2}$" (64mm) to a maximum of one half the pavement depth minus $\frac{1}{2}$" (13mm).

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

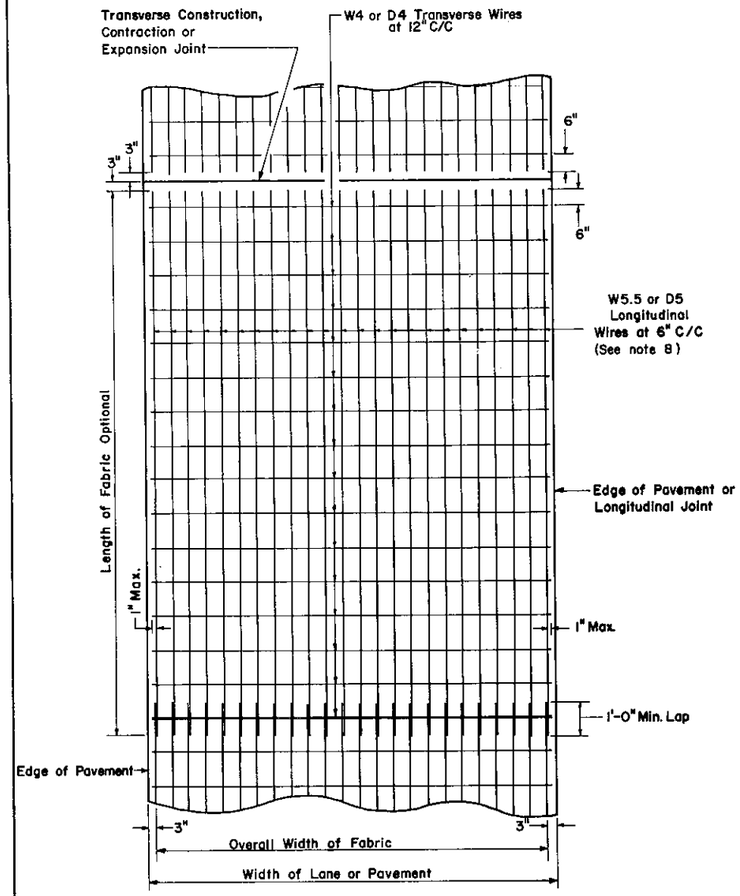
REINFORCED CEMENT CONCRETE PAVEMENT

Recommended May 31, 1979
Director, Bureau of Design

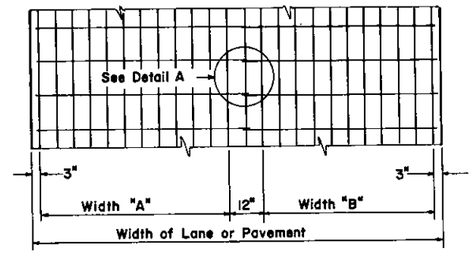
Approved May 31, 1979
Chief Hwy. Engr.

Sht. 1 Of 1

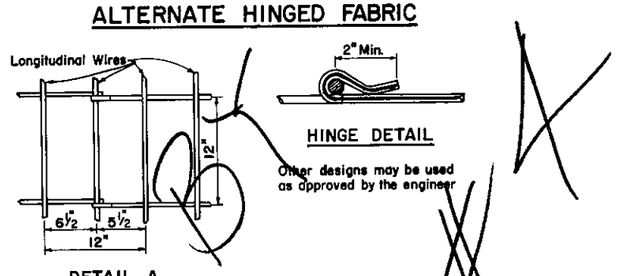
RC-21



WIRE FABRIC REINFORCEMENT



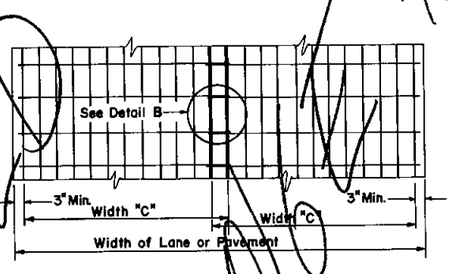
ALTERNATE HINGED FABRIC



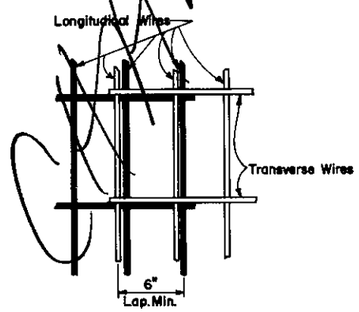
HINGE DETAIL

Other designs may be used as approved by the engineer

DETAIL A



ALTERNATE LAPPED FABRIC



DETAIL B

WIDTH OF LANE OR PAVEMENT	NUMBER OF WIRES	WIDTH "A"	WIDTH "B"	WIDTH "C"	OVERALL WIDTH OF FABRIC
11'-0"	22	60"	54"	66"	10'-6"
12'-0"	24	66"	60"	72"	11'-6"
13'-0"	26	72"	66"	78"	12'-6"
14'-0"	28	—	—	84"	13'-6"
15'-0"	30	—	—	90"	14'-6"
16'-0"	32	—	—	96"	15'-6"
17'-0"	34	—	—	102"	16'-6"
18'-0"	36	—	—	108"	17'-6"

GENERAL NOTES

1. Fabric reinforcement shall be constructed in accordance with Specification Form 408.
2. For variable width pavement and for widths not shown, the reinforcement shall be cut as required.
3. Wire fabric reinforcement may be placed with transverse wires above or below longitudinal wires.
4. Depth for placement of wire fabric reinforcement, measured from top of pavement to the top of fabric shall be as follows with a tolerance of ± ½":

Pav't. Depth	Depth of Fabric
8"	3"
9"	3½"
10"	3½"

5. Hinged fabric reinforcement may be used for 11'-0", 12'-0", and 13'-0" widths where longitudinal joints are not permitted.
6. Lapped fabric reinforcement may be used for all widths where longitudinal joints are not permitted.
7. All longitudinal and transverse laps of wire fabric reinforcement shall be securely tied.
8. On projects where additional lanes are being added to existing cement concrete pavements and the existing joint spacing is more than 46.5', the longitudinal wire size shall be W6 or D5.5.
9. 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.

VOIDED

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

REINFORCEMENT FOR REINFORCED CEMENT CONCRETE PAVEMENT

Recommended Aug. 20, 1975
B.O. Rowhin
Director, Bureau of Design

Approved Aug. 20, 1975
Chas. R. Master
Deputy Chief Hwy. Engr.

Sht. 1 Of 1

RC-21

TRACED BY
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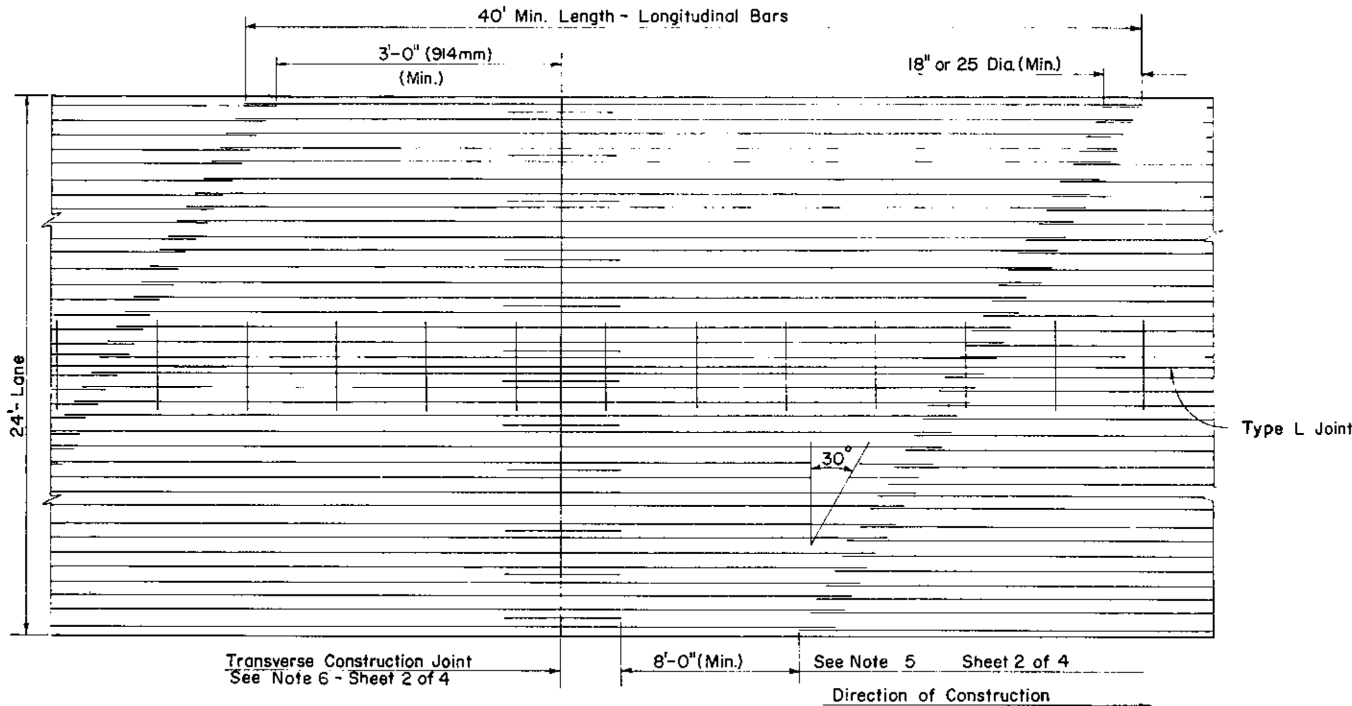
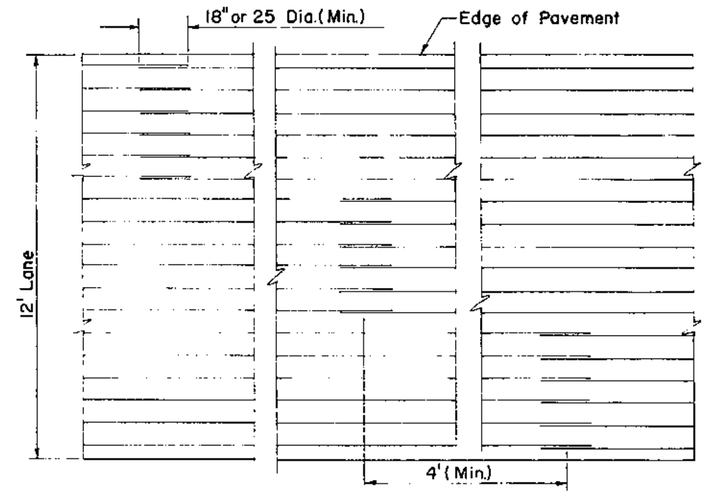
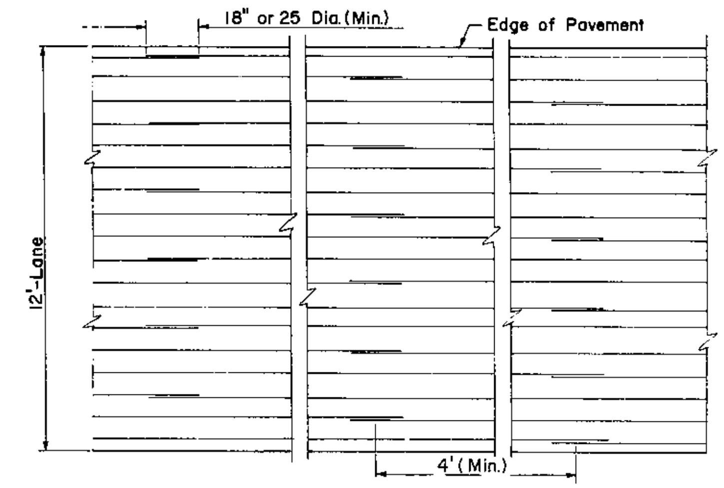


PLAN LOOSE BARS



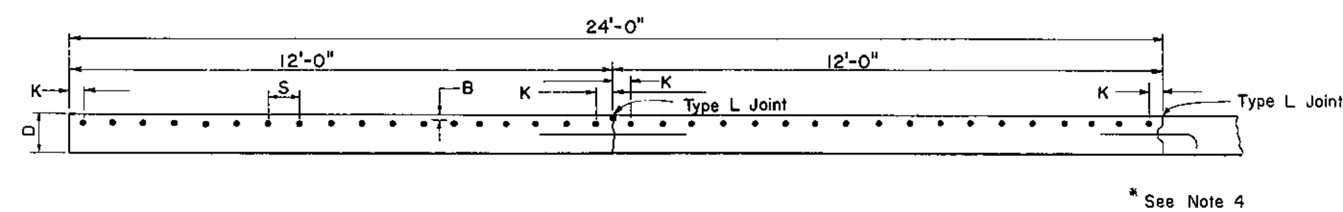
ALTERNATE PLAN LOOSE BARS

See Note 3



ALTERNATE PLAN LOOSE BARS

See Note 3



TYPICAL CROSS SECTION LOOSE BARS

TABLE I

	Thickness D (inches)	Longitudinal Steel 12' Lane: No. of Bars	Bar Size	S (in.)	K (in.)	Transverse Bars ⊕ (when required)
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

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:

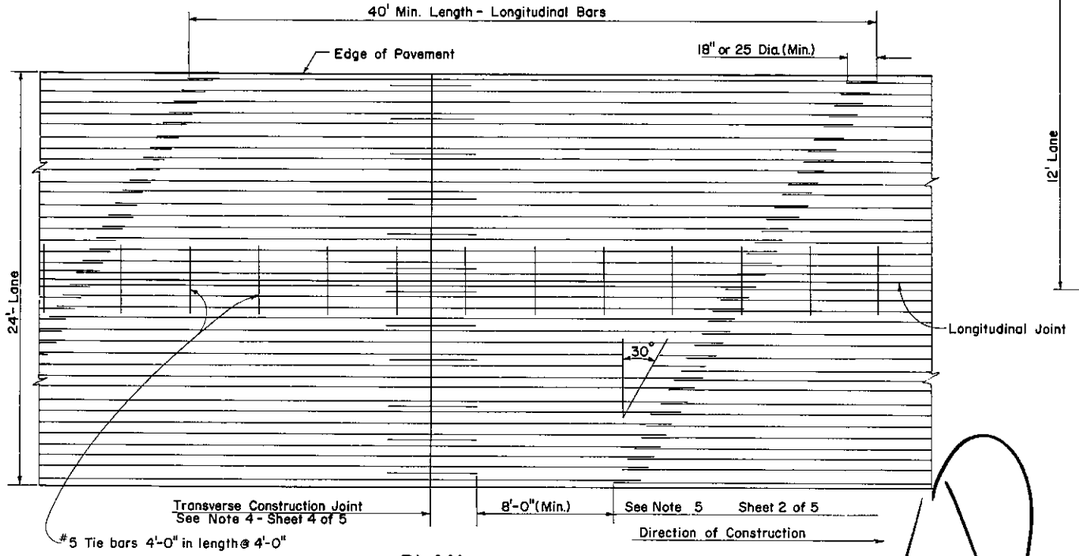
D	B	Tolerance
6" (152mm)	3" (76mm)	±½" (13mm)
7" (178mm)	3¼" (83mm)	±½" (13mm)
8" (203mm)	3¼" (83mm)	±¾" (19mm)
9" (229mm)	3½" (89mm)	±¾" (19mm)
10" (254mm)	3¾ (95mm)	±¾" (19mm)

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.

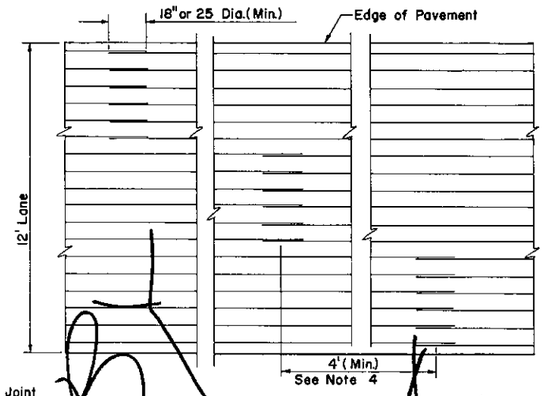
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

CONTINUOUSLY REINFORCED CONCRETE PAVEMENT

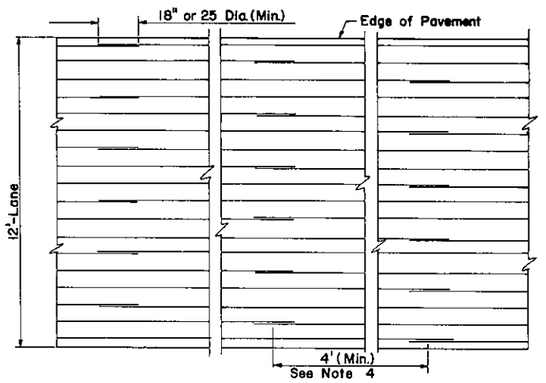
Recommended May 31, 1979 B.D. [signature] Director, Bureau of Design
Approved May 31, 1979 [signature] Chief Hwy. Engr.
Sht. 1 Of 4
RC-22



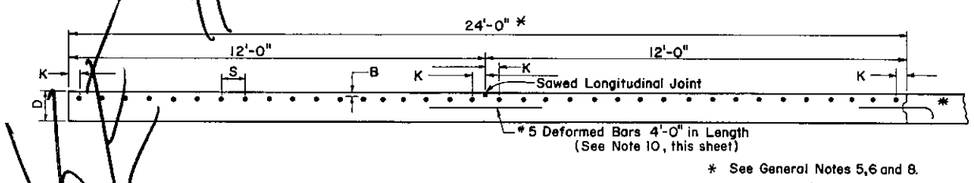
PLAN
LOOSE BARS



ALTERNATE PLAN
LOOSE BARS



ALTERNATE PLAN
LOOSE BARS



* See General Notes 5,6 and 8.

TYPICAL CROSS SECTION
LOOSE BARS

TABLE I

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

⊕ Transverse bars required by special provision only

NOTES

1. Material and workmanship shall be in accordance with Specification Form 408.
2. All Longitudinal Bars shall have a minimum lap of 18" or 25 diameters whichever is greater.
3. Bars of high yield strength shall not be bent.
4. No more than one-third of the Longitudinal Bars shall be lapped within the same transverse plane. The minimum distance between laps is 4'-0".
5. For 36' pavement width in one operation on a straight slope, both joints at 12' intervals shall be sawed Longitudinal Joints in accordance with Form 408, Section 501.3. For 36' pavement width in two operations, 24' and 12' widths, the center joint for the 24' width shall be a sawed Longitudinal Joint and the remaining joint shall be a keyed and tied construction joint.
6. For 48' pavement width, the outer joints shall be sawed longitudinal joints and the center joint shall be a keyed construction joint with no ties.
7. Longitudinal construction joints are to be constructed in accordance with Standard Drawings RC-20, except ties are eliminated at the center joint of the 48' pavement width.
8. Transverse steel bars, when required by special provision, may be provided in full width lengths for 24' and 36' pavement widths, and tie bars will not be required. When Transverse Bars are provided in one lane widths, the 4' tie bar shall be provided and be positioned between the Transverse Bars. Transverse Bars shall have a 2" min. clearance from end of bar to edge of pavement or lane.
9. 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 ± ¾":

D	B
8"	3¼"
9"	3½"
10"	3¾"

10. The preferred location for the tie bars is at mid-depth. The tie bars shall be placed below the longitudinal steel for any method of steel placement.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

CONTINUOUSLY REINFORCED CONCRETE PAVEMENT

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

Approved June 1, 1976
Deputy Chief Hwy. Engr.

Sht. 1 of 5
RC-22

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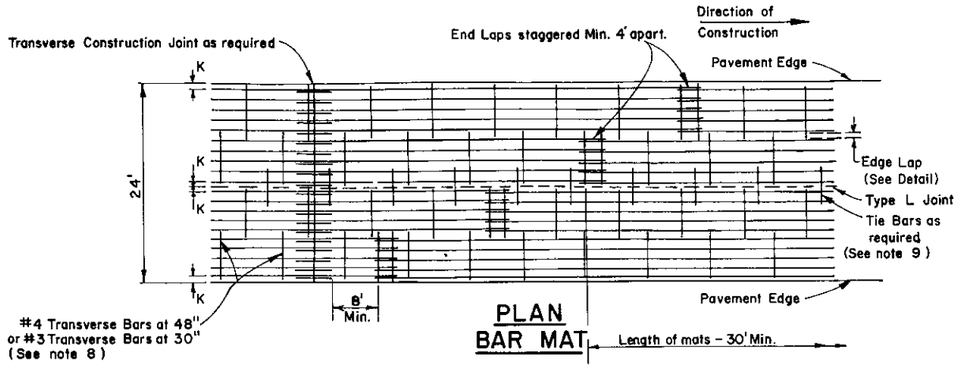
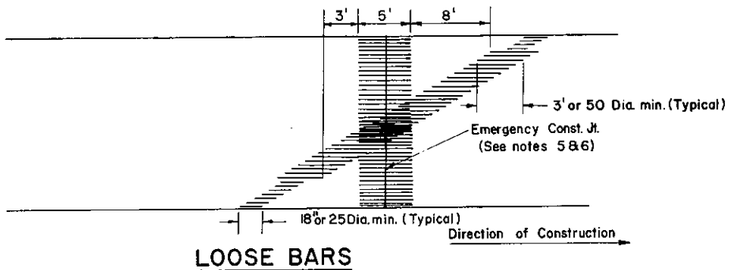
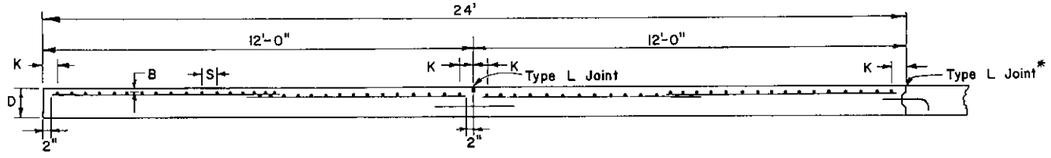


PLAN
BAR MAT



LOOSE BARS
EMERGENCY CONSTRUCTION JOINT

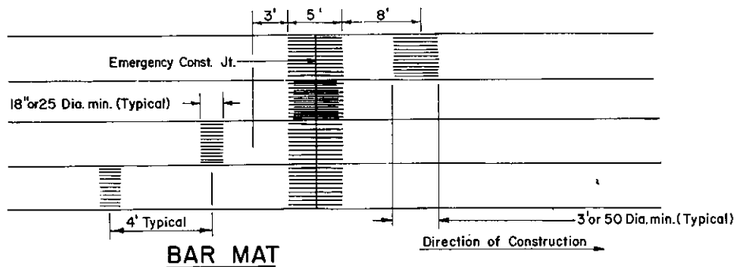


*See note 4 Sheet 1 of 4

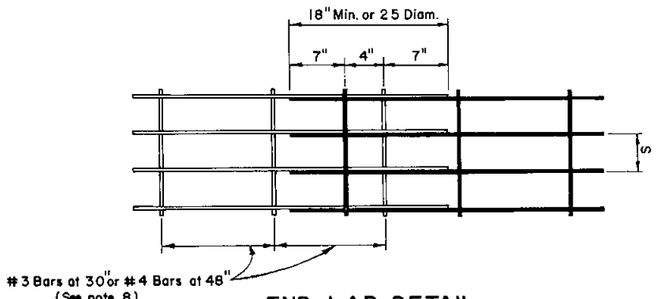
TYPICAL CROSS SECTION
BAR MAT

*See note 4 Sheet 1 of 4

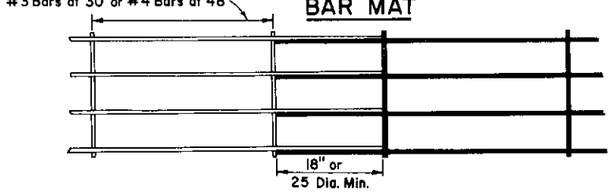
NOTE:
See table I for values of S,K,D Sheet 1 of 4



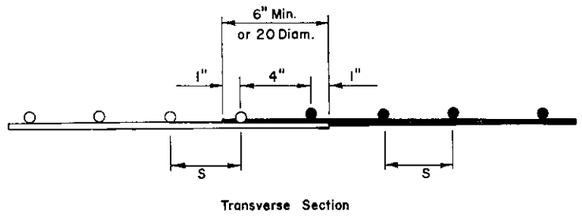
BAR MAT
EMERGENCY CONSTRUCTION JOINT



END LAP DETAIL
BAR MAT



ALTERNATE END LAP DETAIL-BAR MAT



Transverse Section

EDGE LAP DETAIL
BAR MAT

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 ± 3/4":

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

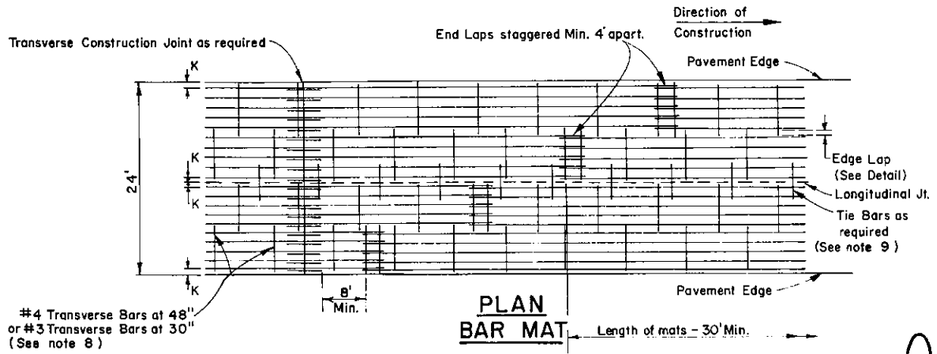
Transverse steel may be on the top or bottom except as qualified in note 9.

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 I 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.

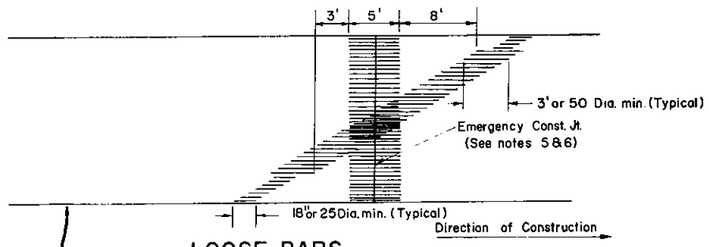
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

CONTINUOUSLY REINFORCED CONCRETE PAVEMENT

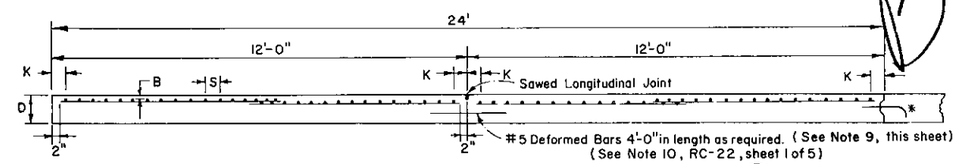
Recommended May 31, 1979	Approved May 31, 1979	Sht. 2 Of 4
Director, Bureau of Design	Chief Hwy. Engr.	RC-22



PLAN
BAR MAT Length of mats - 30' Min.



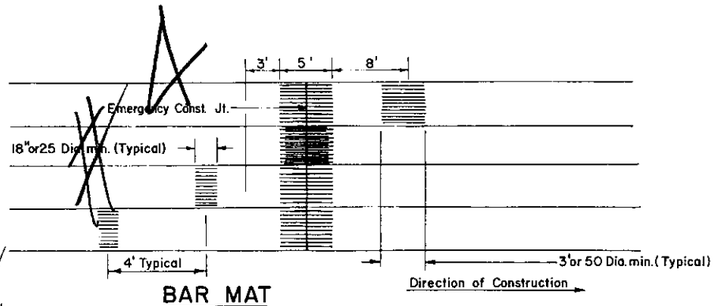
LOOSE BARS
EMERGENCY CONSTRUCTION JOINT



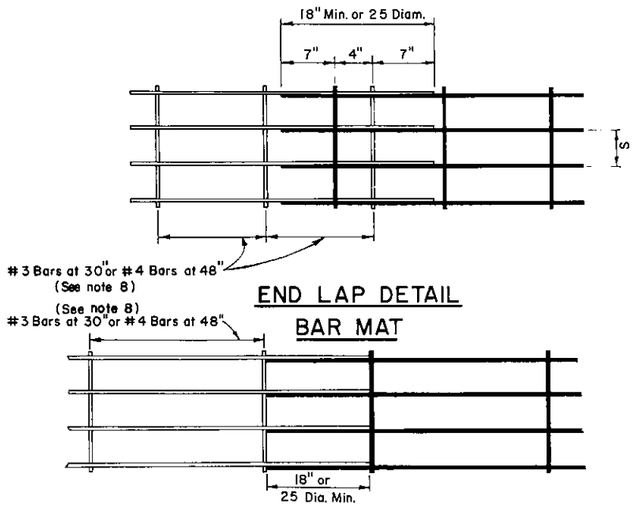
TYPICAL CROSS SECTION
BAR MAT

* See notes 5, 6, & 7 Sheet 1 of 5

NOTE:
See Table I for values of S, K, D Sheet 1 of 5

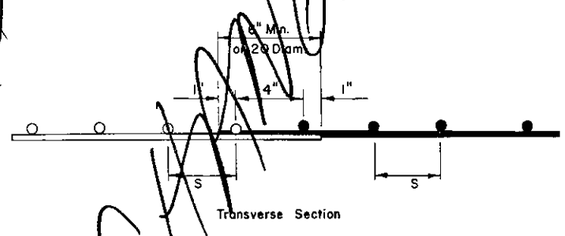


BAR MAT
EMERGENCY CONSTRUCTION JOINT



END LAP DETAIL
BAR MAT

ALTERNATE END LAP DETAIL-BAR MAT



EDGE LAP DETAIL
BAR MAT

VOIDED CHANGE

NOTES

1. Materials and workmanship shall be in accordance with Specification Form 408.
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 ± 3/4":

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

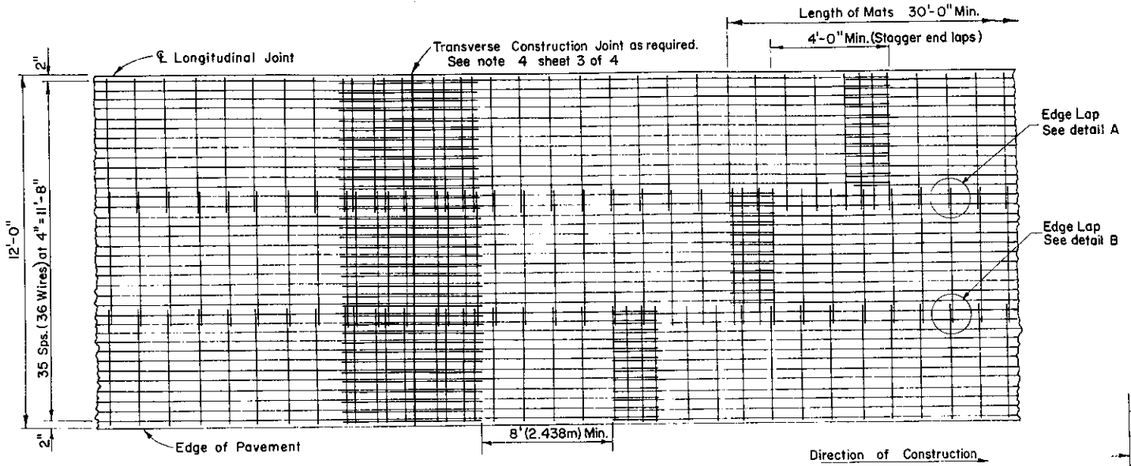
Transverse steel may be on the top or bottom except as qualified in note 9.

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. The Emergency Construction Joint shall be strengthened by the addition of supplementary deformed bars, 5 foot long and of the same nominal size as the longitudinal reinforcement, placed symmetrically with the joint and at a uniform spacing along the joint. The number of supplementary bars shall be as to increase the areas 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 I on Sheet 1 of 5.
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.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

CONTINUOUSLY REINFORCED CONCRETE PAVEMENT

Recommended June 1, 1976	Approved June 1, 1976	Sht. 2 Of 5
R.D. Lumb Director, Bureau of Design	Deputy Chief Hwy. Engr.	RC-22

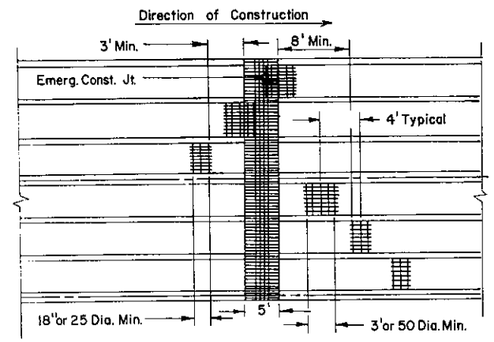


TYPICAL REINFORCING PLAN
USING DEFORMED WELDED WIRE FABRIC

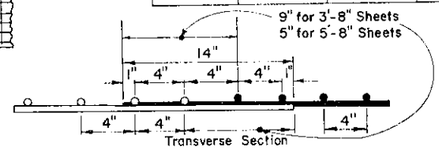
TABLE 2

DEFORMED WELDED WIRE FABRIC DETAILS

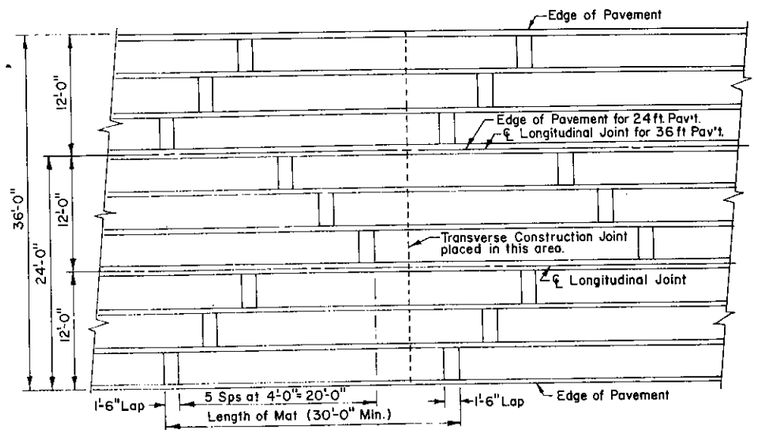
12' Slab		Longitudinal Steel 12' Slab			Transverse Steel
Slab Thickness D (inches)	Cross Sectional Area of 12' Slab Sq. In.	Req'd Cross Sectional Area of Steel Sq. in.	36 at 4" Wire Size	36 at 4" Area Sq.In.	Size & Spacing
8	1,152	6.912	D-19.2	6.912	W4 or D4 @ 12"
9	1,296	7.776	D-21.6	7.776	W4 or D4 @ 12"
10	1,440	8.640	D-24.0	8.640	W4 or D4 @ 12"



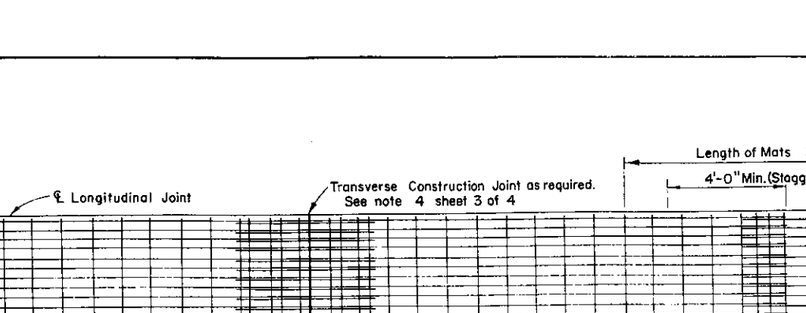
EMERGENCY CONSTRUCTION JOINT
DEFORMED WELDED WIRE FABRIC



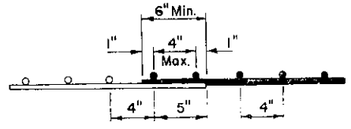
EDGE LAP DETAIL
Detail A



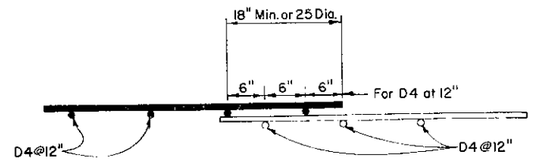
TYPICAL MAT PLACEMENT PATTERN
DEFORMED WELDED WIRE FABRIC



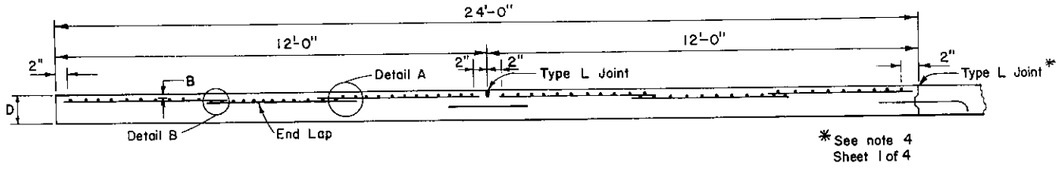
TYPICAL REINFORCING PLAN
DEFORMED WELDED WIRE FABRIC



EDGE LAP DETAIL
Detail B



END LAP DETAIL
Detail C



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"

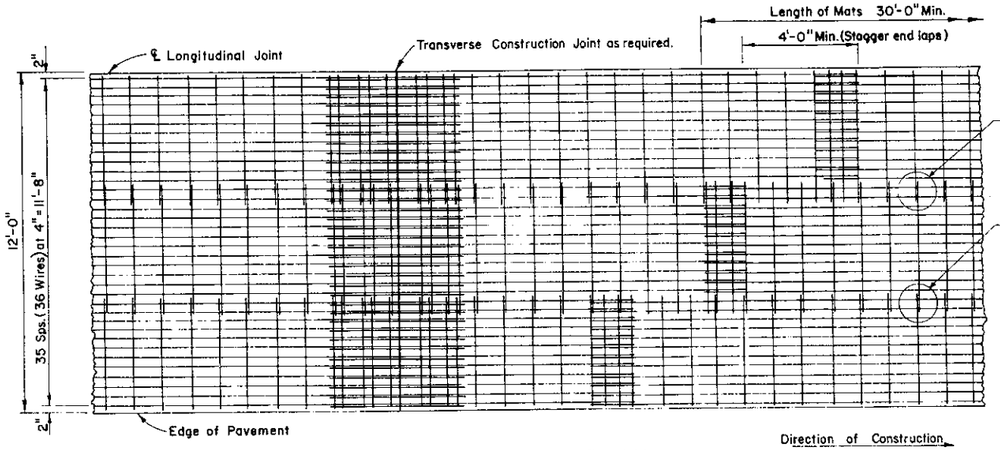
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

CONTINUOUSLY REINFORCED CONCRETE PAVEMENT

Recommended May 31, 1979
B.O. Rundio
Director, Bureau of Design

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

Sht. 3 Of 4
RC-22

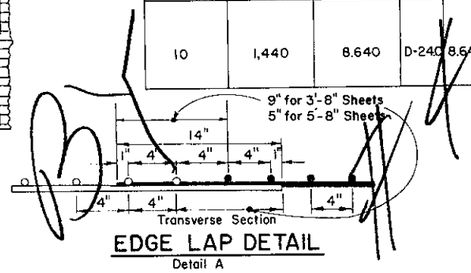


TYPICAL REINFORCING PLAN USING DEFORMED WELDED WIRE FABRIC

TABLE 2

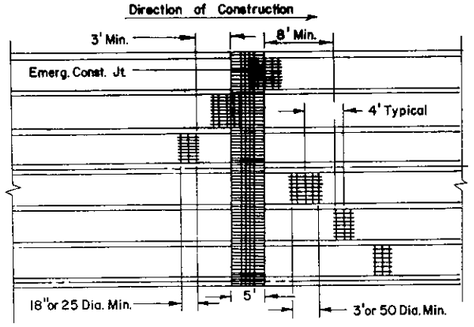
DEFORMED WELDED WIRE FABRIC DETAILS

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	36 at 4" 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-24.0	8.640	W4 or D4 @ 12"

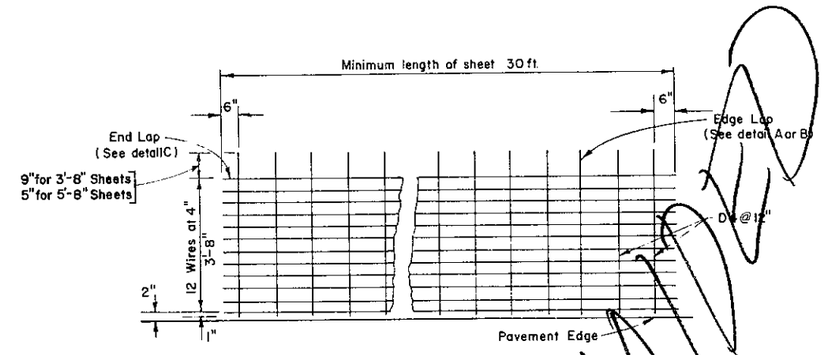


EDGE LAP DETAIL

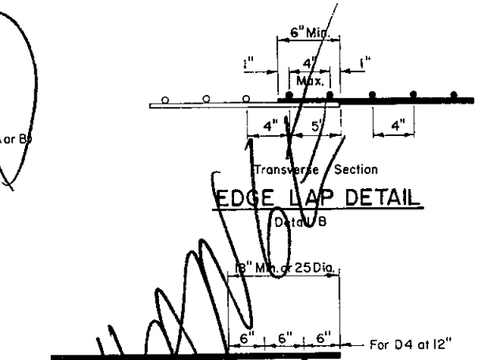
Detail A



EMERGENCY CONSTRUCTION JOINT DEFORMED WELDED WIRE FABRIC

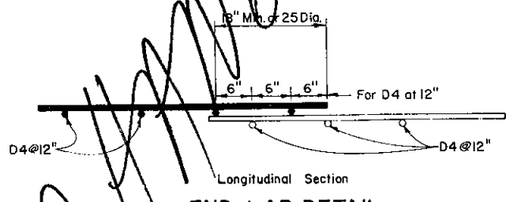


TYPICAL REINFORCING PLAN DEFORMED WELDED WIRE FABRIC



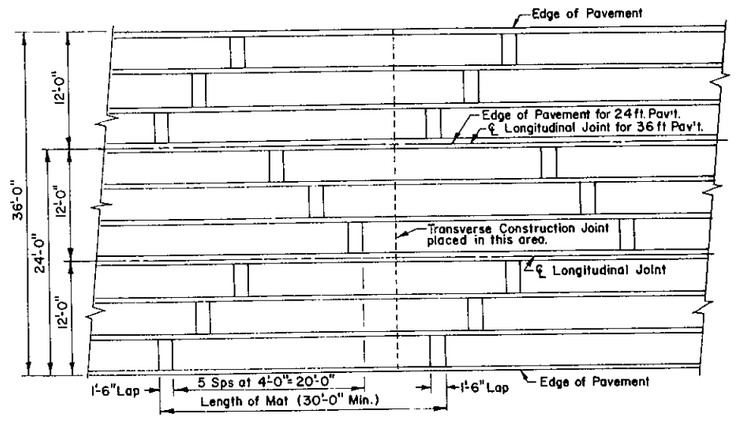
EDGE LAP DETAIL

Detail B

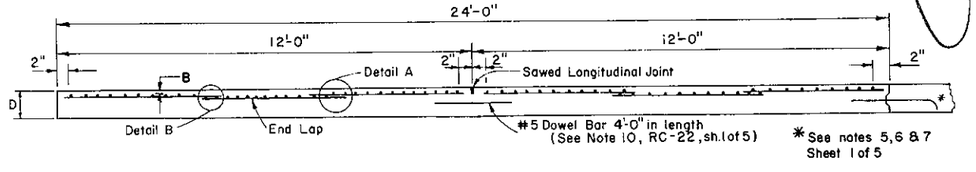


END LAP DETAIL

Detail C



TYPICAL MAT PLACEMENT PATTERN DEFORMED WELDED WIRE FABRIC



TYPICAL CROSS SECTION

NOTES

1. All Materials and Workmanship shall be in accordance with Specifications Form 408.
2. Deformed Tie Bars in the Longitudinal Joint shall be placed at Mid Point of the Slab and shall conform to the spacing indicated in Table 1.
3. All Longitudinal Wires in the Fabric shall have a minimum Lap of 18" or 25 Dia., whichever is greater.
4. Transverse Wire in the consecutive Fabric sheets shall have a minimum edge lap of 6."
5. The Emergency Construction Joint shall be strengthened by the addition of supplementary Deformed Bars, 5 feet long and of the same nominal size as the Longitudinal Reinforcement, (or #5 Deformed Bars) placed symmetrically with the joint and at a uniform spacing along the joint. The number of supplementary bars shall be such as to increase the area of steel through the joint by at least one third.
6. 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.
7. Deformed Welded Wire Fabric may have a nominal width of either 4', 6' or 8'. The sawed long. jt. is required at center line of 24' pavement width. (See Note 9 on RC-22, Sheet 2 of 5)
8. 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"

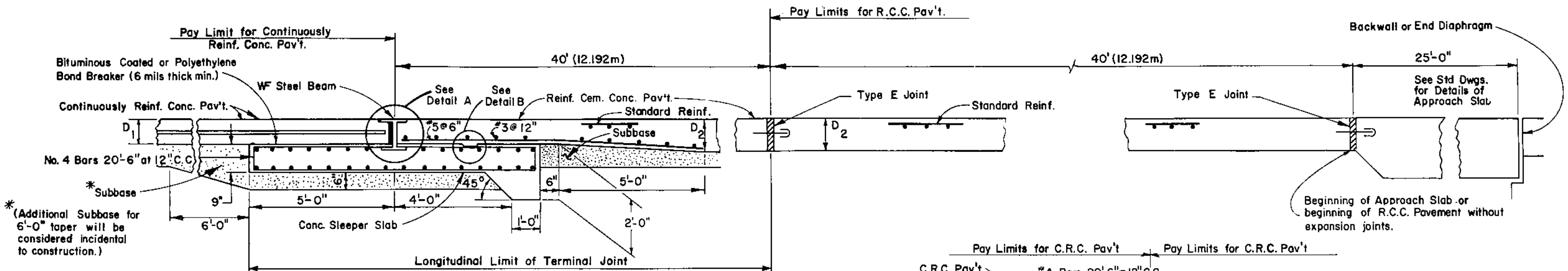
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

CONTINUOUSLY REINFORCED CONCRETE PAVEMENT

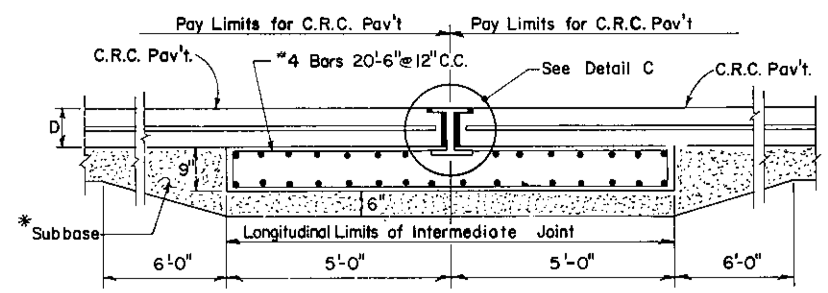
Recommended June 1, 1976
B.O. Rundio
Director, Bureau of Design

Approved June 1, 1976
Deputy Chief Hwy. Engr.

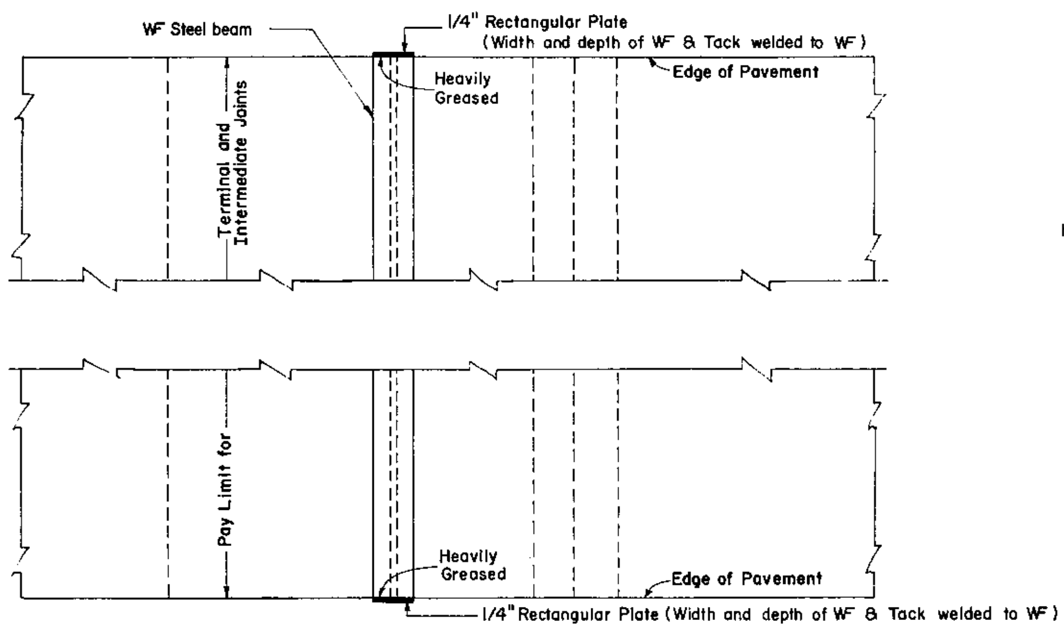
Sht. 3 Of 5
RC-22

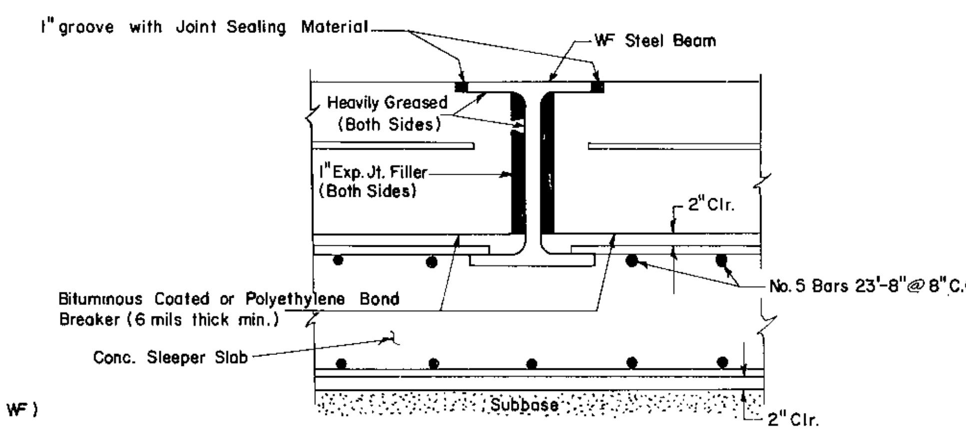


TERMINAL JOINT

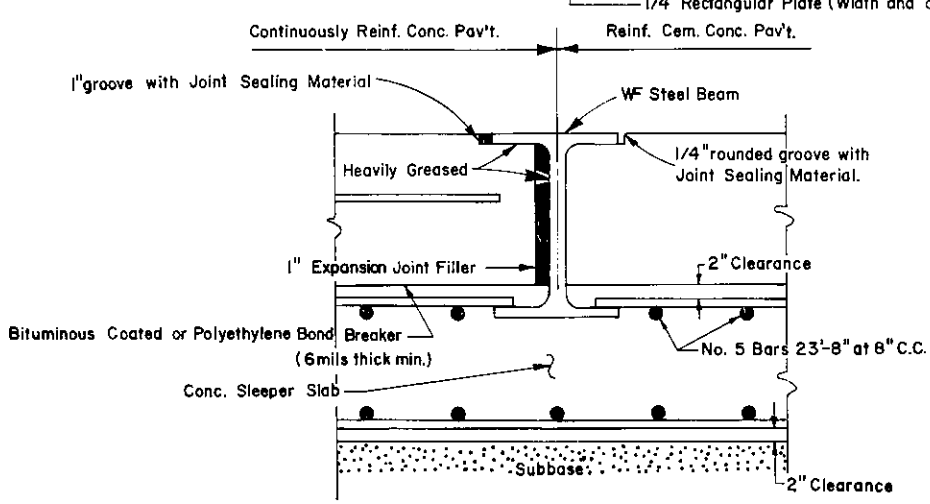


INTERMEDIATE JOINT

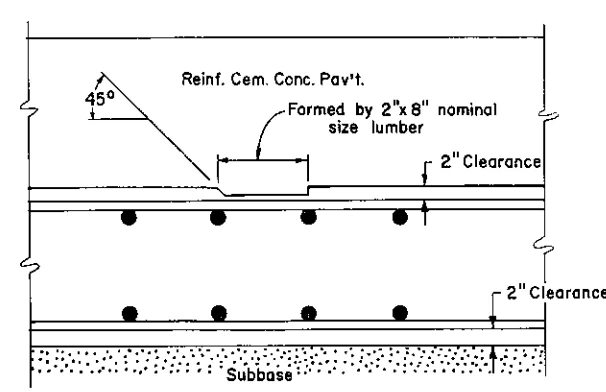




DETAIL C



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 jointed (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 same 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	$4\frac{1}{8}$	54	$10\frac{1}{8}$	10	$\frac{5}{8}$	$\frac{3}{8}$
7	$3\frac{1}{8}$	54	$10\frac{1}{8}$	10	$\frac{5}{8}$	$\frac{3}{8}$
8	$4\frac{1}{4}$	58	$12\frac{1}{4}$	10	$\frac{5}{8}$	$\frac{3}{8}$
9	$3\frac{1}{4}$	58	$12\frac{1}{4}$	10	$\frac{5}{8}$	$\frac{3}{8}$
10	$3\frac{7}{8}$	61	$13\frac{7}{8}$	10	$\frac{5}{8}$	$\frac{3}{8}$

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

CONTINUOUSLY REINFORCED CONCRETE PAVEMENT

Recommended May 31, 1979 B.O. Rauschie — Director, Bureau of Design

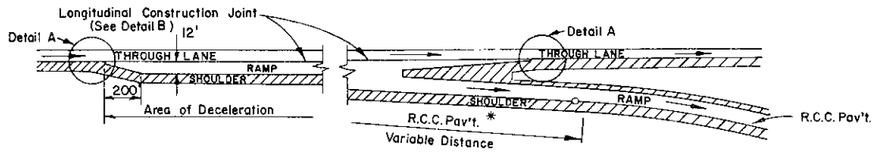
Approved May 31, 1979 David A. Sims — Chief Hwy. Engr.

Sht. 4 of 4

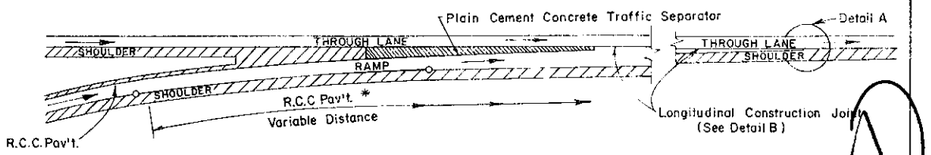
RC-22

FORM 4237 REV 3-61

RAMP CONNECTION DETAILS

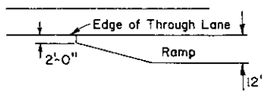


EXIT TERMINAL

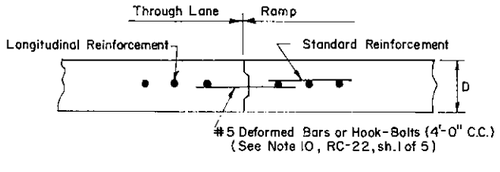


ENTRANCE TERMINAL

* When the ramp connection is located 500' or less from the terminus of the main line C.R.C. pavement, this portion of the ramp pavement shall be C.R.C. and a terminal joint shall be used on the ramp.

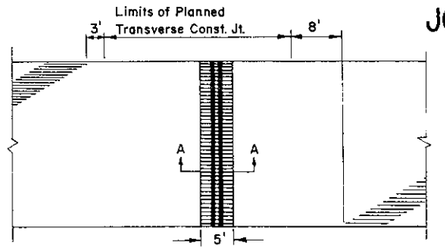


DETAIL A

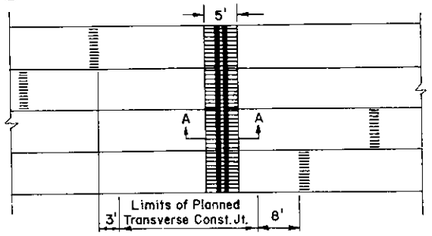


DETAIL B

TRANSVERSE CONSTRUCTION JOINT DETAILS



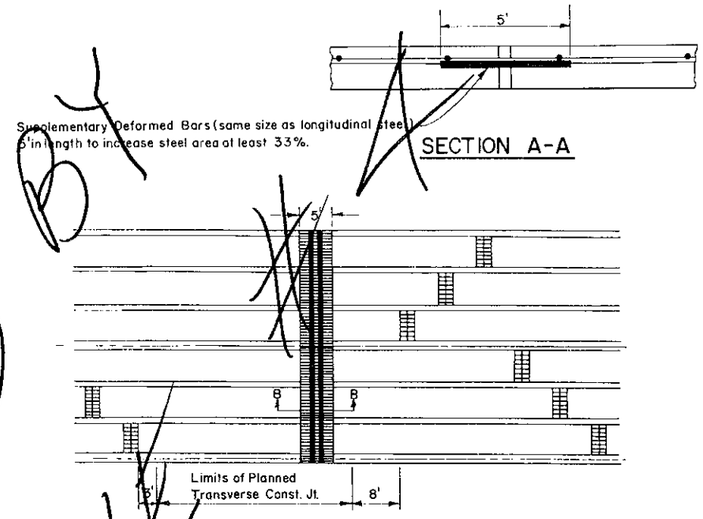
LOOSE BARS



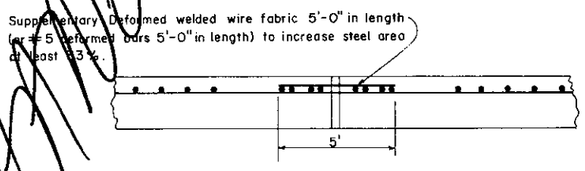
BAR MAT

NOTES

1. Transverse Construction Joints are required at the end of a days work or whenever paving operations are interrupted for 30 min. or more. The paving operation shall be planned so that the construction joint will fall within the Limits of Planned Transverse Construction Joint shown on the Transverse Construction Joint Details. Any joint outside this area will be considered an Emergency Construction Joint.
2. The bulkhead must be set perpendicular to the centerline of the pavement and be approved by the engineer.
3. Longitudinal steel shall extend through the bulkhead and be properly supported from the subbase beyond the bulkhead to prevent undue deflection during paving operations.
4. Supplementary deformed bars, 5' long and of the same nominal size as the longitudinal reinforcement shall be placed symmetrically with the joint and at a uniform spacing when loose or bar mats are utilized. The number of supplementary bars shall be such as to increase the area of steel through the joint, by at least one-third.
5. Supplementary deformed welded wire fabric 5'-0" in length (or #5 deformed bars 5'-0" in length) shall be placed symmetrically with the joint when deformed welded wire fabric is utilized. The deformed wire fabric used (or #5 deformed bars) shall be such as to increase the area of steel through the joint by at least one-third.



DEFORMED WELDED WIRE FABRIC



SECTION B-B

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

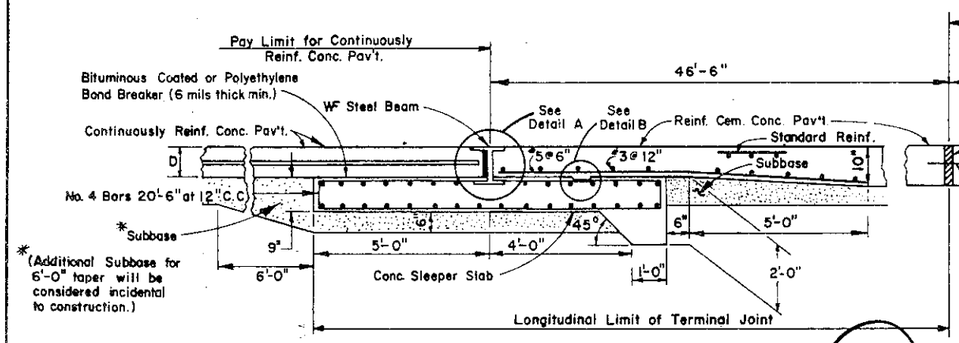
CONTINUOUSLY REINFORCED CONCRETE PAVEMENT

Recommended June 1, 1976
Director, Bureau of Design

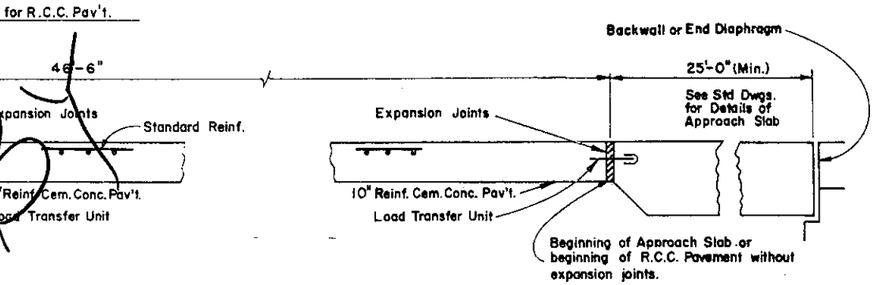
Approved June 1, 1976
Deputy Chief Hwy. Engr.

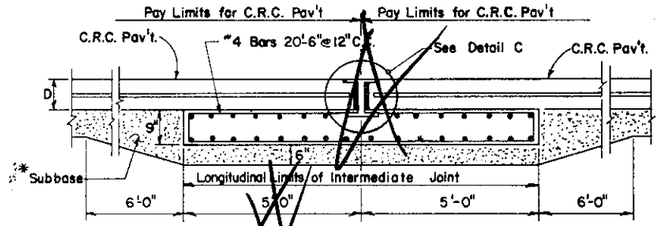
Sht. 4 Of 5

RC-22

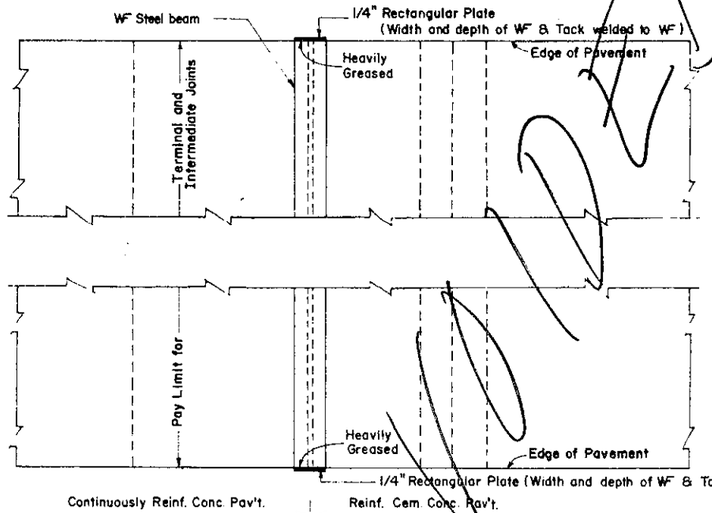


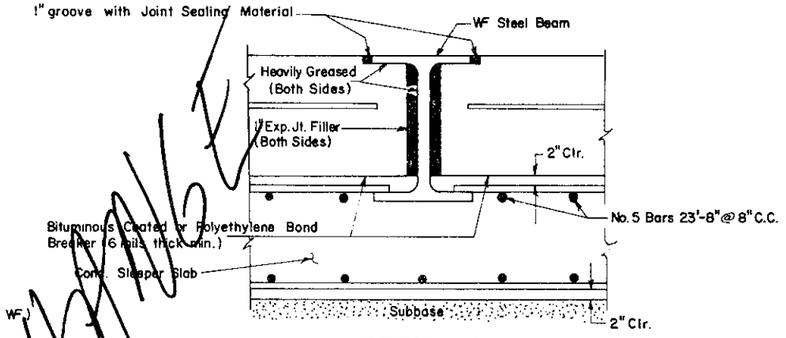
TERMINAL JOINT



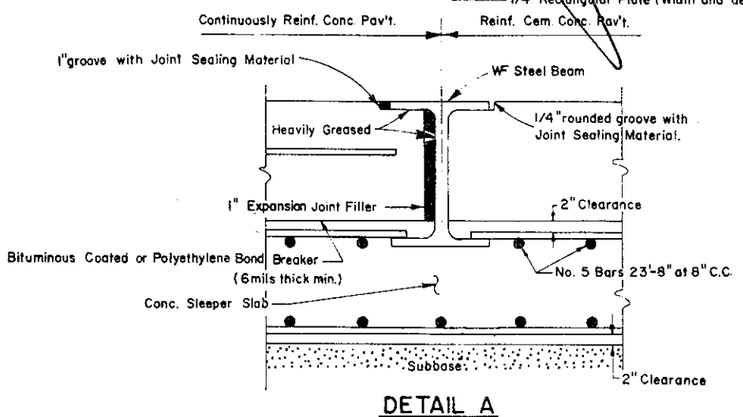


INTERMEDIATE JOINT

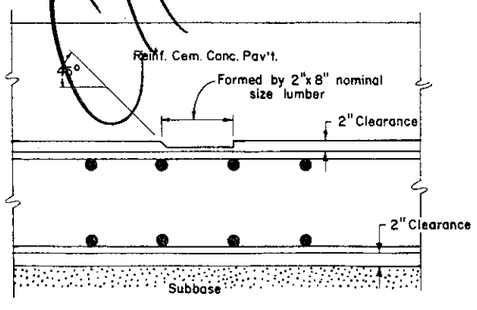




DETAIL C



DETAIL A



DETAIL B

NOTES

1. All materials and workmanship shall be in accordance with specifications Form 408.
2. Joint sealing material for the grooved joint shall comply with Section 705.5 of Form 408.
3. Expansion joint filler shall be cork or rubber and shall comply with AASHO Designation M 153.
4. The surface of the conc. sleeper slab on the continuously reinforced conc. pavement side of the joint shall be steel trowel finished.
5. 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.
6. Length under 500' between Structures use Reinforced Cement Concrete Pavement only, conventionally jointed, 46½' slabs, as required.
7. 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), 46½' length slabs, conventionally jointed (exp. jt.) pavement, at each end of pavement between terminal joint and approach slab.
   d. One (1) Bridge Approach Slab adjacent to each structure.
8. At the termini of each continuously reinforced paving project, an intermediate Joint will be required if the adjacent projects are not paved during the same 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)
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

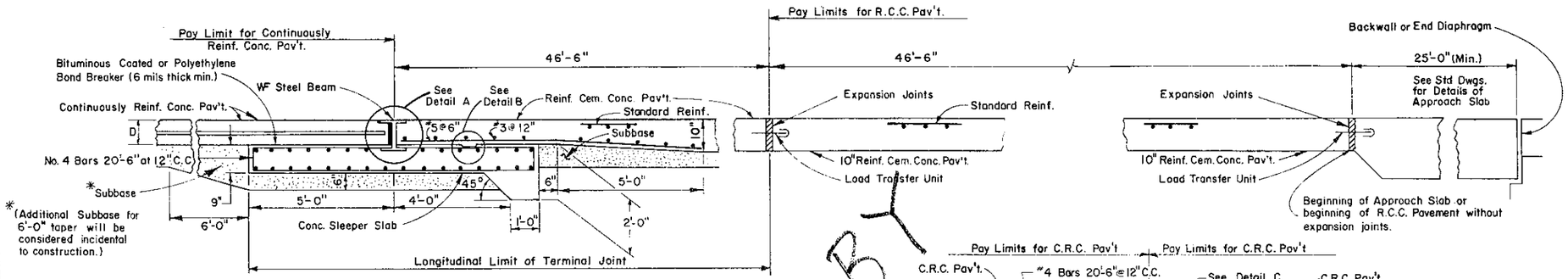
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

CONTINUOUSLY REINFORCED CONCRETE PAVEMENT

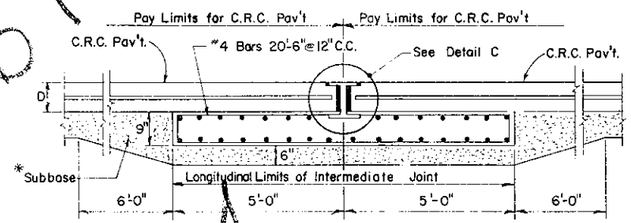
Recommended Nov. 15, 1977
B.O. Sandin
Director, Bureau of Design

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

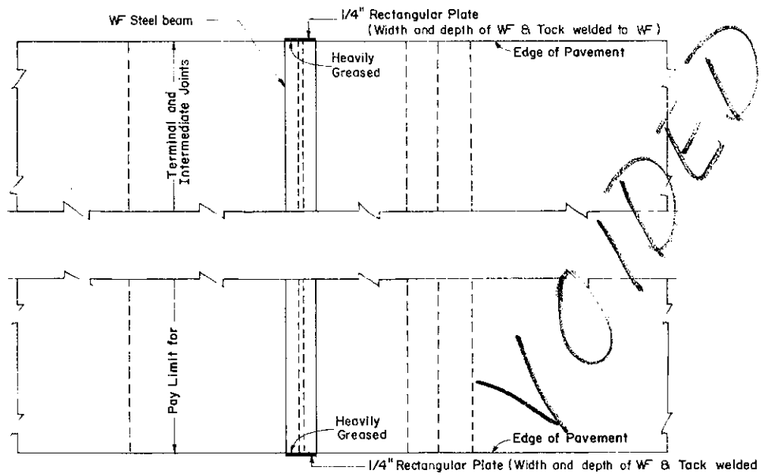
Sht. 5 Of 5
RC-22

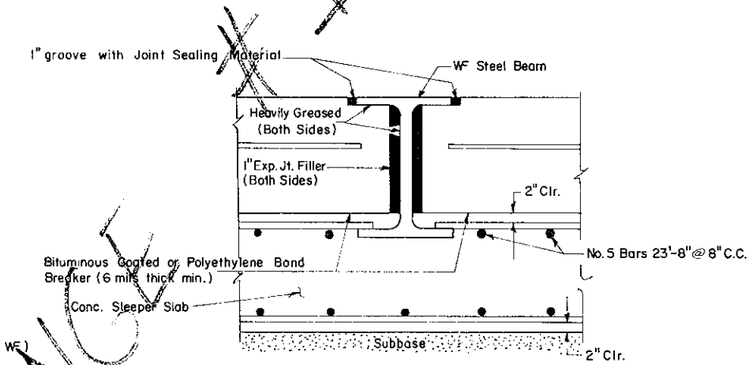


TERMINAL JOINT

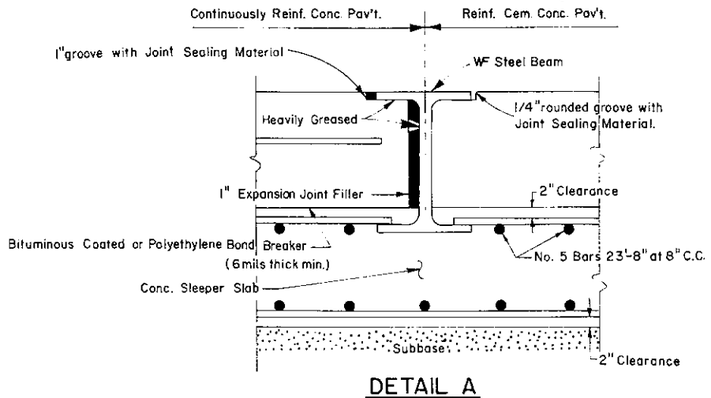


INTERMEDIATE JOINT

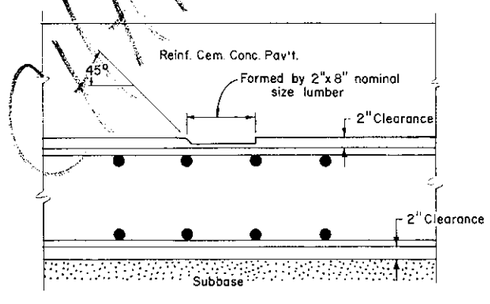




DETAIL C



DETAIL A



DETAIL B

NOTES

1. All materials and workmanship shall be in accordance with specifications Form 408.
2. Joint sealing material for the grooved joint shall comply with Section 705.5 of Form 408.
3. Expansion joint filler shall be cork or rubber and shall comply with AASHO Designation M 153.
4. The surface of the conc. sleeper slab on the continuously reinforced conc. pavement side of the joint shall be steel trowel finished
5. Pipe foundation under drain Type A with Type II backfill 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.
6. Length under 500' between Structures use Reinforced Cement Concrete Pavement only, conventionally jointed, 46½' slabs, as required.
7. 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), 46½' length slabs, conventionally jointed (exp. jt.) pavement, at each end of pavement between terminal joint and approach slab.
   d. One (1) Bridge Approach Slab adjacent to each structure.
8. At the termini of each continuously reinforced paving project, an Intermediate Joint will be required if the adjacent projects are not paved during the same 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)
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10	3 7/8	61	13 7/8	10	5/8	3/8

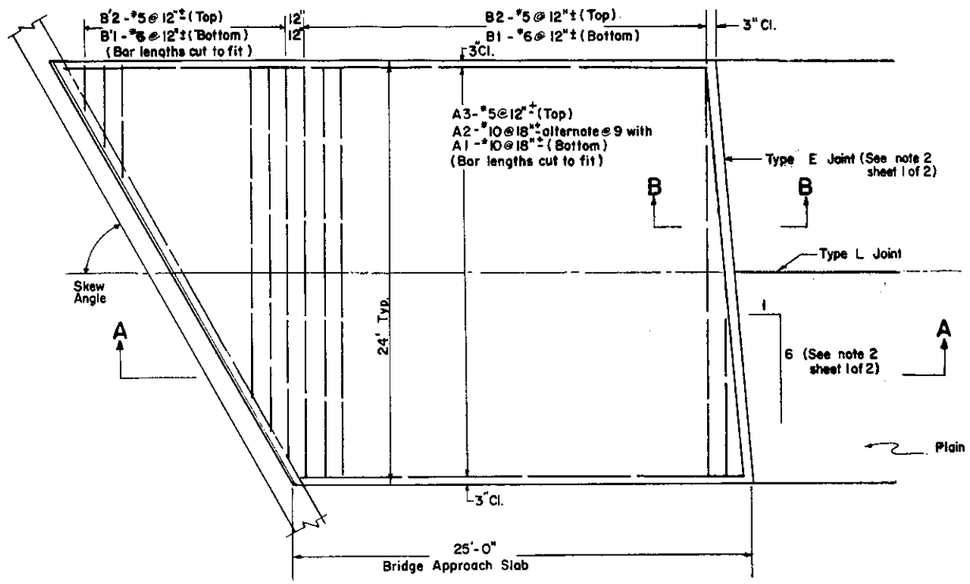
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

CONTINUOUSLY REINFORCED CONCRETE PAVEMENT

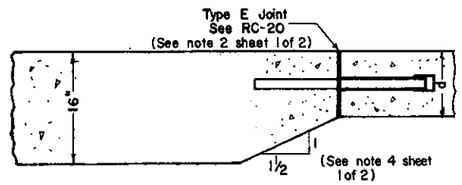
Recommended June 1, 1976
B.D. Rambo
Director, Bureau of Design

Approved June 1, 1976
Deputy Chief Hwy. Engr.

Sht. 5 Of 5
RC-22



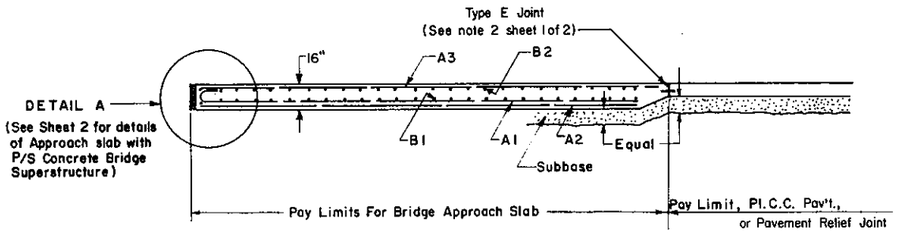
PLAN



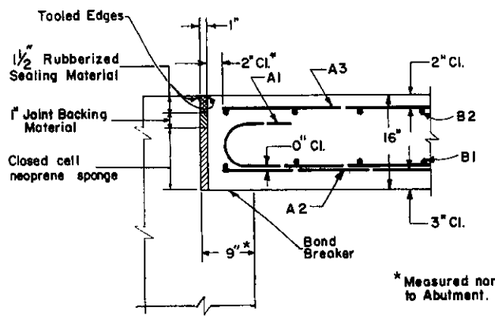
SECTION B-B

NOTES

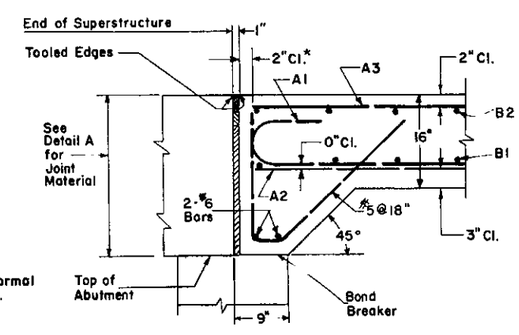
1. Bridge Approach Slab shall be constructed in accordance with this Standard Drawing unless otherwise modified or shown on the structure drawings.
2. The skewed Type E joint does not apply when approach slab is being constructed in conjunction with a Pavement Relief Joint, See RC-24.
3. The standard 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

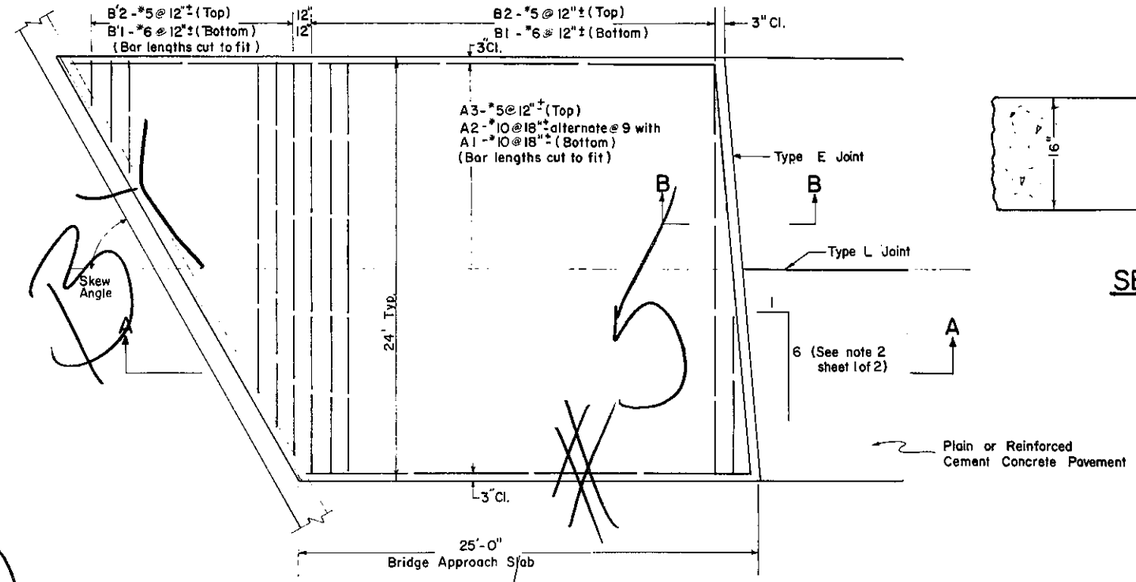


DETAIL A (ALTERNATE)
(TO APPLY ONLY WHEN INDICATED ON STRUCTURE DRAWINGS)

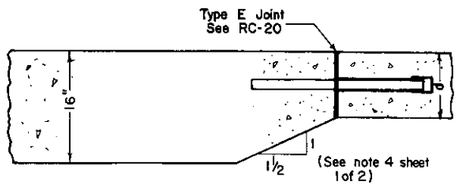
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

BRIDGE APPROACH SLAB

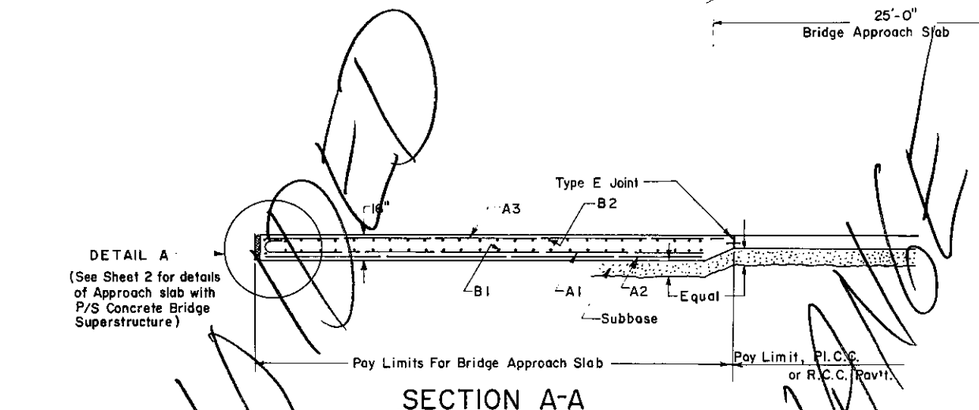
Recommended	Approved	Sht. 1 Of 2
Director, Bureau of Design	Deputy Sec. for Highway Admin.	RC-23



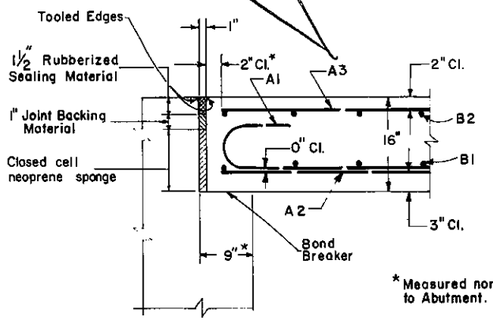
PLAN



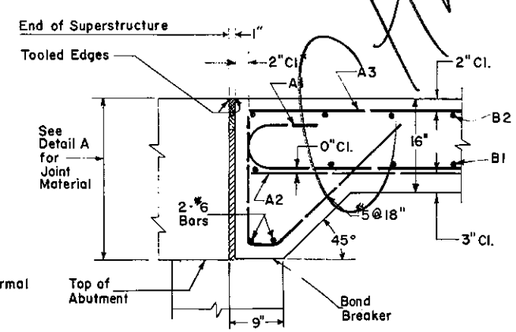
SECTION B-B



SECTION A-A



DETAIL A



DETAIL A (ALTERNATE)
(TO APPLY ONLY WHEN INDICATED ON STRUCTURE DRAWINGS)

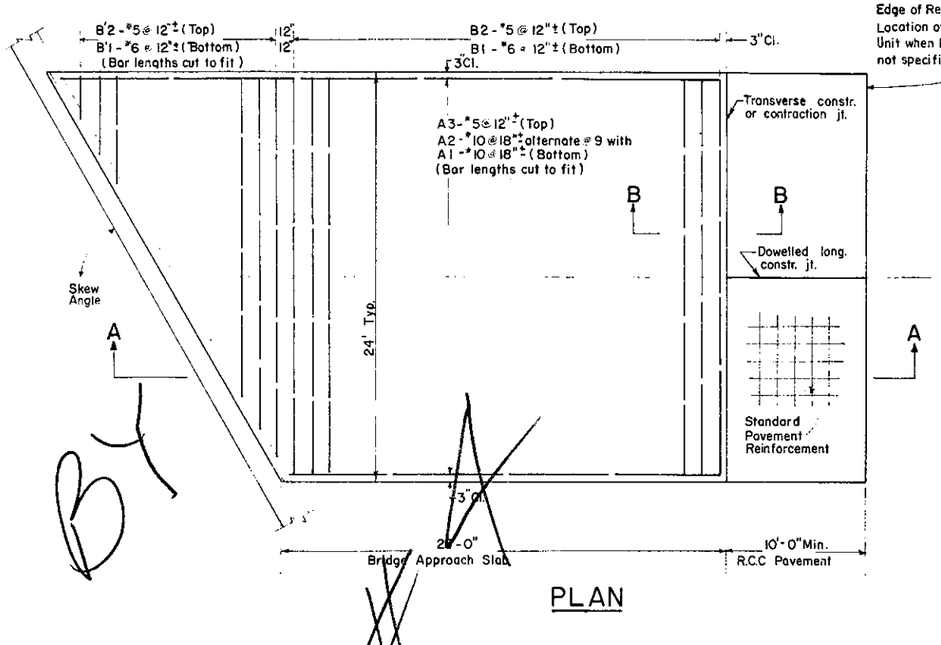
NOTES

1. Bridge Approach Slab shall be constructed in accordance with this Standard Drawing unless otherwise modified or shown on the structure drawings.
2. For reconstruction work the skewed 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.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

BRIDGE APPROACH SLAB

Recommended May 31, 1979	Approved May 31, 1979	Sht. 1 Of 2
Director, Bureau of Design	Chief Hwy. Engr.	RC-23



NOTES

1. Materials, workmanship and method of payment shall be in accordance with Section 505 of Form 408.
2. Bridge Approach Slab shall be constructed in accordance with this Standard Drawing unless otherwise modified or shown on the structure drawings.
3. When the Pavement Relief Joint is not used adjacent to the bridge approach slab, replace premolded Expansion Joint filler at backwall or end diaphragm with closed cell neoprene sponge.
4. 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 dowelled longitudinal construction joint; for 4 lane construction, 2 standard Bridge Approach Slabs shall be connected by a dowelled longitudinal construction joint.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

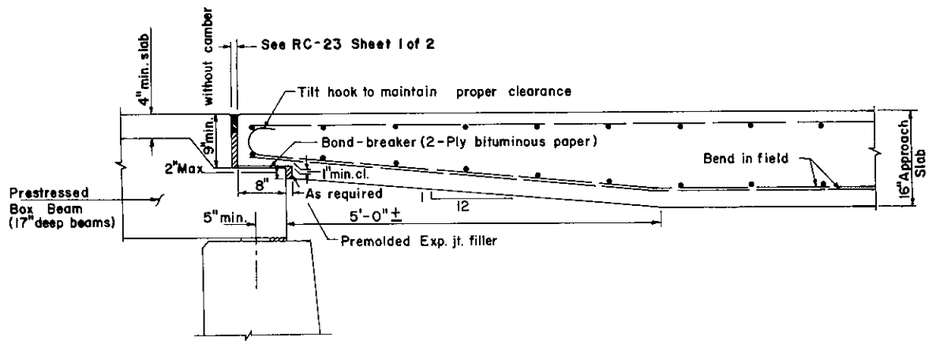
BRIDGE APPROACH SLAB

Recommended Jan. 31, 1977
Chief Bridge Engr.

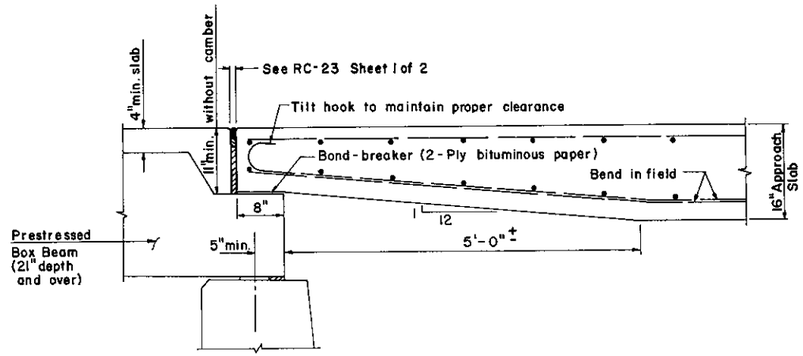
Approved Jan. 31, 1977
Deputy Chief Hwy. Engr.

Sht. 1 Of 2

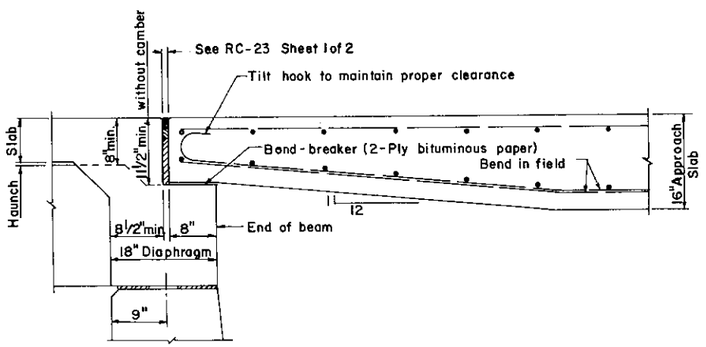
RC-23



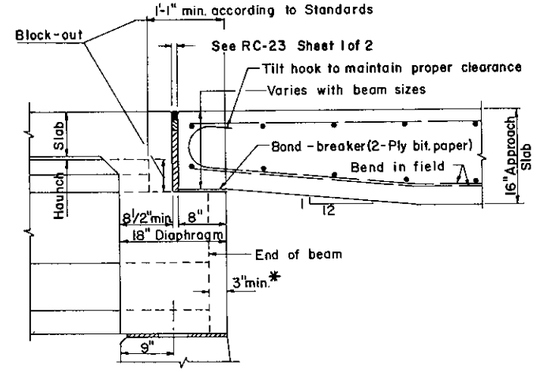
17" DEEP ADJACENT COMPOSITE BOX BEAMS WITH 9" DEEP APPROACH SLAB NOTCH



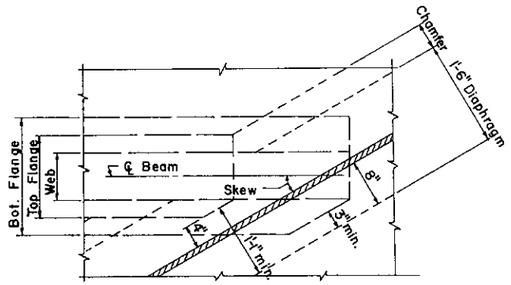
21" TO 48" DEEP ADJACENT COMPOSITE BOX BEAMS WITH 11" DEEP APPROACH SLAB NOTCH



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



I-BEAMS



PLAN - I-BEAMS

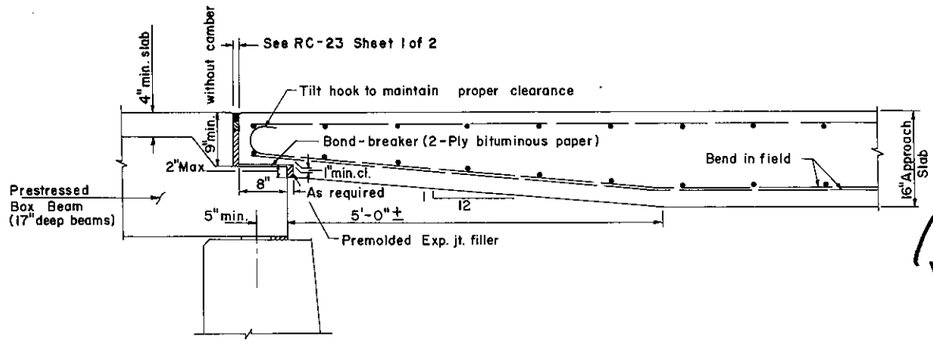
Notes for Construction Revisions

- 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.

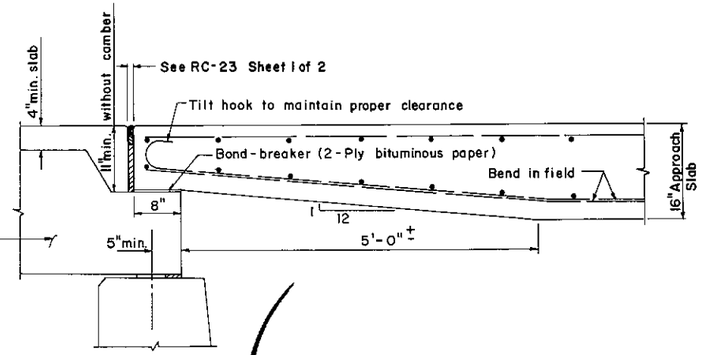
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

BRIDGE APPROACH SLAB

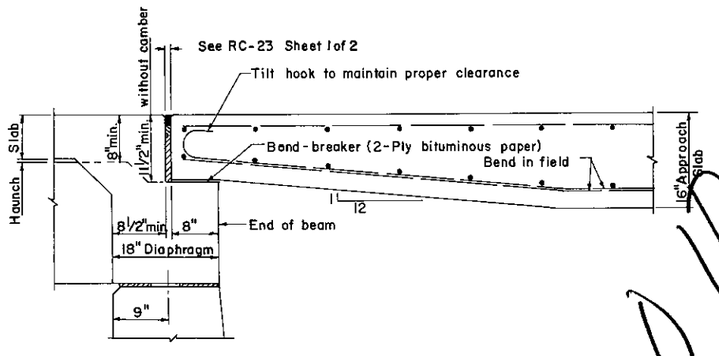
Recommended	Approved July 5, 1980	Sht. 2 Of 2
Director, Bureau of Design	David C. Unrich, Deputy Sec. for Highway Admin.	RC-23



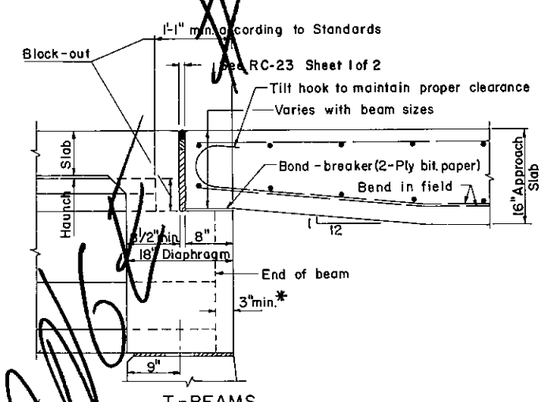
17" DEEP ADJACENT COMPOSITE BOX BEAMS WITH 9" DEEP APPROACH SLAB NOTCH



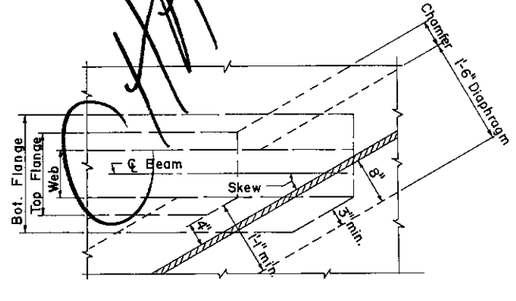
21" TO 48" DEEP ADJACENT COMPOSITE BOX BEAMS WITH 11" DEEP APPROACH SLAB NOTCH



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



I-BEAMS



PLAN - I-BEAMS

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.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

BRIDGE APPROACH SLAB

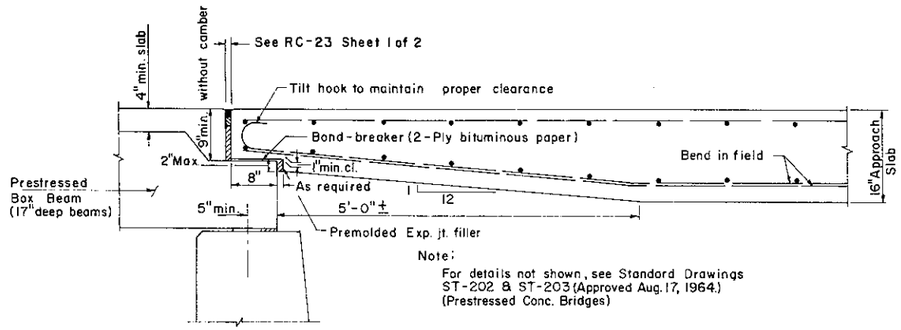
Recommended May 31, 1979
Director, Bureau of Design

Approved May 31, 1979
Chief Hwy. Engr.

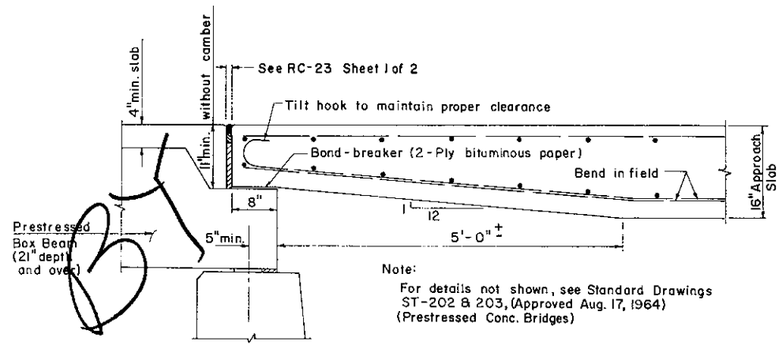
Sht. 2 Of 2

RC-23

FORM 4232 REV 3-61



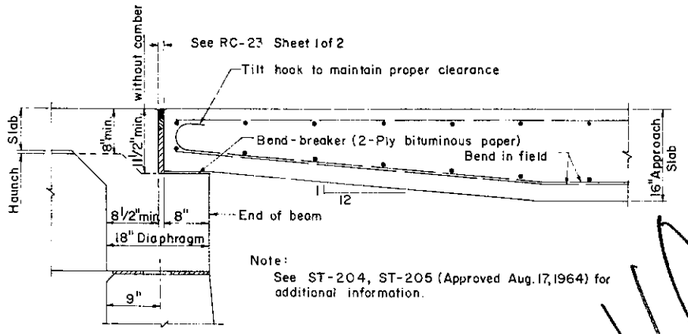
17" DEEP ADJACENT COMPOSITE BOX BEAMS WITH 9" DEEP APPROACH SLAB NOTCH



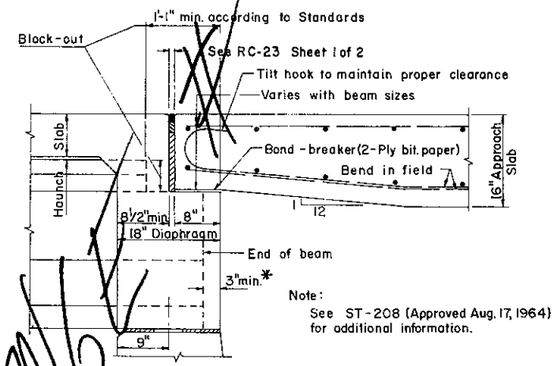
21" TO 48" DEEP ADJACENT COMPOSITE BOX BEAMS WITH 11" DEEP APPROACH SLAB NOTCH

Notes for Construction Revisions

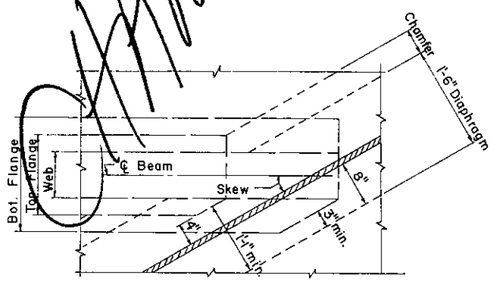
- When making construction changes in the field this drawing is to serve as a guide for modifying notch details shown on P/S Standard Drawings (ST-200 Series, Approved Aug. 17, 1964) for accommodating the Standard 16" Bridge Approach Slab.
- At beam ends, burn off reinforcement protruding into approach slab notch.
- * Increase in field, providing overhang, if required.



SPREAD BOX BEAMS WITH APPROACH SLAB NOTCH 11½" OR DEEPER



I-BEAMS



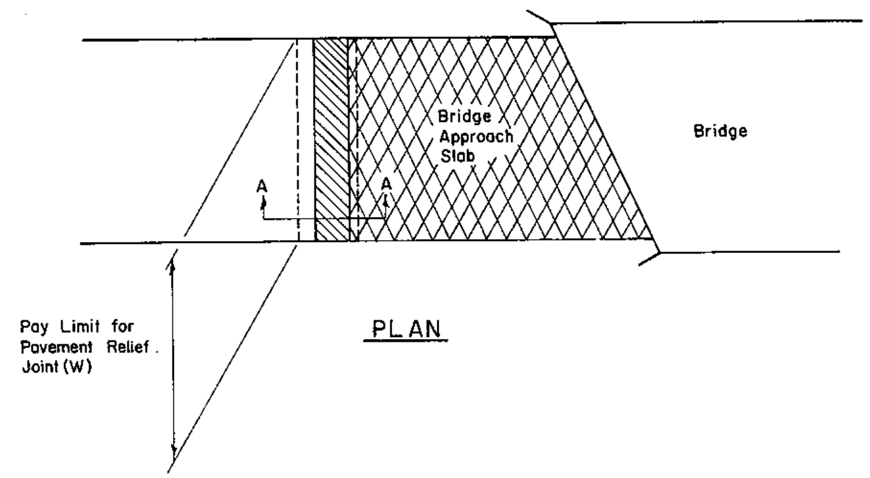
PLAN - I-BEAMS

VOIDED

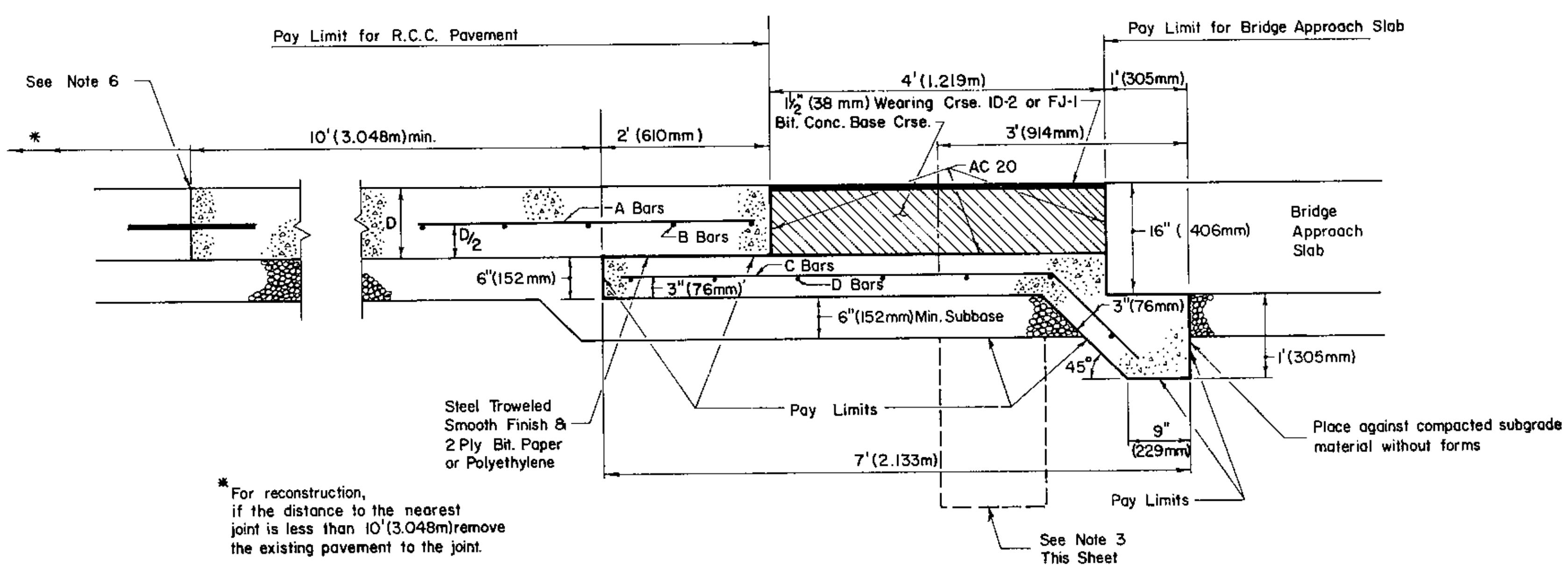
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

BRIDGE APPROACH SLAB

Recommended Jan. 31, 1977	Approved Jan. 31, 1977	Sht. 2 Of 2
Chief Bridge Engr.	Deputy Chief Hwy. Engr.	RC-23



PLAN

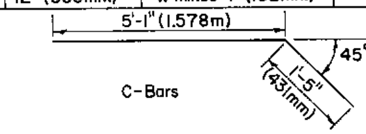


*For reconstruction, if the distance to the nearest joint is less than 10'(3.048m)remove the existing pavement to the joint.

SECTION A-A

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



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 610 of Form 408.
4. Where bridges are located less than 1,000ft. (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 1,000ft. (304.800m)and 1,500ft.(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.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

PAVEMENT RELIEF JOINT

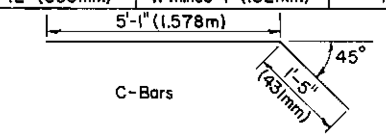
Recommended July 16, 1980 / [signature] / Director, Bureau of Design	Approved July 16, 1980 / [signature] / Deputy Sec. for Highway Admin.	Sht. 1 Of 1 / RC-24

TRACED BY
FINAL BY

7530-0330-0140 KGE 19 1153 12-73 2763•

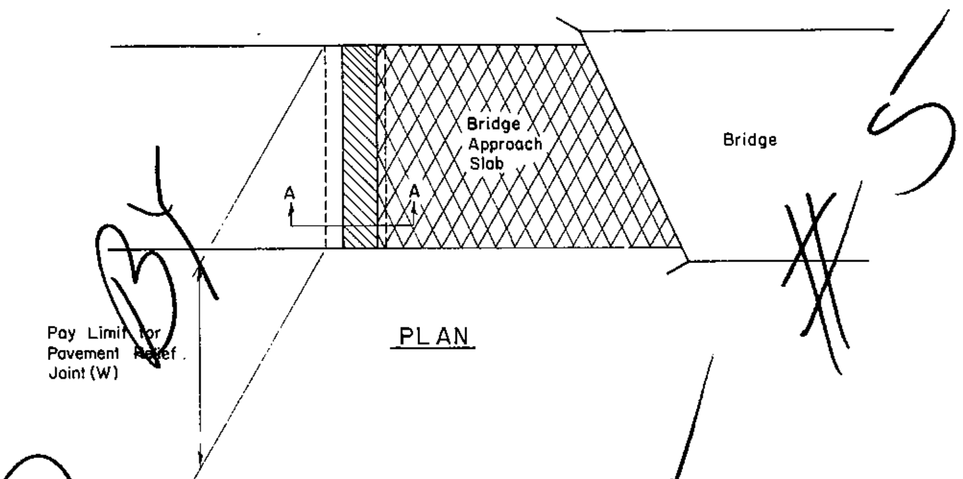
SCHEDULE OF REINFORCEMENT STEEL

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

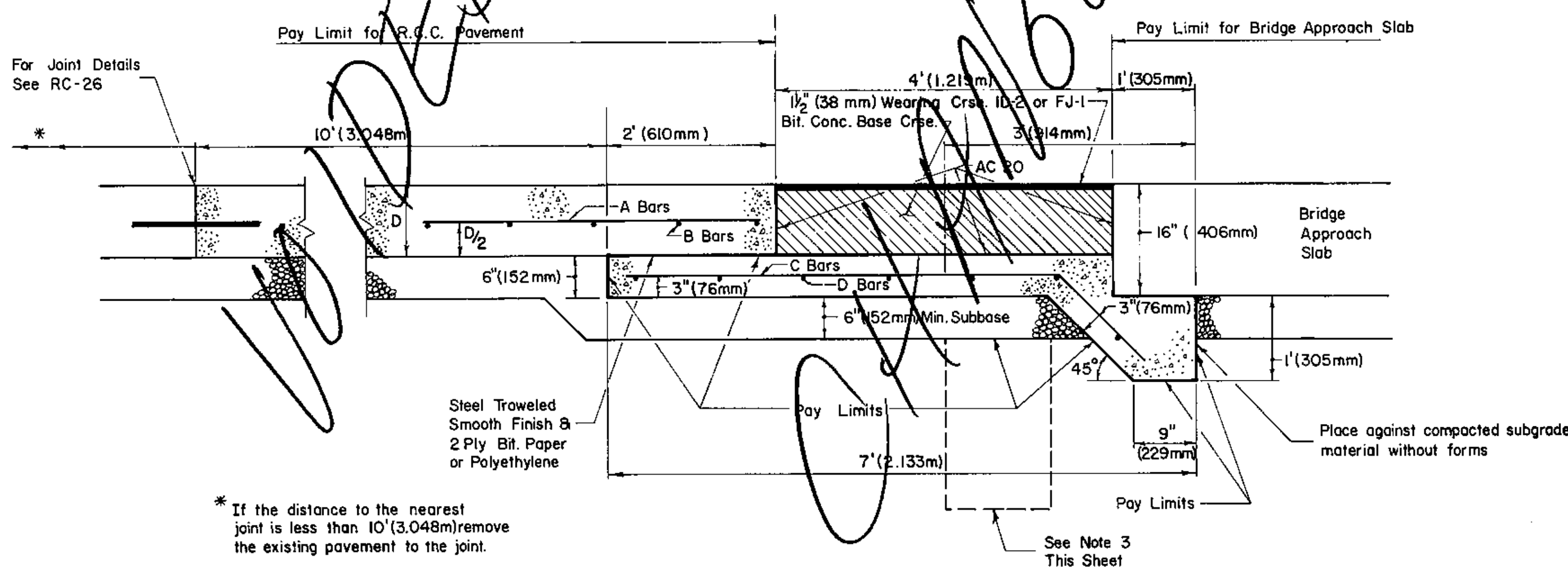


GENERAL NOTES

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 610 of Form 408.



PLAN



* If the distance to the nearest joint is less than 10'(3.048m) remove the existing pavement to the joint.

SECTION A-A

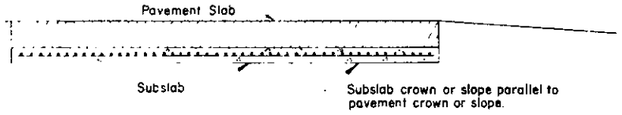
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

PAVEMENT RELIEF JOINT
(RECONSTRUCTION)

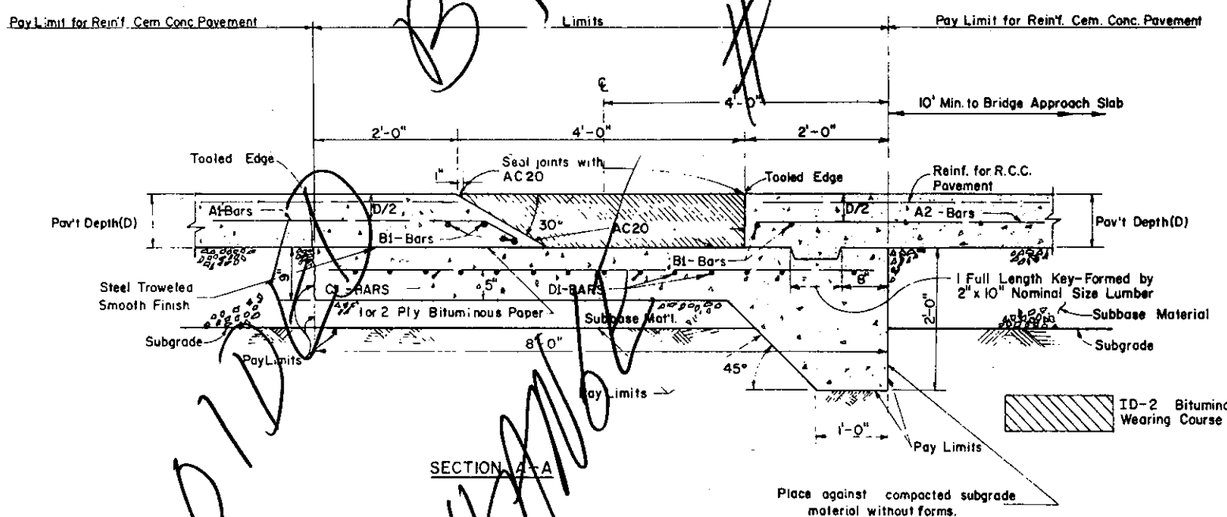
Recommended May 31, 1979	Approved May 31, 1979	Sht. 1 Of 1
B.D. Rouskie — Director, Bureau of Design	David ... — Chief Highway Engineer	RC-24

TRACED BY
FINAL BY

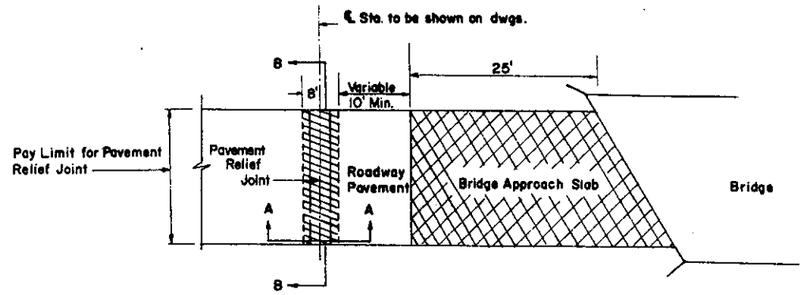
45



SECTION B-B



SECTION A-A



PLAN

NOTES

Material, workmanship and method of payment shall be in accordance with Section 504 of Form 408.

Concrete in subslab to be Class AA (at contractors option subslab concrete may be H.E.S.)

Portions of A1-Bars and A2-Bars which are outside of the indicated pay lines are to be included in price bid for complete joint.

Bituminous wearing course to be placed in lifts not to exceed 5" compacted depth.

Pavement Base Drain, (See details RC-30), shall be used for transverse drainage under the subslab on the upgrade side and will be measured and paid for as specified in Section 610 of Form 408.

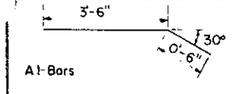
When plain cement concrete base course is specified the pavement relief joint shall be shown on the construction drawings as a special design.

Where bridges are located less than 500 feet apart, (measured from the face of nearest abutments) no relief joint will be used between the bridges.

Where bridges are located between 500 feet and 1000 feet apart, one relief joint shall be placed midway between the bridges.

SCHEDULE OF REINFORCEMENT STEEL

MARK	SIZE	SPACING C-C	LENGTH	NO REQ'D	WEIGHT/FT. TRANSVERSE MEASURE LBS.
A1	5	12"	4'-0"	(W)	4.172
A2	5	12"	3'-0"	(W)	3.129
B1	5	6"	W minus 4"	5	5.215
C1	4	6"	7'-8"	(W)(2)	10.240
D1	4	6"	W minus 4"	16	10.688



A1-Bars

APPROXIMATE QUANTITIES PER FOOT OF TRANSVERSE MEASURE

	MAIN LINE PAVEMENT DEPTH		
	8"	9"	10"
Cu. Yds. Class AA Conc.	.30	.30	.30
Lbs. Reinforcement Steel	33.44	33.44	33.44
Tons ID-2 Bit Wearing Crse *	.17	.19	.20
Sq. Yds. R.C.C. Pavement * *	.51	.52	.53

* Calculated using 145#/ft³

* * Beveled portion of pavement slab has been converted to equivalent design depth of main line pavement.

VOID CHANGE

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

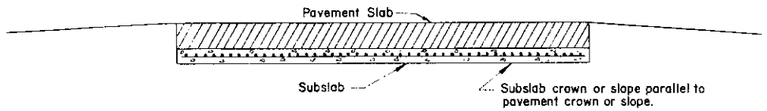
PAVEMENT RELIEF JOINT

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

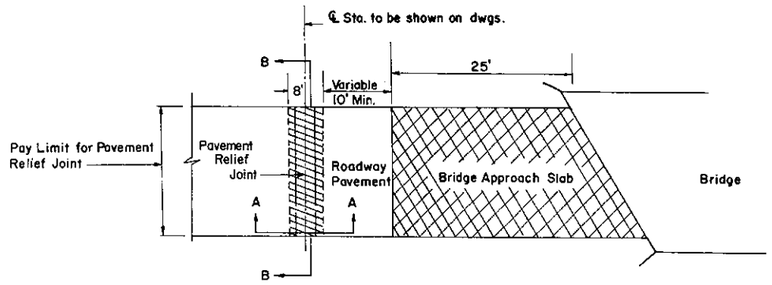
Approved Nov. 15, 1977
J. M. Sebastian
Deputy Chief Hwy. Engr.

Sht. 1 Of 1.

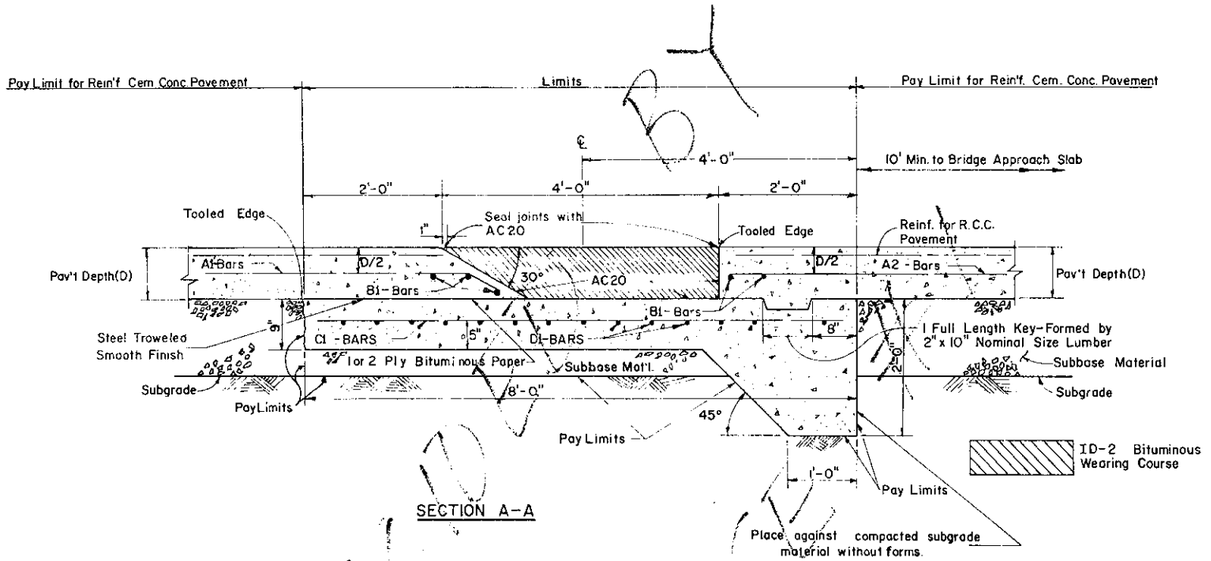
RC-24



SECTION B–B



PLAN



SECTION A–A

NOTES

Material, workmanship and method of payment shall be in accordance with Section 504 of Form 408.

Concrete in subslab to be Class AA (at contractors option subslab concrete may be H.E.S.)

Portions of A1-Bars and A2-Bars which are outside of the indicated pay lines are to be included in price bid for complete joint.

Bituminous wearing course to be placed in lifts not to exceed 5" compacted depth.

Pipe foundation under drain, Type A with Type II backfill shall be used for transverse drainage under the subslab on the upgrade side and will be measured and paid for as specified in Section 610.

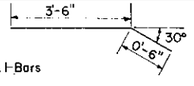
When plain cement concrete base course is specified the pavement relief joint shall be shown on the construction drawings as a special design.

Where bridges are located less than 500 feet apart, (measured from the face of nearest abutments) no relief joint will be used between the bridges.

Where bridges are located between 500 feet and 1000 feet apart, one relief joint shall be placed midway between the bridges.

SCHEDULE OF REINFORCEMENT STEEL

MARK	SIZE	SPACING C–C	LENGTH	NO. REQ'D	WEIGHT/FT. TRANSVERSE MEASURE LBS.
A1	5	12"	4'-0"	(W)	4.172
A2	5	12"	3'-0"	(W)	3.129
B1	5	6"	W minus 4"	5	5.215
C1	4	6"	7'-8"	(W)(2)	10.240
D1	4	6"	W minus 4"	16	10.688



A1-Bars

APPROXIMATE QUANTITIES PER FOOT OF TRANSVERSE MEASURE

	MAIN LINE PAVEMENT DEPTH		
	8"	9"	10"
Cu. Yds. Class AA Conc.	.30	.30	.30
Lbs. Reinforcement Steel	33.44	33.44	33.44
Tons ID-2 Bit. Wearing Crse.*	.17	.19	.20
Sq. Yds. R.C.C. Pavement **	.51	.52	.53

* Calculated using 145#/ft³

** Beveled portion of pavement slab has been converted to equivalent design depth of main line pavement.

VOID CHANGE

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

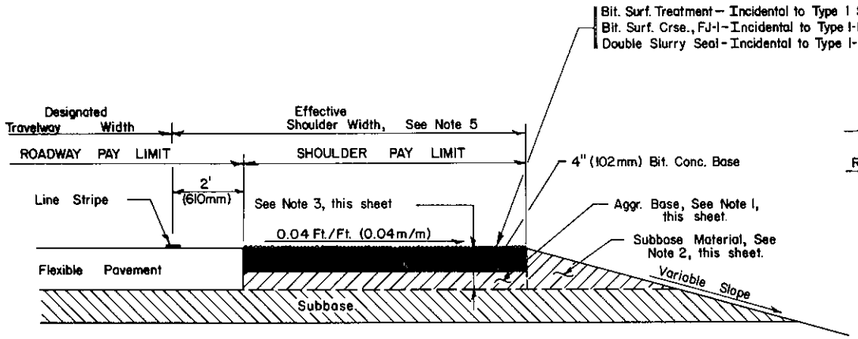
PAVEMENT RELIEF JOINT

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

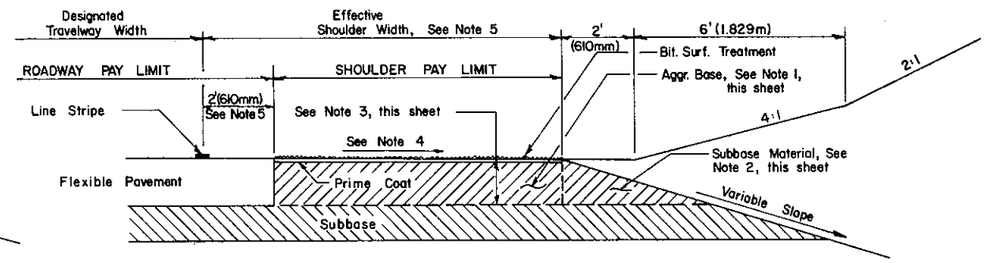
Approved June 1, 1976
Robert R. Mercer
Deputy Chief Hwy. Engr.

Sht. 1 Of 1

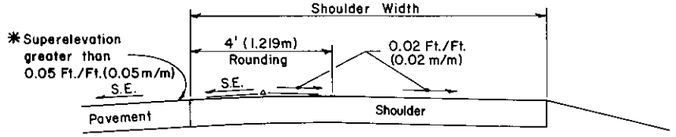
RC-24



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



TYPE 3 SHOULDER



* 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

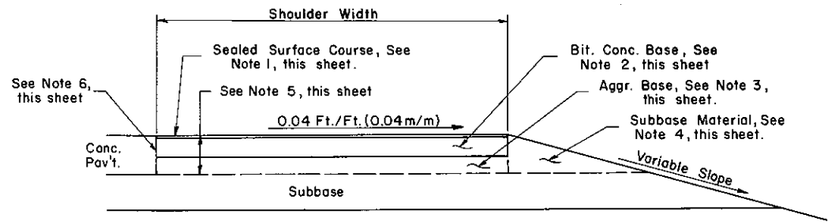
1. The Aggr. Base shall be constructed as specified in Section 350.3, Form 408, and shall be considered part of the shoulder.
2. The payment for this area of subbase material shall be considered incidental to the shoulder.
3. Depth of shoulder to be the combined depth of surface and base courses.
4. Slope shoulder at .06¼ (.06 m/m) for shoulder widths ≦ 8'(2.438m). For shoulder widths > 8'(2.438m) slope shoulder at .04¼ (.04 m/m).
5. For shoulder widths 6'(1.829m) and less, pave out to out of shoulders with full depth roadway pavement. Line stripe to provide required designated travelway width.

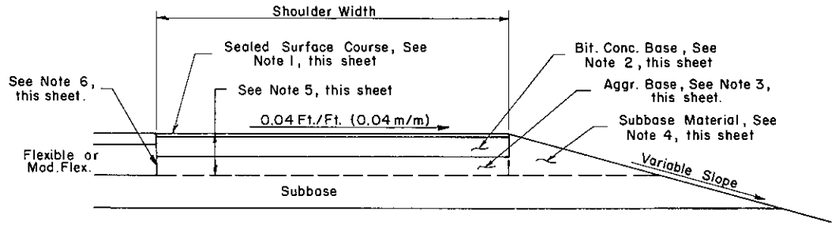
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

SHOULDERS

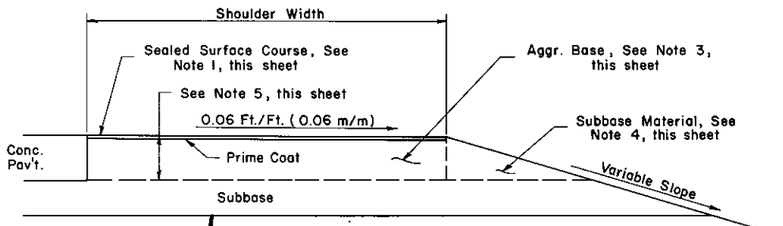
Recommended July 16, 1980	Approved July 16, 1980	Sht. 1 Of 3
Director, Bureau of Design	Deputy Sec. for Highway Admin.	RC-25

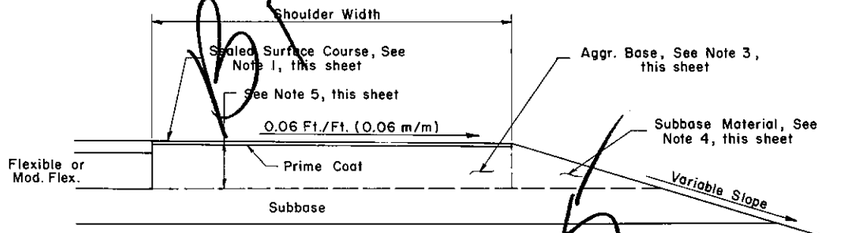
TRACED BY





PAVED SHOULDERS TYPE 1

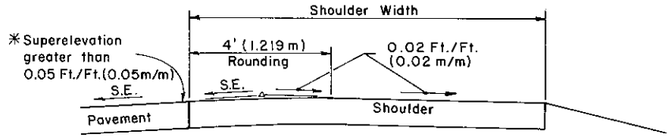




PAVED SHOULDERS TYPE 3

NOTES

1. The Sealed Surface Course shall be placed to an approximate depth of 3/4" (19 mm) after rolling in accordance with Form 408.
2. The Bit. Conc. Base shall have a depth of 4" (102 mm) min. after final compaction.
3. The Aggr. Base shall be constructed as specified in Section 350.3, Form 408, and shall be considered part of the shoulder.
4. The payment for this area of subbase material shall be considered incidental to the shoulder.
5. Depth of shoulder to be the combined depth of surface and base courses or depth of concrete pavement.
6. Paint the vertical edge of the roadway pavement with a coat of bituminous material Class AC-20, E-6, RC-250, or RC-800.



* For superelevations under 0.05 Ft./Ft., eliminate the 4' (1.219 m) 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

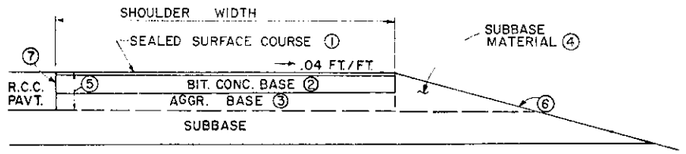
NOTE: Shoulder rounding is to be used only on Class 1 & 2 highways unless otherwise shown on the typical sections.

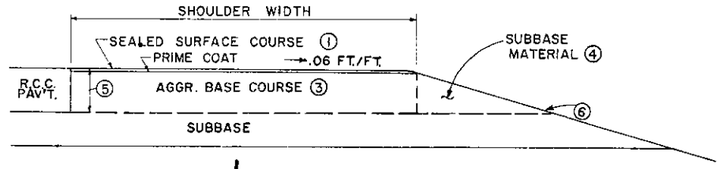
VOIDED CHANGE #

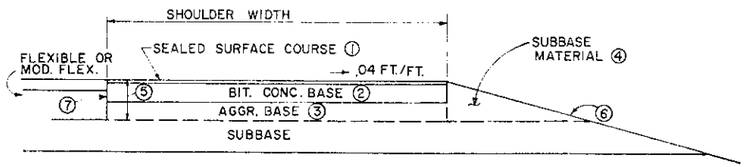
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

SHOULDERS

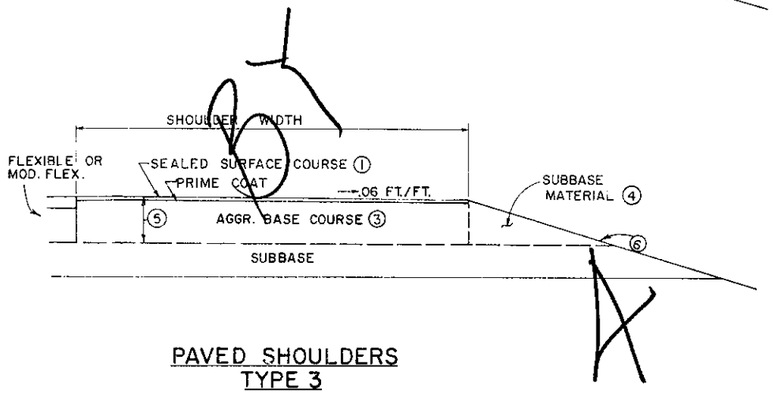
Recommended May 31, 1979	Approved May 31, 1979	Sht. 1 Of 3
Director, Bureau of Design	Chief Hwy. Engr.	RC-25







PAVED SHOULDERS
TYPE 1



PAVED SHOULDERS
TYPE 3

NOTES

① The Sealed Surface Course shall be placed to an approximate depth of 3/4" after rolling in accordance with Form 408.

② The Bit. Conc. Base shall have a depth of 4" min. after final compaction.

③ The Aggr. Base Course shall be constructed as specified in Section 350.3 of Form 408, and shall be considered part of the shoulder.

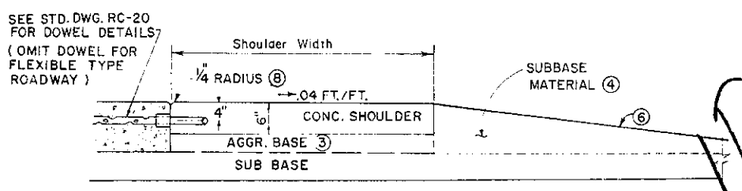
④ The payment for this area of subbase material shall be considered incidental to the shoulder.

⑤ Depth of shoulder to be the combined depth of surface and base courses or depth of R.C.C. Pavement.

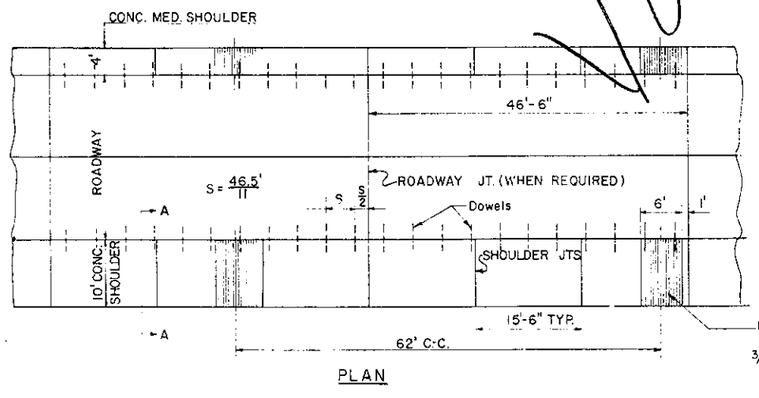
⑥ Variable slope as shown on typical sections.

⑦ Paint the vertical edge of the roadway pavement with a coat of bituminous material Class AC-2000, E-6, RC-250 or RC-800.

⑧ All shoulder joints shall be sealed in accordance with Section 501.3(q.)

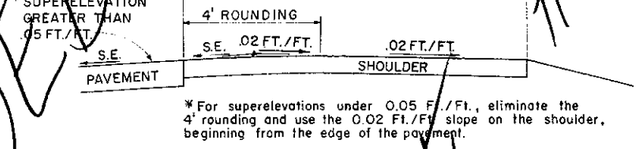


SECTION A-A



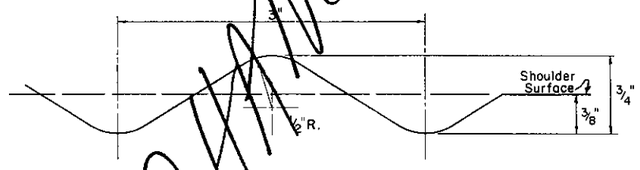
PLAN

CONCRETE SHOULDERS



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

SHOULDER ROUNDING ON HIGH SIDE OF SUPERELEVATED CURVES



CORRUGATION DETAIL

RUMBLE CORRUGATIONS SHALL BE FORMED BY USING 3/4" DEPTH BY 3" PITCH CORRUGATIONS.

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 1FT. FROM THE CURB.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

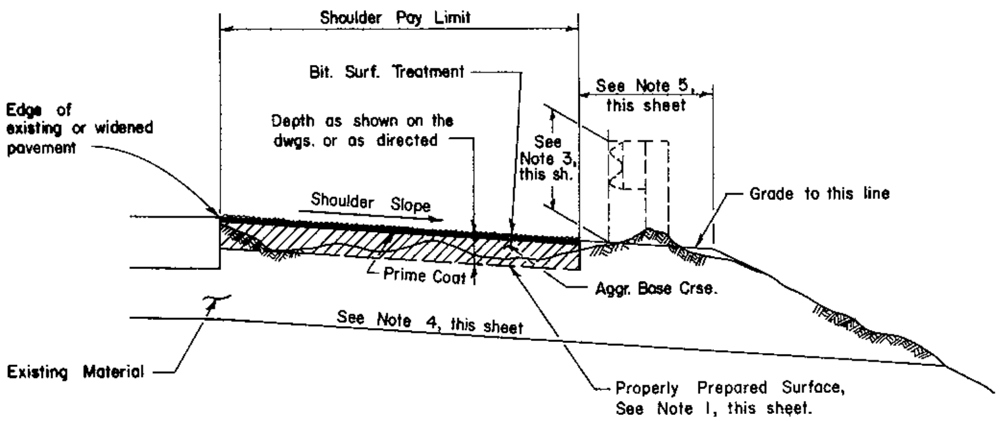
SHOULDERS

Recommended Jan. 31, 1977
Director, Bureau of Design

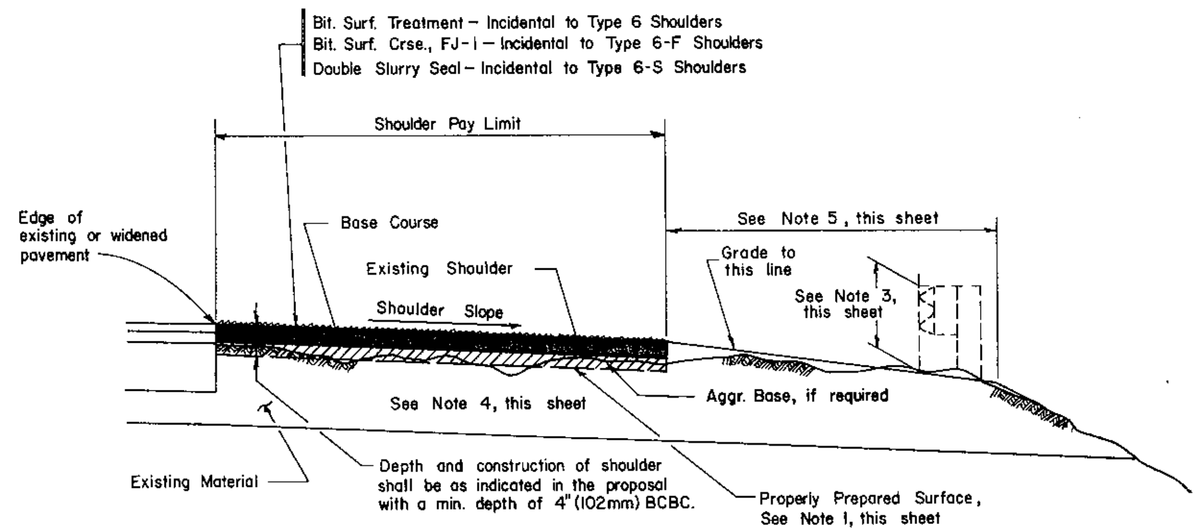
Approved Jan. 31, 1977
Deputy Chief Hwy. Engineer

Sht. 1 Of 2

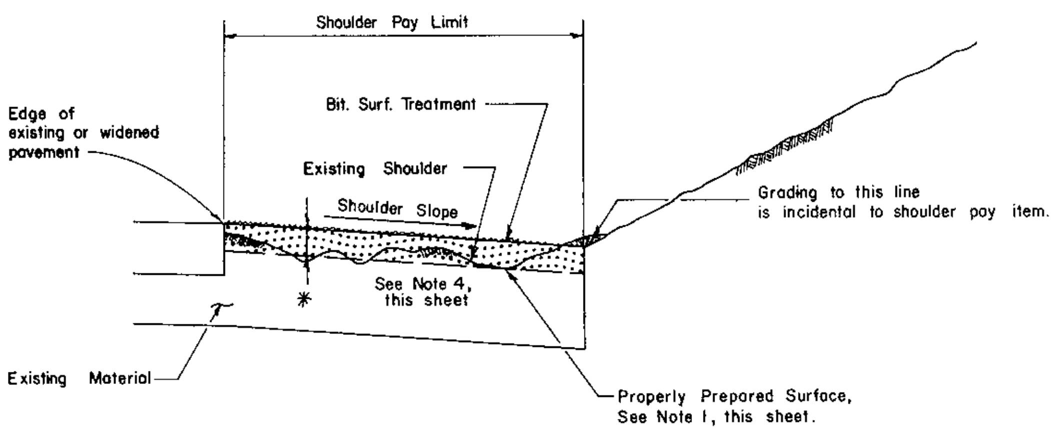
RC-25



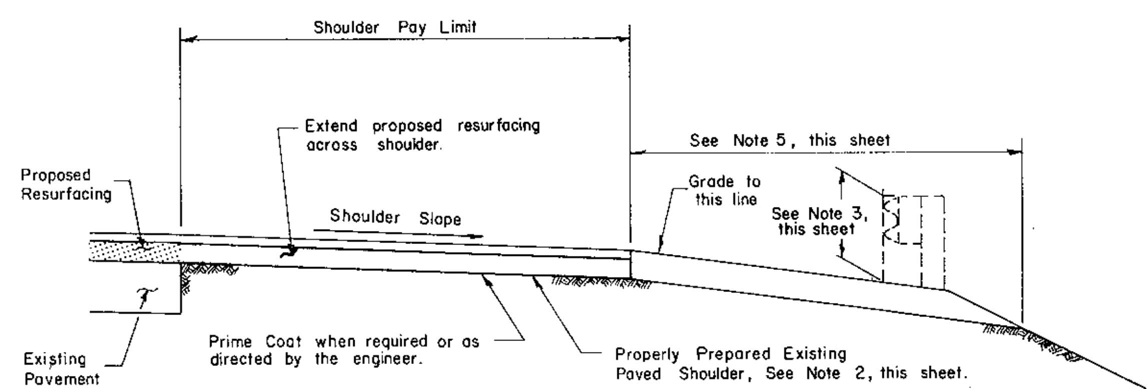
TYPE 4 SHOULDER



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



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

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"(710mm), 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"(786mm).

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.)

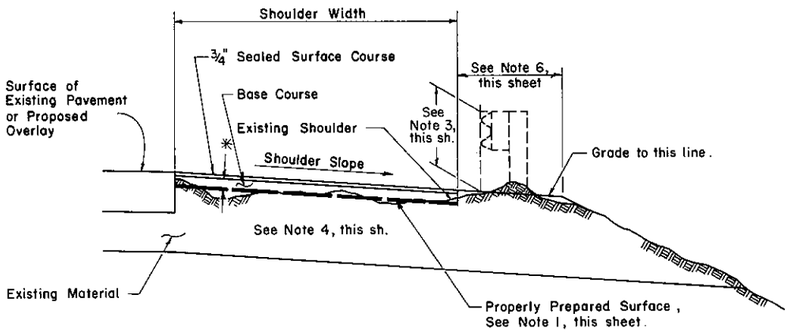
5. Grading will be considered incidental to the shoulder pay item. Where there is insufficient graded material from the grading operation to complete this operation, material meeting the requirements of Section 350 or 351 shall be used and will be paid for as Tons of Selected Borrow Excavation.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

RECONSTRUCTED SHOULDERS

Recommended July 16, 1980 [signature] Director, Bureau of Design	Approved July 16, 1980 David C. Sims Deputy Sec. for Highway Admin.	Sht. 2 Of 3 RC-25

TRACED BY
FINAL BY



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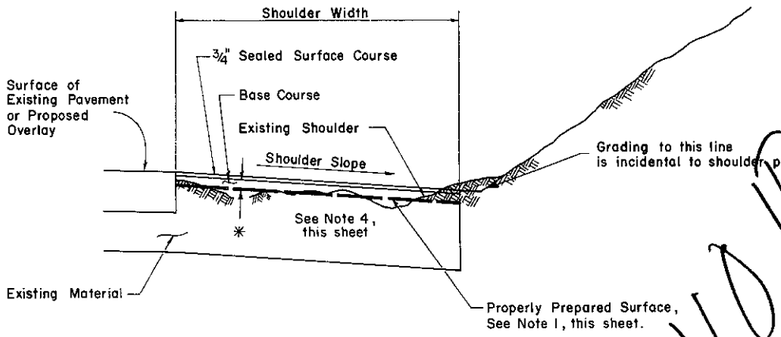


CUT SECTION

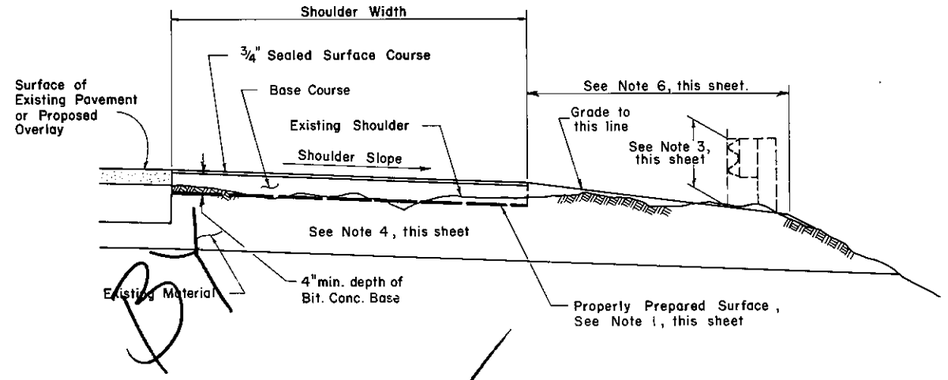
* TYPE 4

Depth of Aggr. Base as shown on the drawings or as directed. (Material in accordance with Section 350.2, Form 408)

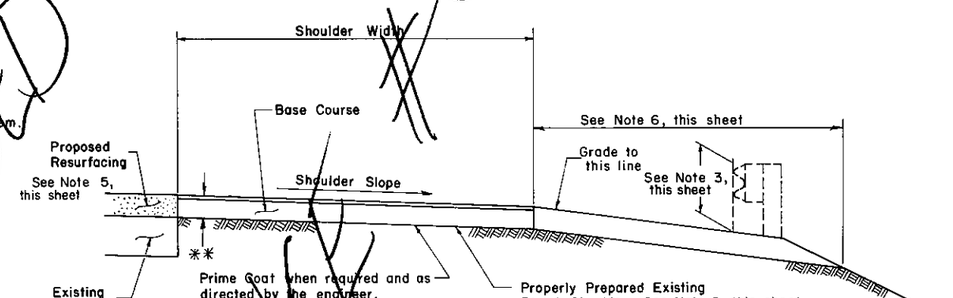
* TYPE 5

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

PAVED SHOULDERS
TYPE 4 & TYPE 5



PAVED SHOULDERS
TYPE 6



* Depth and composition of shoulder shall be as indicated in the proposal. The following min. dimensions shall apply:

(a) A one-inch (2.54 cm) minimum depth, after final compaction, of Bituminous Wearing Course, ID-2 and a Bituminous Seal Coat.

(b) A one-inch (2.54 cm) minimum depth, after final compaction, of Bituminous Surface Course FB-1 and a Bituminous Seal Coat.

(c) A four-inch (10.16 cm) minimum depth, after final compaction, of Bituminous Concrete Base Course and a 3/4" (19mm) sealed surface coat and a Bituminous Prime Coat when required.

(d) A two-inch (5.08 cm) minimum depth, after final compaction, of Bituminous Binder Course ID-2 and a 3/4" (19mm) sealed surface coat and a Bituminous Prime Coat when required.

PAVED SHOULDERS
TYPE 7

VOIDED

CHANGED

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. Where an overlay of 1 1/2" is applied to the roadway and the existing paved shoulder has at least 4" Bit. Conc. Base or 2" of Bit. Binder use a 1" min. depth of ID-2 plus a Bit. Seal Coat. On other types of good existing paved shoulders use a 1" min. depth of FB-1 Bit. Wearing Crse. plus a Bit. Seal Coat.

6. 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.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

SHOULDERS

Recommended May 31, 1979	Approved May 31, 1979	Sht. 2 Of 3
Director, Bureau of Design	Chief Hwy. Engr.	RC-25

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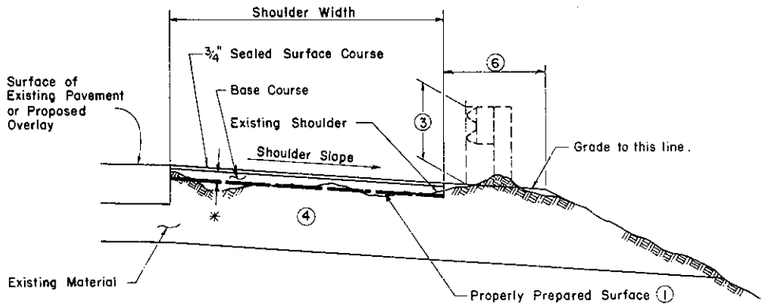
PRINT. BY



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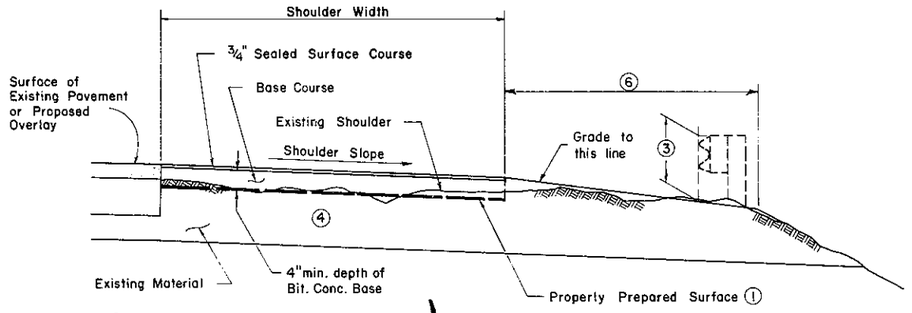
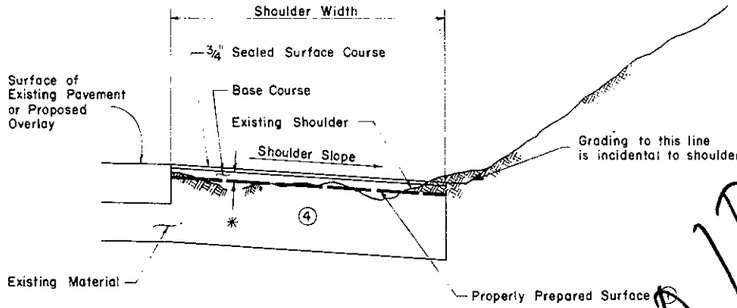
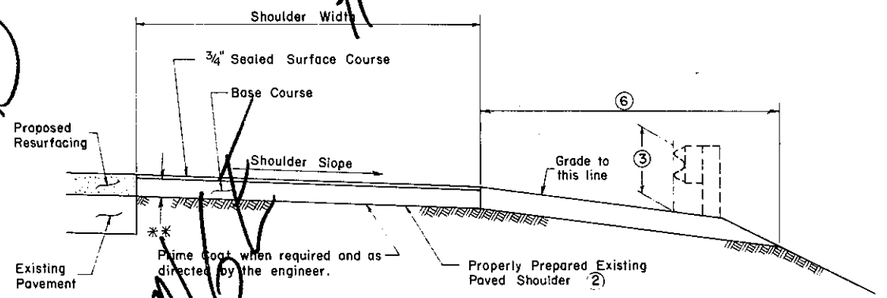


PAVED SHOULDERS
TYPE 6



CUT SECTION



** The following min. dimensions shall apply: (5)
4" for Bit. Conc. Base
2" for Bit. Binder

PAVED SHOULDERS
TYPE 7

* TYPE 4

Depth of Aggr. Base as required to establish a properly prepared surface as shown on the drawings or as directed. (Material in accordance with Section 350.2, Form 408).

* TYPE 5

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

PAVED SHOULDERS
TYPE 4 & TYPE 5

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.

(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 then 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 shall be measured and paid for in accordance with Sections 654, 655, and 656, Form 408. (Cross sections not required)

(5) Where an overlay of 1½" is applied to the roadway and the existing paved shoulder has at least 4" Bit. Conc. Base or 2" of Bit. Binder use a 1" min. depth of ID-2 plus a Bit. Seal Coat. On other types of good existing paved shoulders use a 1" min. depth of FB-1 Bit. Wearing Crse. plus a Bit. Seal Coat.

(6) Grading in this area shall be paid for as follows:
(a.) 4' or less - grading shall be considered incidental to the shoulder pay item. (Backfill material, if necessary, shall meet the requirements of Section 350 or 351, Form 408.)
(b.) Greater than 4' - grading shall be paid for as Selected Borrow Excavation in accordance with Section 205, Form 408. The material shall meet the requirements of Section 350 or 351, Form 408.

• Shaping includes the placement of graded material from the shaping operation into the low areas. Where there is insuffient graded material from the shaping operation to bring the existing surface to the plane of the bottom of the proposed base course, the contractor shall complete the work by adding additional aggregate base course material.

VOID

CHANGE

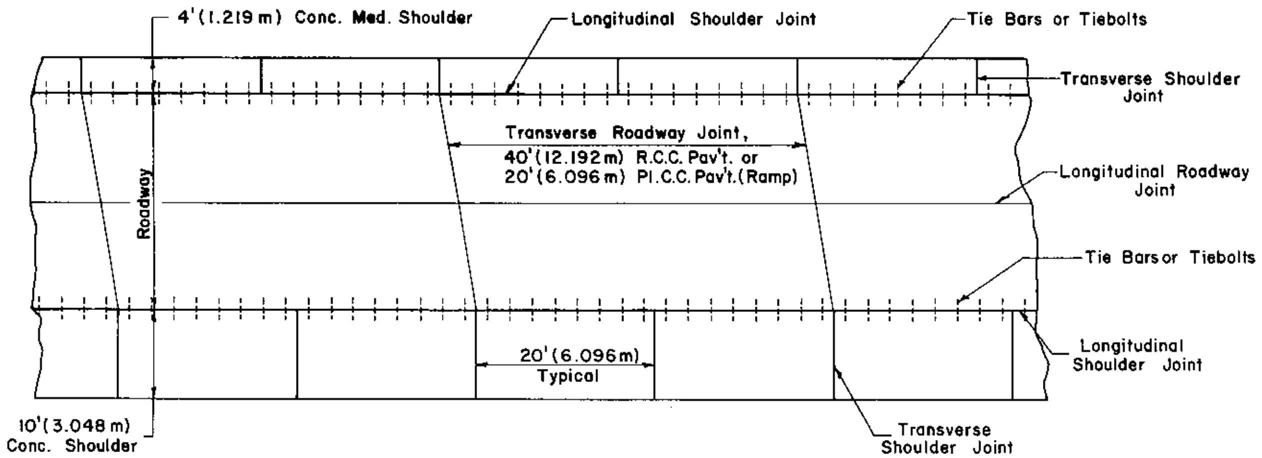
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

SHOULDERS

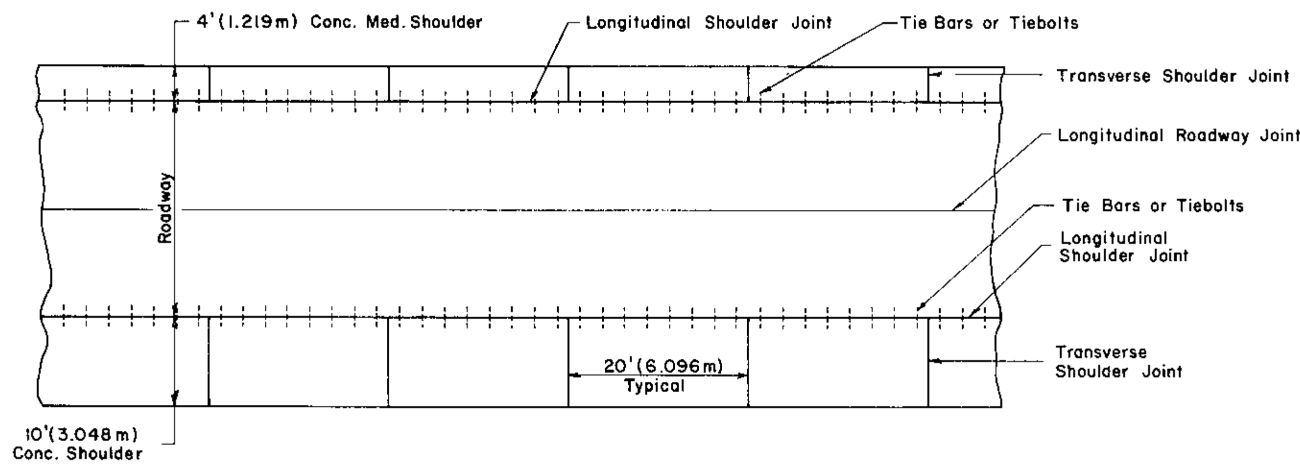
Recommended Jan 31, 1977
B.D. Laudise
Director, Bureau of Design

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

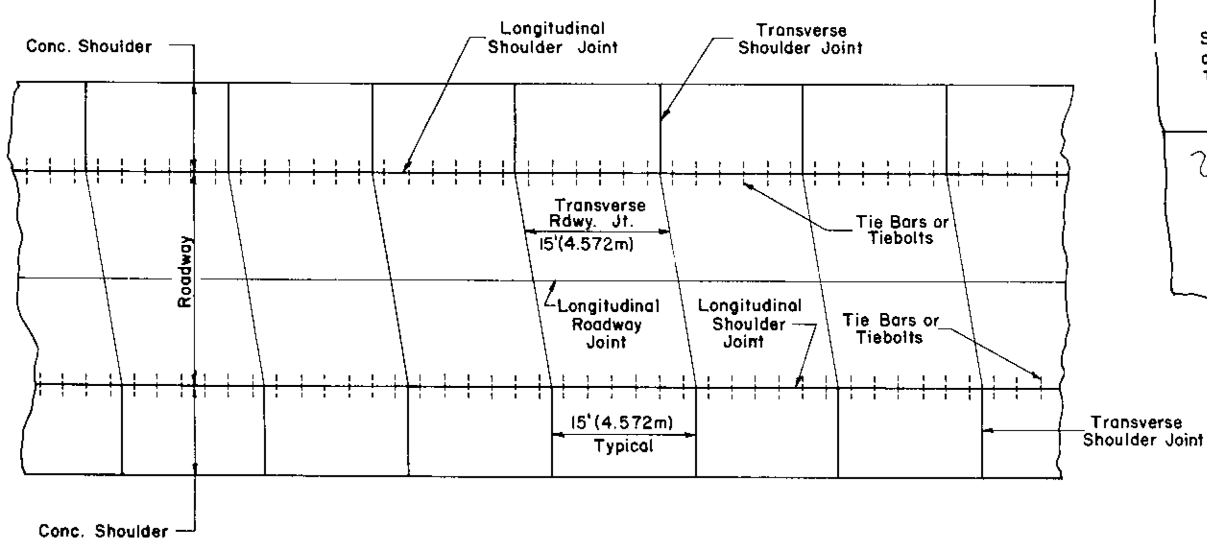
Sht. 2 Of 2
RC-25



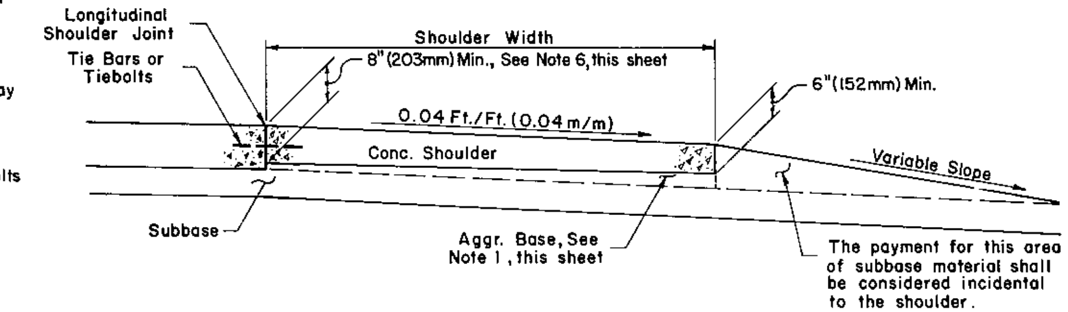
CONCRETE SHOULDERS ADJACENT TO R.C.C. PAVEMENT AND PL.C.C. PAVEMENT (RAMP)



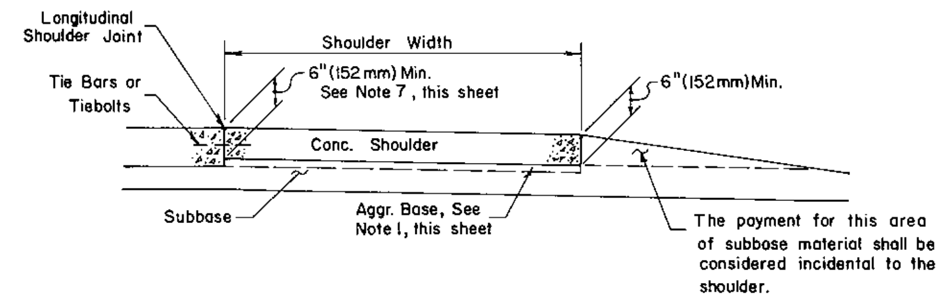
CONCRETE SHOULDERS ADJACENT TO C.R.C. PAVEMENT



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



CONCRETE SHOULDER TYPE 1

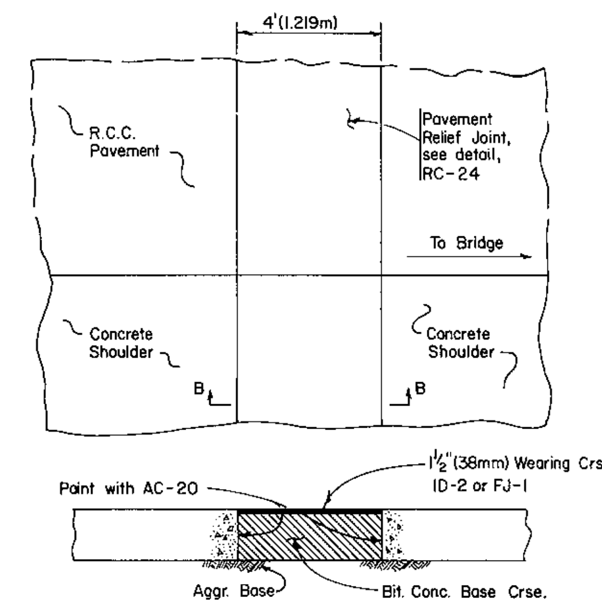


CONCRETE SHOULDER TYPE 2

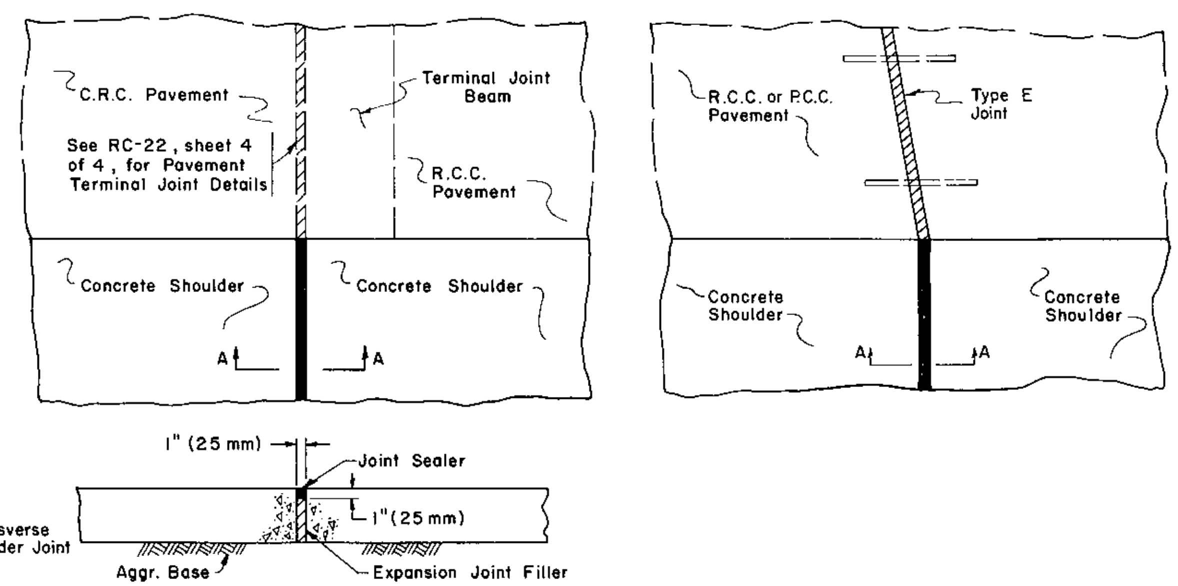
TYPICAL SECTION

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



SECTION A-A

CONCRETE SHOULDER EXPANSION JOINTS

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

SHOULDERS (CONCRETE)

Recommended July 16, 1980	Approved July 16, 1980	Sht. 3 Of 3
Director, Bureau of Design	Deputy Sec. for Highway Admin.	RC-25

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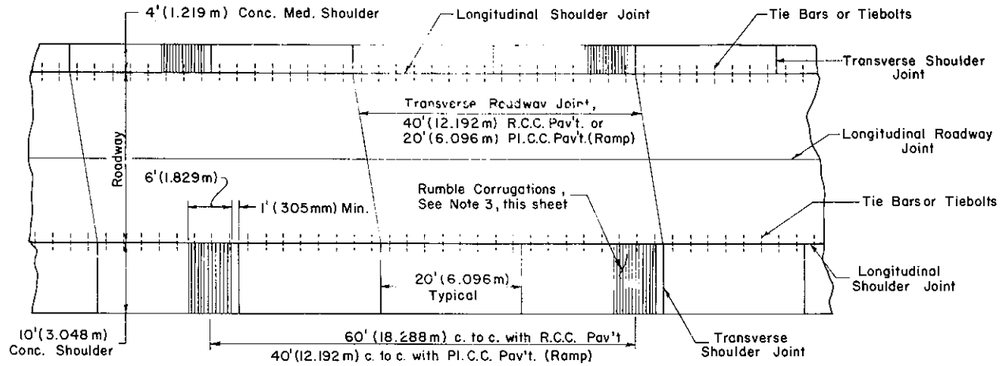
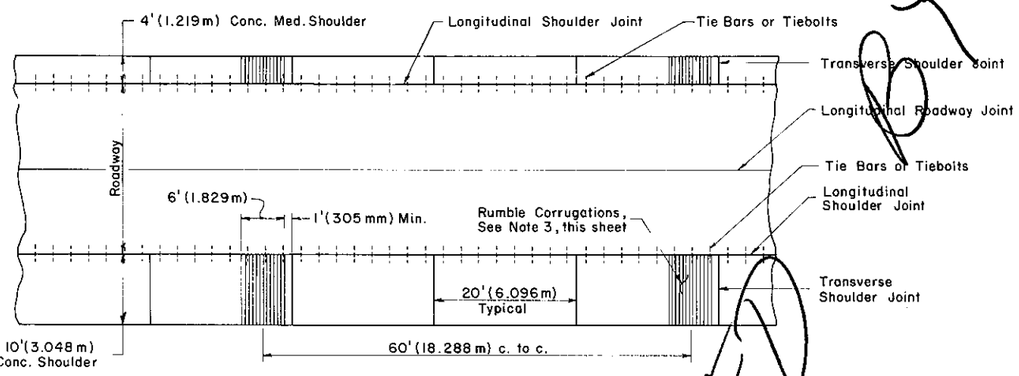
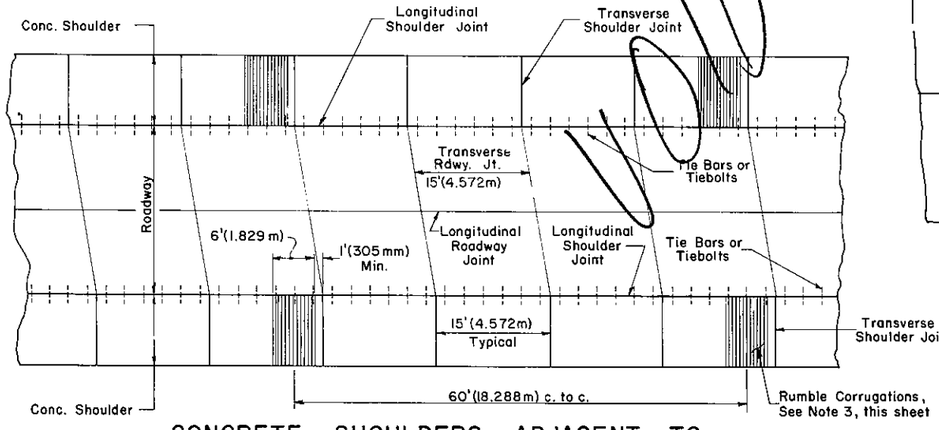


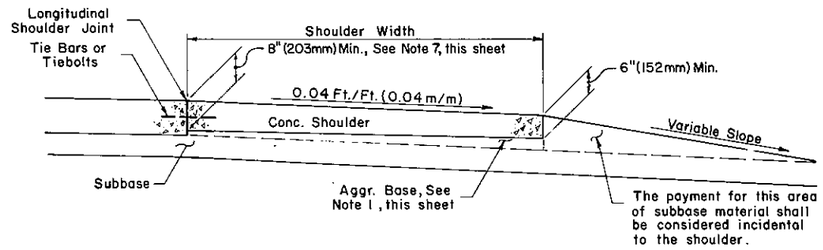
CONCRETE SHOULDERS ADJACENT TO R.C.C. PAVEMENT AND PL.C.C. PAVEMENT (RAMP)



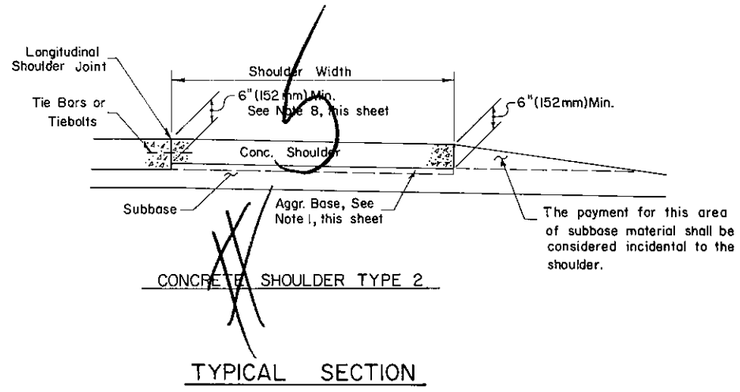
CONCRETE SHOULDERS ADJACENT TO C.R.C. PAVEMENT



CONCRETE SHOULDERS ADJACENT TO PL.C.C. PAVEMENT FOR CLASS 3,4,AND 5 HIGHWAYS



CONCRETE SHOULDER TYPE 1

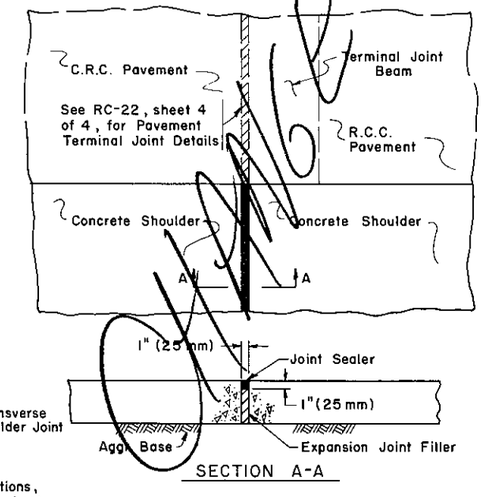


CONCRETE SHOULDER TYPE 2

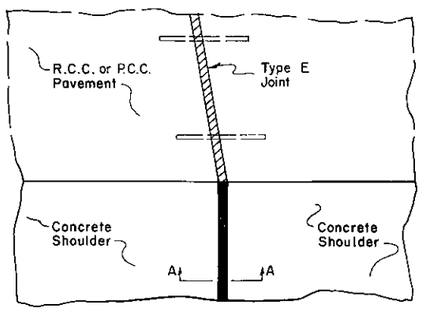
TYPICAL SECTION

NOTES

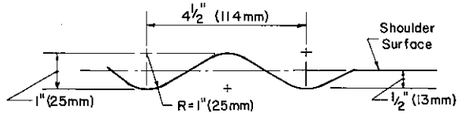
1. The Aggr. Base shall be as specified in Section 350.3, Form 408, and shall be considered part of the shoulder.
2. All shoulder joints shall be sealed in accordance with Section 501.3(q), Form 408.
3. Start rumble corrugations 2"(51mm) from the edge of the roadway pavement. Where a curb is used at the outside edge of the shoulder, the corrugations should be terminated at the gutter or a minimum of 1'(305mm) from the curb.
4. For joint details, see RC-20.
5. See RC-25, sheet 1 of 3, for shoulder rounding detail on high side of superelevations.
6. At the contractors option, shoulder joints may be placed at a skew in line with the skewed joints of the roadway pavement.
7. 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.
8. At the contractors option, Type 2 concrete shoulders may be constructed on a taper, with a 6"(152mm) minimum depth, or at the some depth as the pavement, at no additional expense to the Department.



SECTION A-A



CONCRETE SHOULDER EXPANSION JOINTS



CORRUGATION DETAIL

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

SHOULDERS (CONCRETE)

Recommended May 31, 1979	Approved May 31, 1979	Sht. 3 of 3
Director, Bureau of Design	Chief Hwy. Engr.	RC-25

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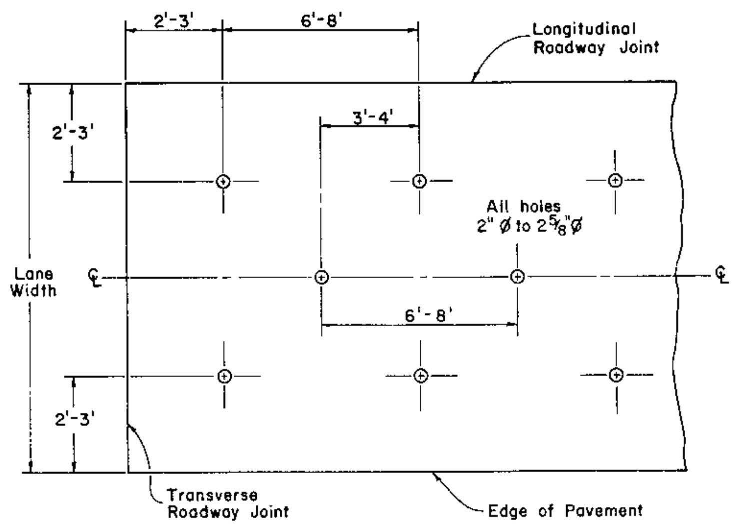
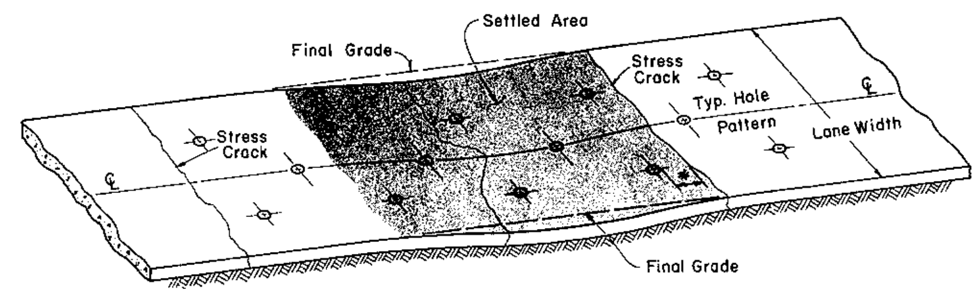
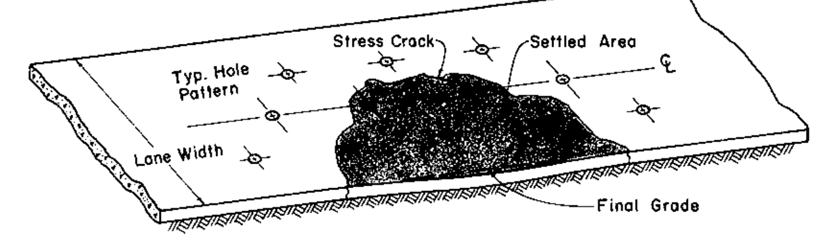


TYPICAL GUIDE FOR SLABJACKING HOLE ARRANGEMENT



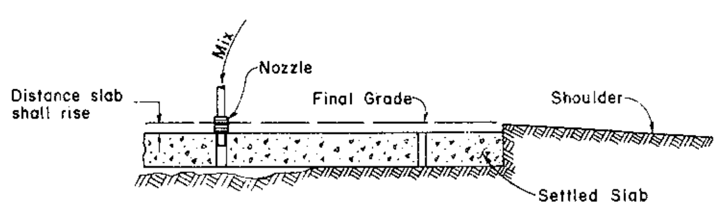
FULL LANE WIDTH SETTLEMENT

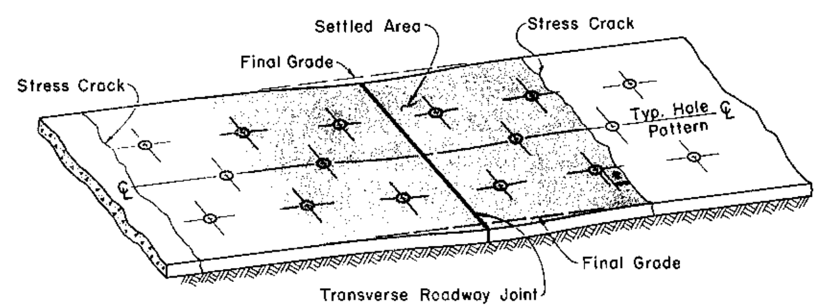


EDGE SETTLEMENT

SLAB SETTLEMENT BETWEEN TRANSVERSE ROADWAY JOINTS

* See Note 3, this sheet.





SLAB SETTLEMENT AT TRANSVERSE ROADWAY JOINTS

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.

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

- via change #4

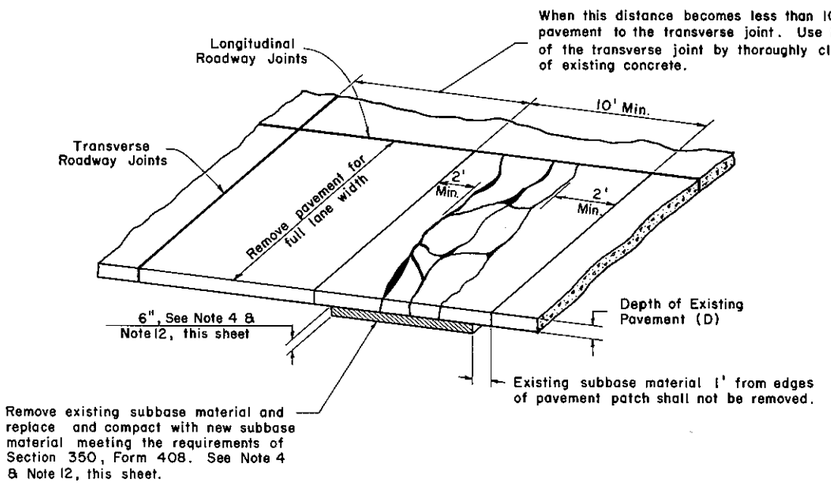
May 31, 1979 May 31, 1979

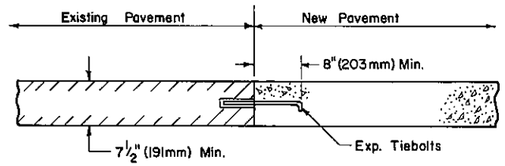
Recommended ~~Jan. 31, 1977~~ [signature] Director, Bureau of Design

Approved ~~Jan. 31, 1977~~ [signature] Deputy Chief Hwy. Engr.

Sht. 1 Of 2

RC-26

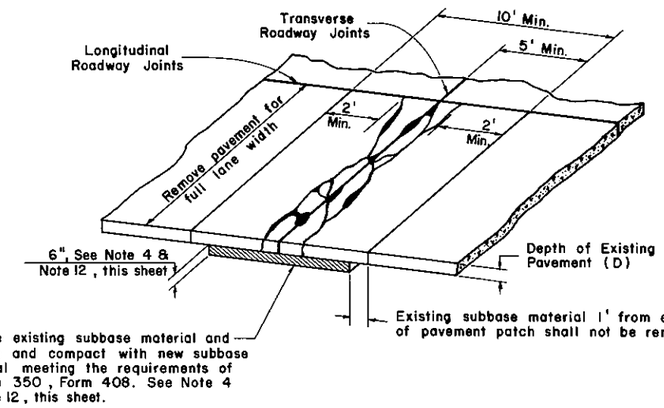


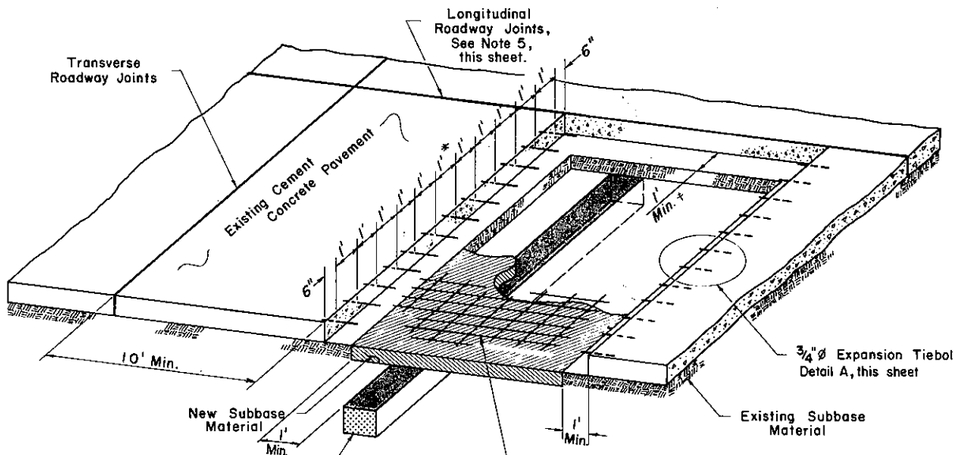


DETAIL A

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" (19mm) in diameter. The Exp. Tiebolts shall have a minimum pull-out strength of 15,000 pounds (66,725 N).

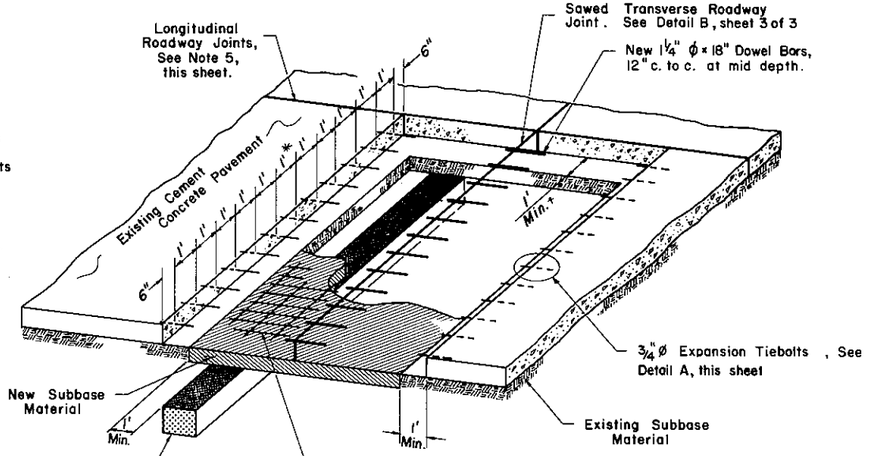




PAVEMENT PATCHING BETWEEN TRANSVERSE ROADWAY JOINTS

✳ 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 finished with an edging tool 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' (3.048 m).
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.)

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

CONCRETE PAVEMENT MAINTENANCE

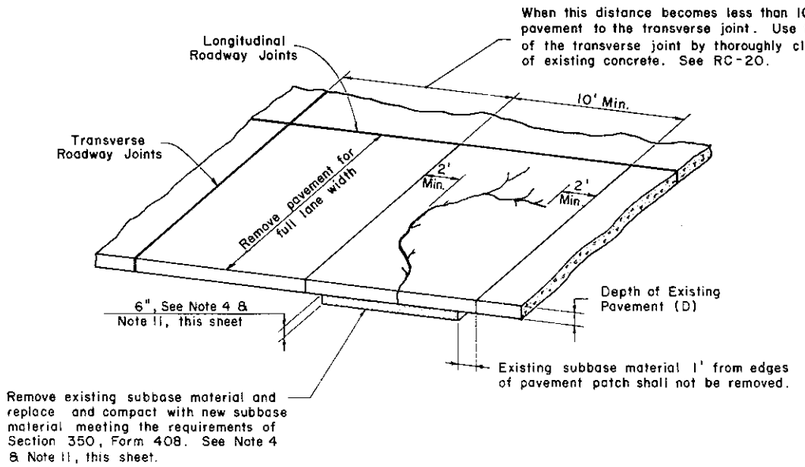
PLAIN & REINFORCED PATCHING

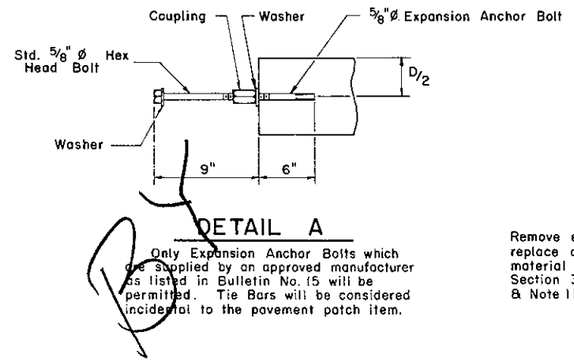
Recommended May 31, 1979
B.O. Lunkin
Director, Bureau of Design

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

Sht. 2 Of 3

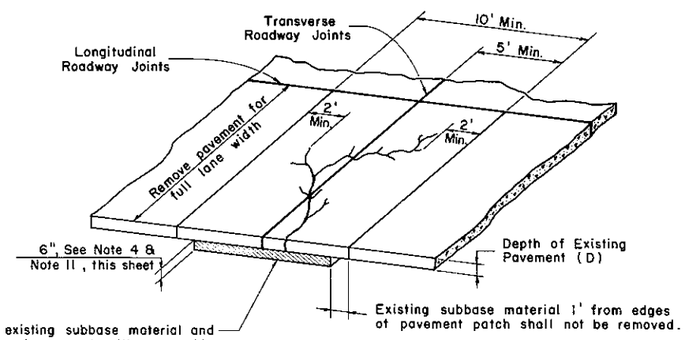
RC-26

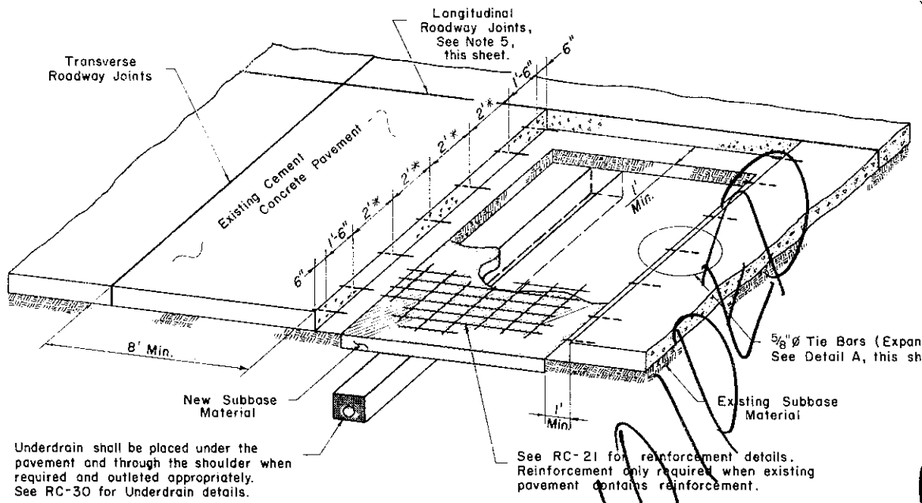




DETAIL A

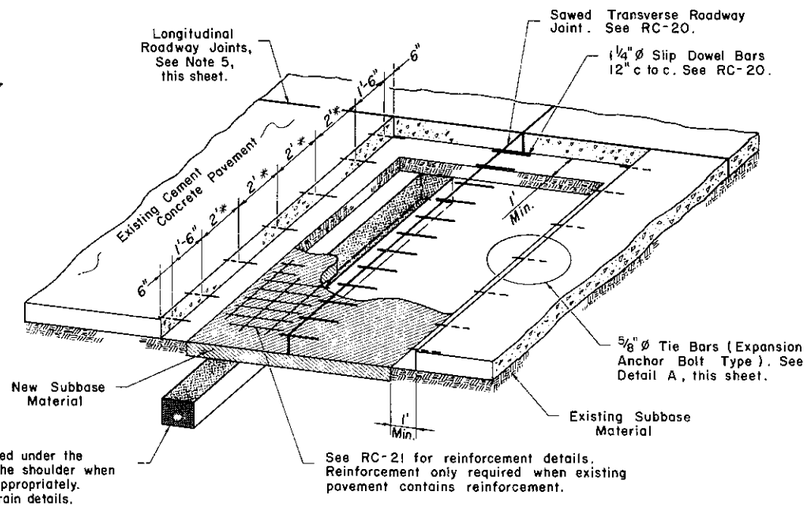
Only Expansion Anchor Bolts which are supplied by an approved manufacturer as listed in Bulletin No. 15 will be permitted. Tie Bars will be considered incidental to the pavement patch item.





PAVEMENT PATCHING BETWEEN TRANSVERSE ROADWAY JOINTS

* For pavement widths other than 12' these dimensions shall be adjusted so that the tie bars are evenly spaced, with a max. spacing of 2'-0" c to c. Tie bars may be added or deleted as required.



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 saw cut 1½" to 2" minimum depth 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 finished with an edging tool and the resulting groove shall be sealed with joint sealing material after the patching is completed.
6. If a patch extends over the full width of the pavement, a longitudinal construction joint shall be used.
7. 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.
8. When the shoulder area adjacent to patch is disturbed for reasons other than the placing of Pipe Underdrain or Foundation Underdrain, it shall be replaced in kind and the cost shall be incidental to the concrete patch item.
9. 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.
10. 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.
11. The removal of the pavement, the existing subbase and the unsuitable additional excavation will be paid for as Class I 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.)

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

CONCRETE PAVEMENT MAINTENANCE

PLAIN & REINFORCED PATCHING

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

Approved Jan. 31, 1977
Deputy Chief Hwy. Engr.

Sht. 2 of 2

RC-26

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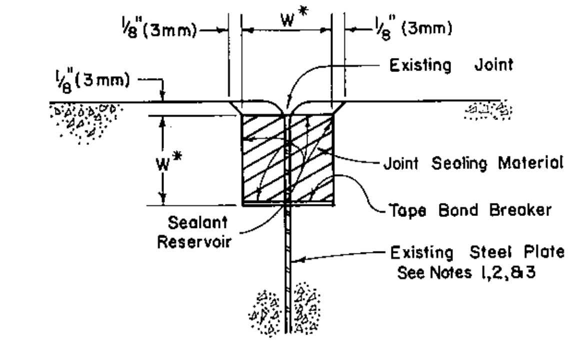
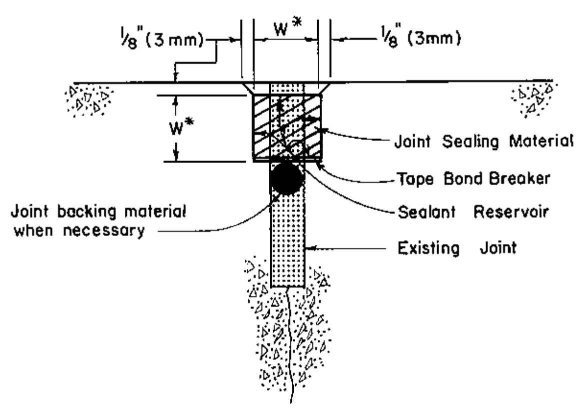
FINAL BY

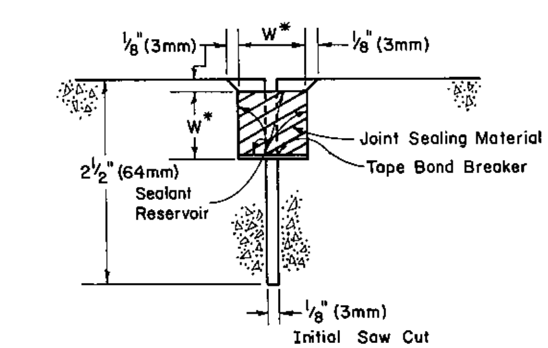


TYPE 2



TYPE 1

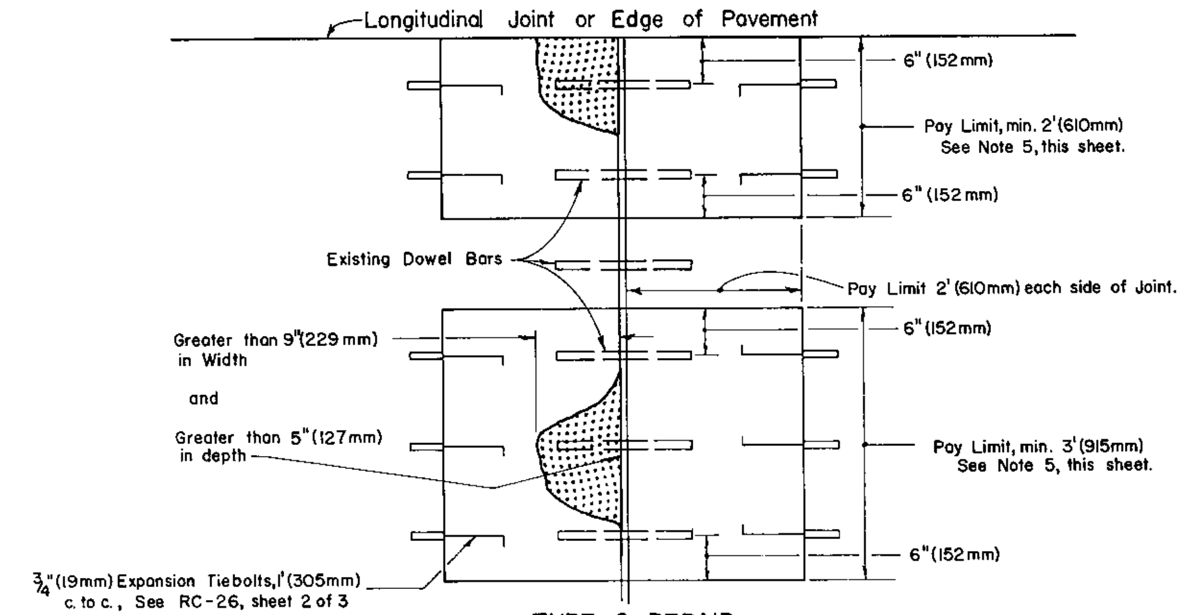
JOINT REHABILITATION



DETAIL B

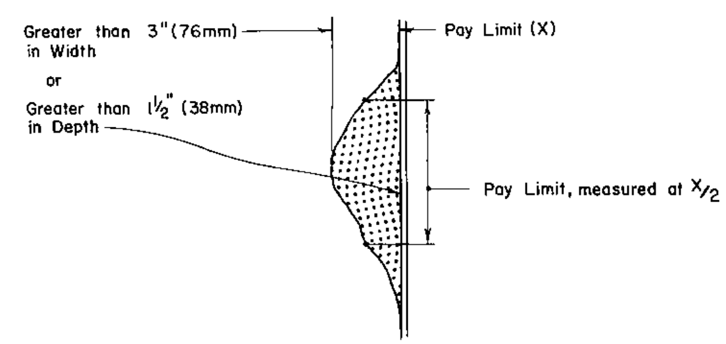
WHEN THE EXISTING JOINT IS REPLACED FULL DEPTH

See Note 6

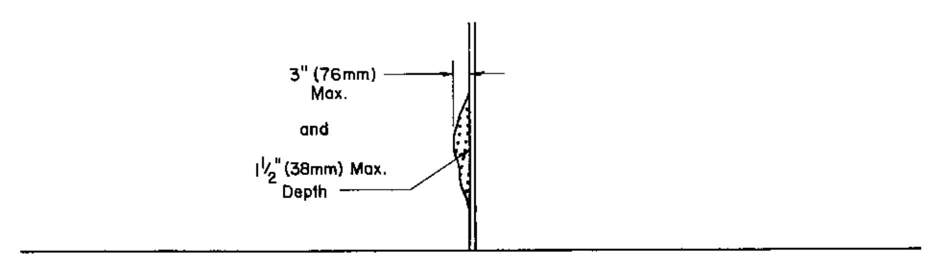


TYPE 2 REPAIR

See Note 7



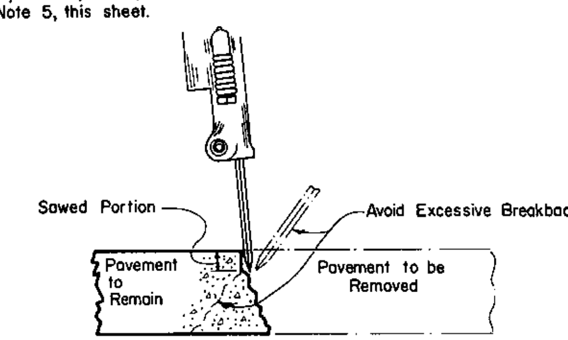
TYPE 1 REPAIR



NO REPAIR REQUIRED

CONCRETE JOINT SPALL REPAIR

* See Note 4



PAVEMENT REMOVAL FOR TYPE 2 REPAIR

NOTES

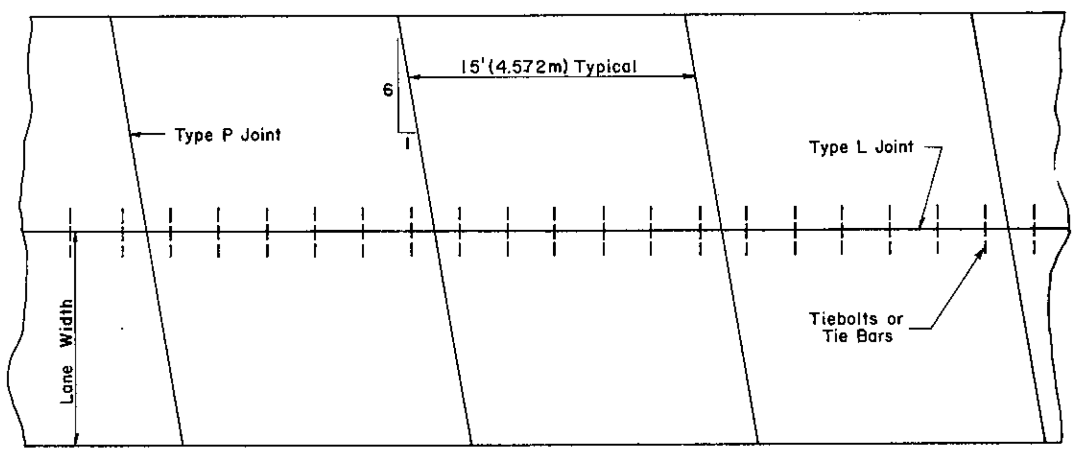
1. The existing steel plate is either 14 Ga. with a lapped top, or a flat plate 1/8" (3mm) thick.
2. Where an existing joint contains a steel plate it shall be removed to the bottom of the new sealant reservoir.
3. If the slab is being replaced adjacent to an existing joint, the removal of the steel 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.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

CONCRETE PAVEMENT MAINTENANCE

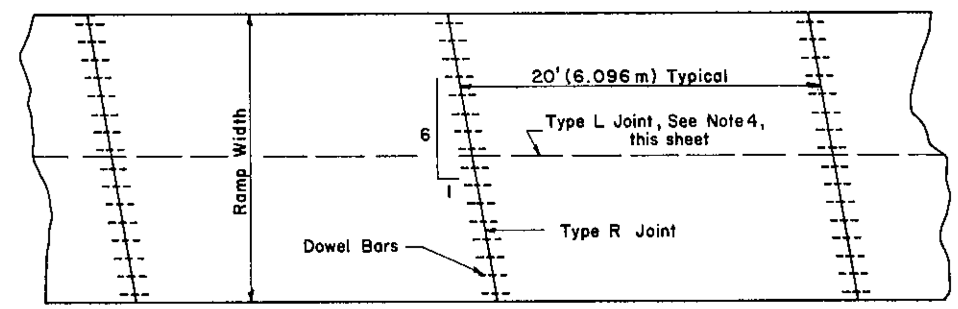
JOINT REHABILITATION & CONCRETE JOINT SPALL REPAIR

Recommended May 31, 1979	Approved May 31, 1979	Sht. 3 Of 3
B.D. Cornelie Director, Bureau of Design	David S. Sims Chief - Hwy. Engr.	RC-26



PLAN

PAVEMENT FOR CLASS 3, 4, AND 5 HIGHWAYS

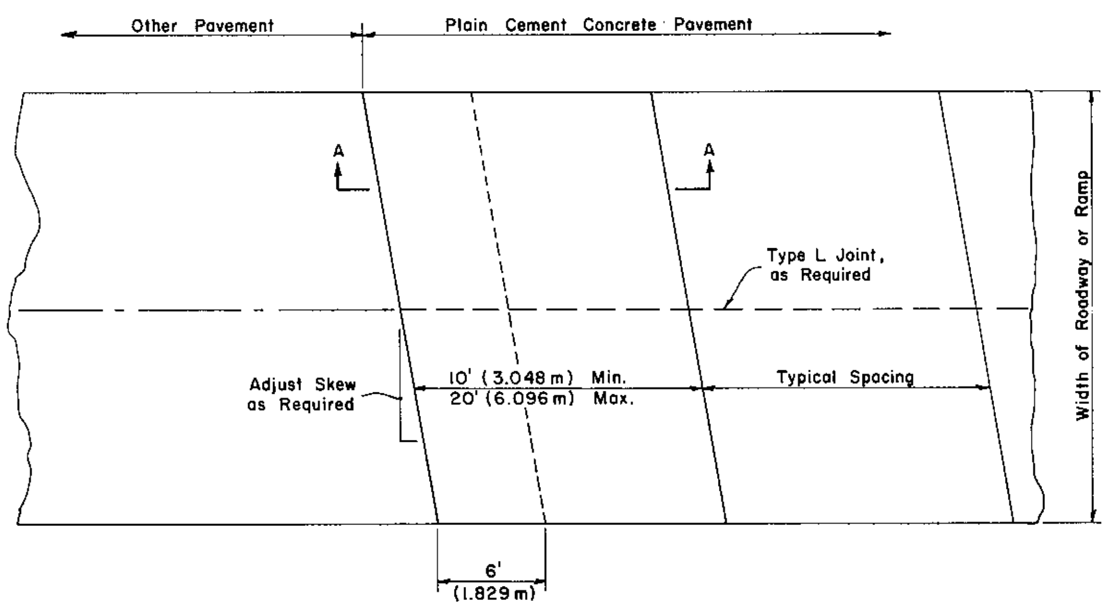


PLAN

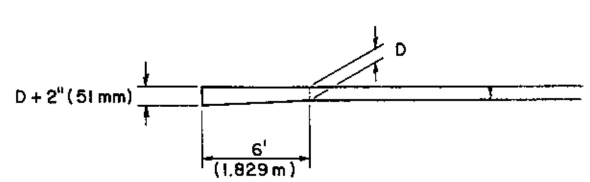
RAMPS

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'(4.267m) a Type L Joint is required at mid point.

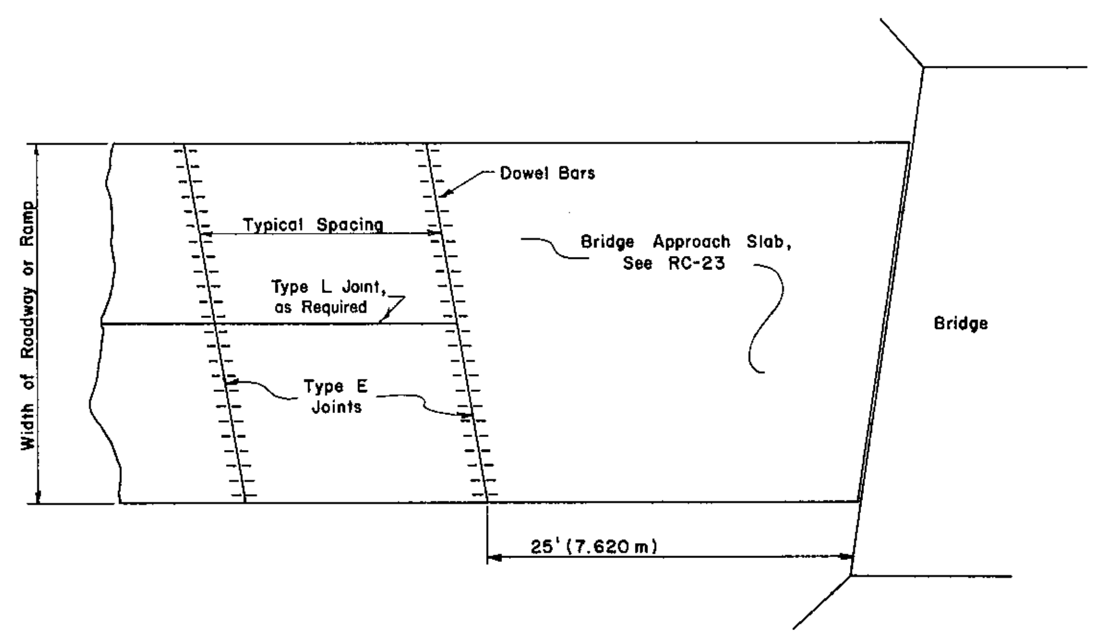


PLAN



SECTION A-A

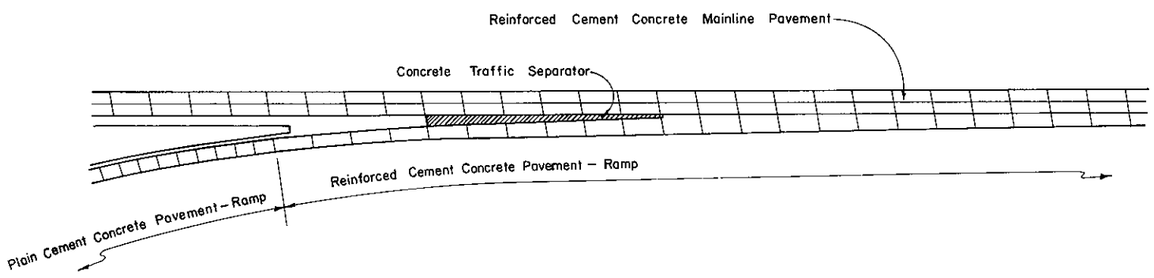
TERMINAL SLAB

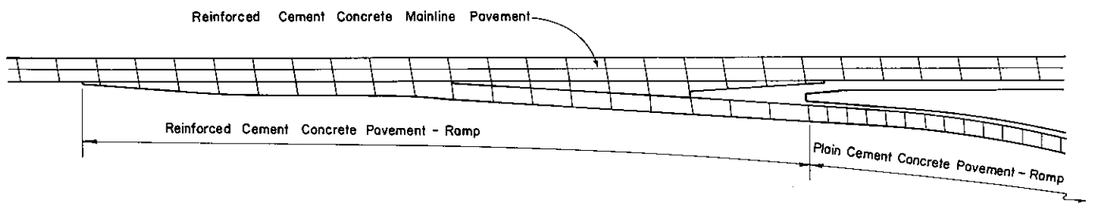


BRIDGE APPROACHES

Commonwealth of Pennsylvania DEPARTMENT OF TRANSPORTATION BUREAU OF DESIGN		
PLAIN CEMENT CONCRETE PAVEMENT		
Recommended May 31, 1979 Director, Bureau of Design	Approved May 31, 1979 Chief Hwy. Engr.	Sht. 1 Of 2 RC-27

RAMP CONNECTIONS WITH R.C.C. MAINLINE PAVEMENT

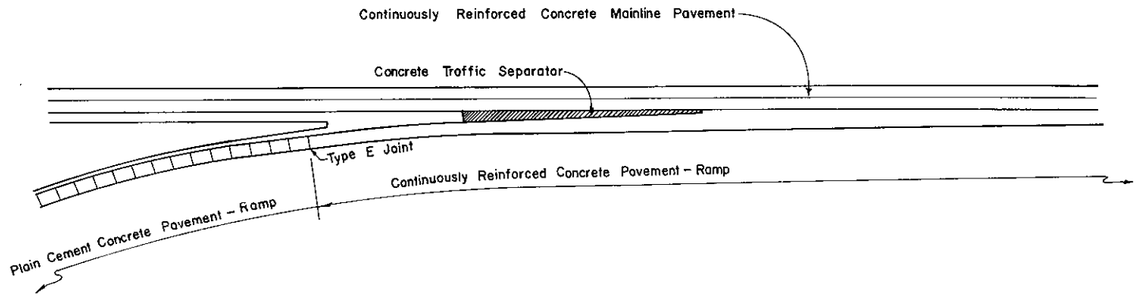


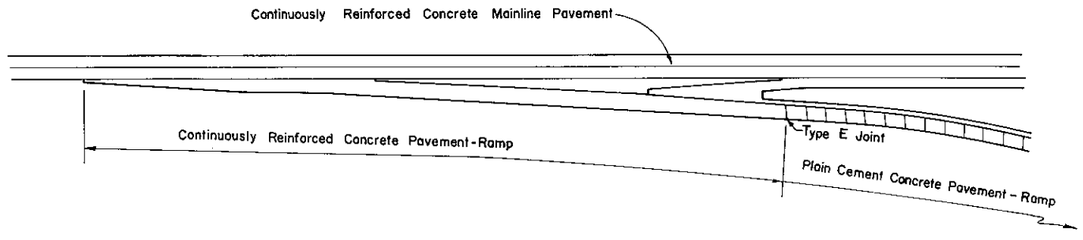


Notes: Actual joint locations to be determined in the field.

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. Fowler Director, Bureau of Design	Approved May 31, 1979 David Arnold Chief Hwy. Engr.	Sht. 2 Of 2 RC-27

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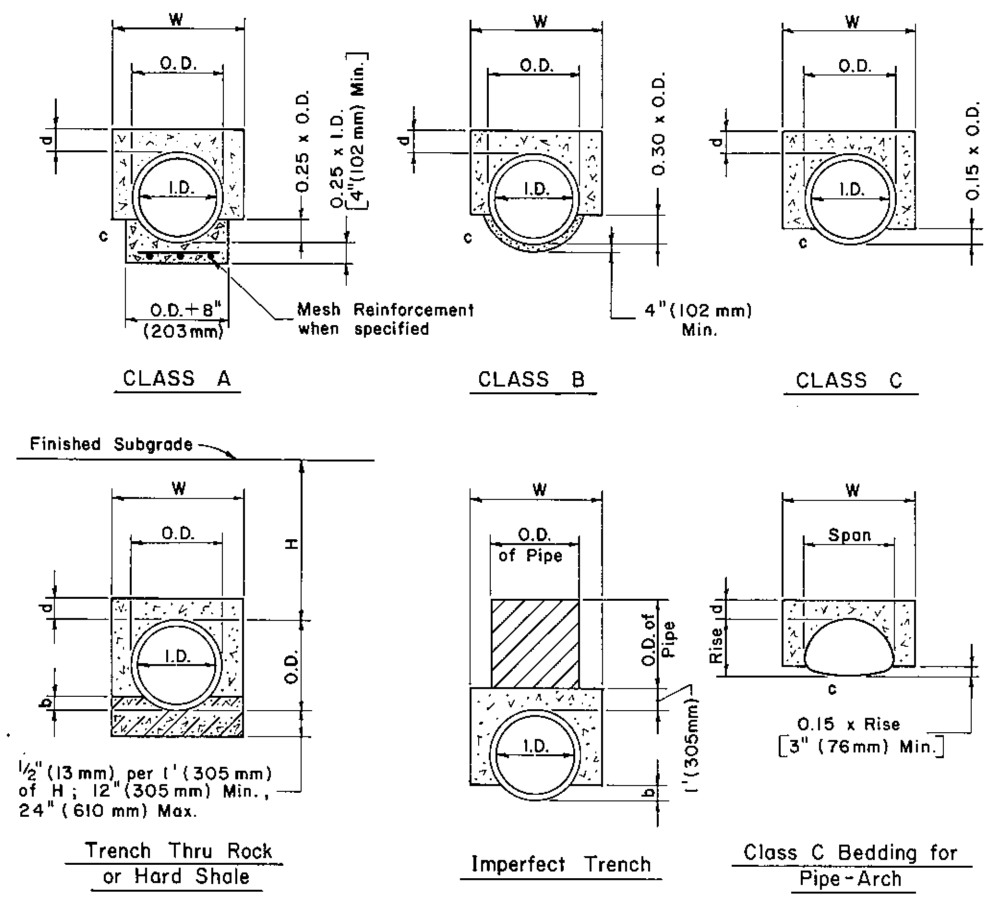


[symbol]	COARSE AGGREGATE FOR PIPE TRENCH BACKFILL.
[symbol]	CEMENT CONCRETE
[symbol]	FINE AGGREGATE FOR CLASS B BEDDING
[symbol]	SELECTED FINE COMPRESSIBLE MATERIAL or when directed COARSE AGGREGATE
[symbol]	LOOSE, HIGHLY COMPRESSIBLE EARTH or other APPROVED MATERIAL

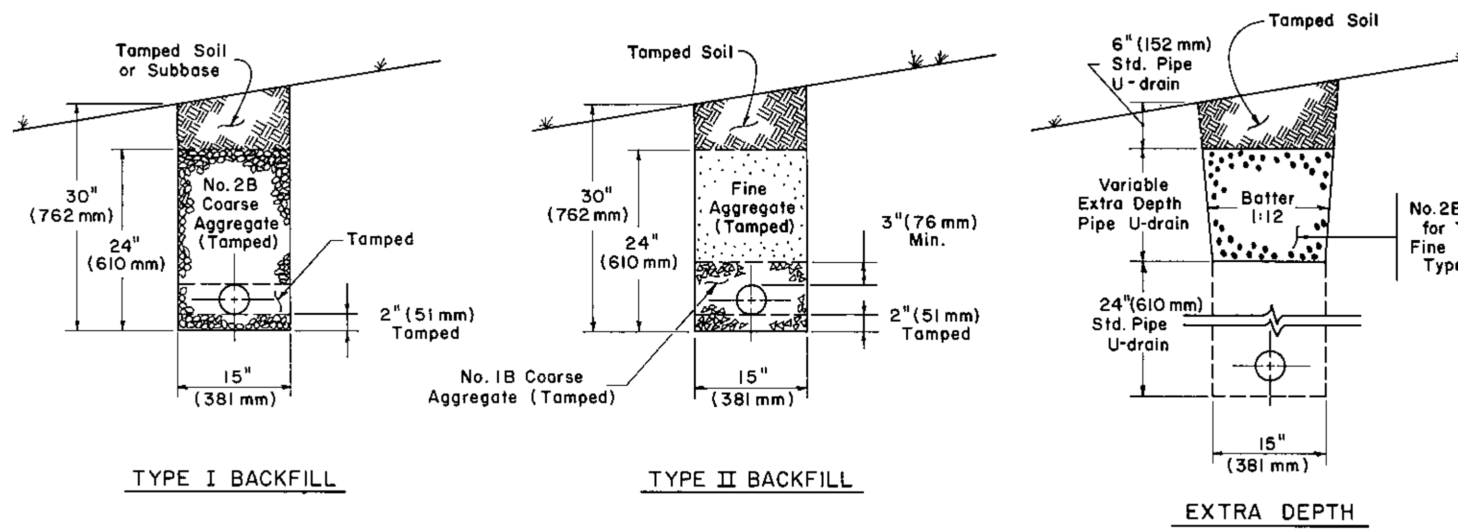
I.D. — Nominal inside diameter of pipe.
O.D. — Outside diameter of pipe barrel or shell.
H.D. — (Hub Diameter) — Outside diameter of pipe at bell or band.
W — 1.0 ft. (305 mm) + H.D. for Combination Storm Sewer and Underdrain.
2.0 ft. (610 mm) + H.D. for pipes or pipe-arches not exceeding 48"(1220 mm) I.D or Span, respectively.
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:

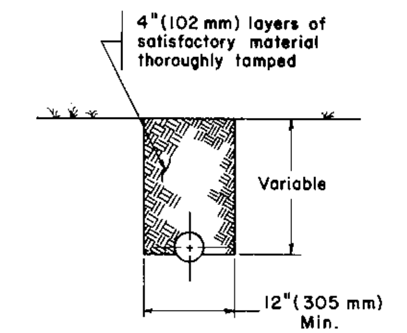
(1) Pipes located in medians.
(2) Pipes located under swales or ditch lines.
(3) Slope pipes in cut or fill.
(4) Pipes under drives to private properties.
(5) Pipes located in graded sections of interchange area.
(6) Storm sewer outside shoulder area.

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

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

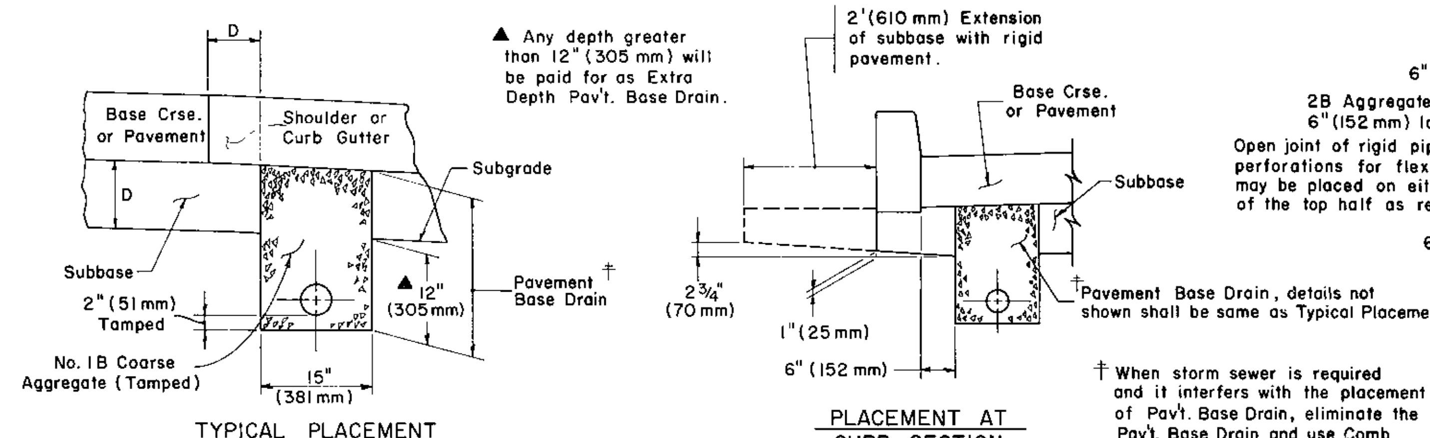


PIPE UNDERDRAIN



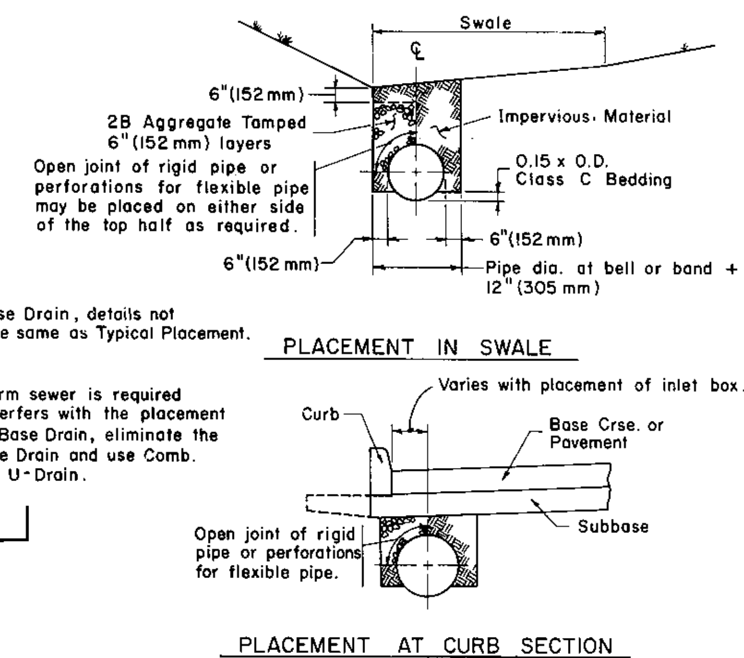
Excavation over 36"(914 mm) in depth and for a maximum width of 24"(610 mm) is payable as Class 4 Excavation. Subsurface Drain Outlets shall be used for Pipe Underdrain and Pavement Base Drain.

SUBSURFACE DRAIN OUTLETS



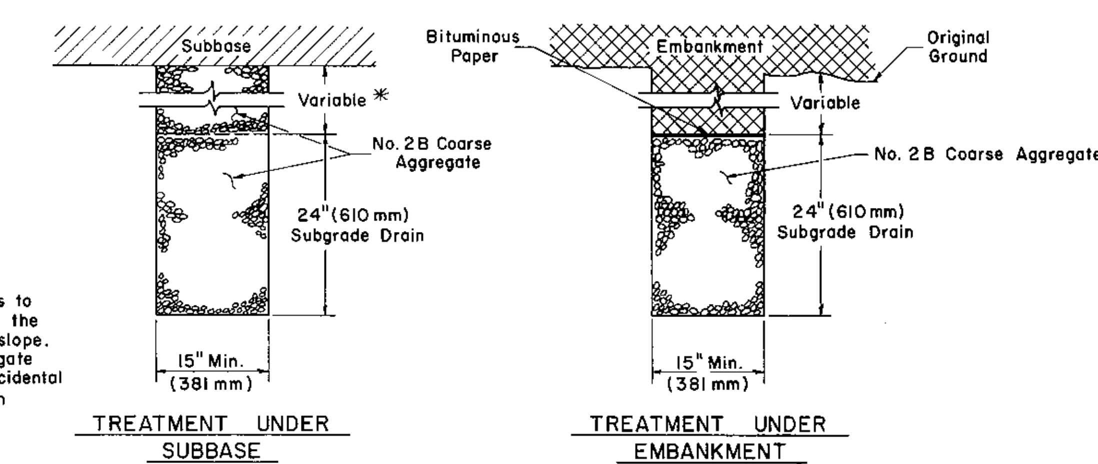
† When storm sewer is required and it interfers with the placement of Pav't. Base Drain, eliminate the Pav't. Base Drain and use Comb. S.S. and U-Drain.

PAVEMENT BASE DRAIN



Details not shown shall be same as Placement in Swale.

COMBINATION STORM SEWER AND UNDERDRAIN



* 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 1, 1978 B. D. [signature] Director, Bureau of Design	Approved May 1, 1978 J. M. Sebastian Deputy Chief Hwy. Engr.	Sht. 1 Of 1 RC-30

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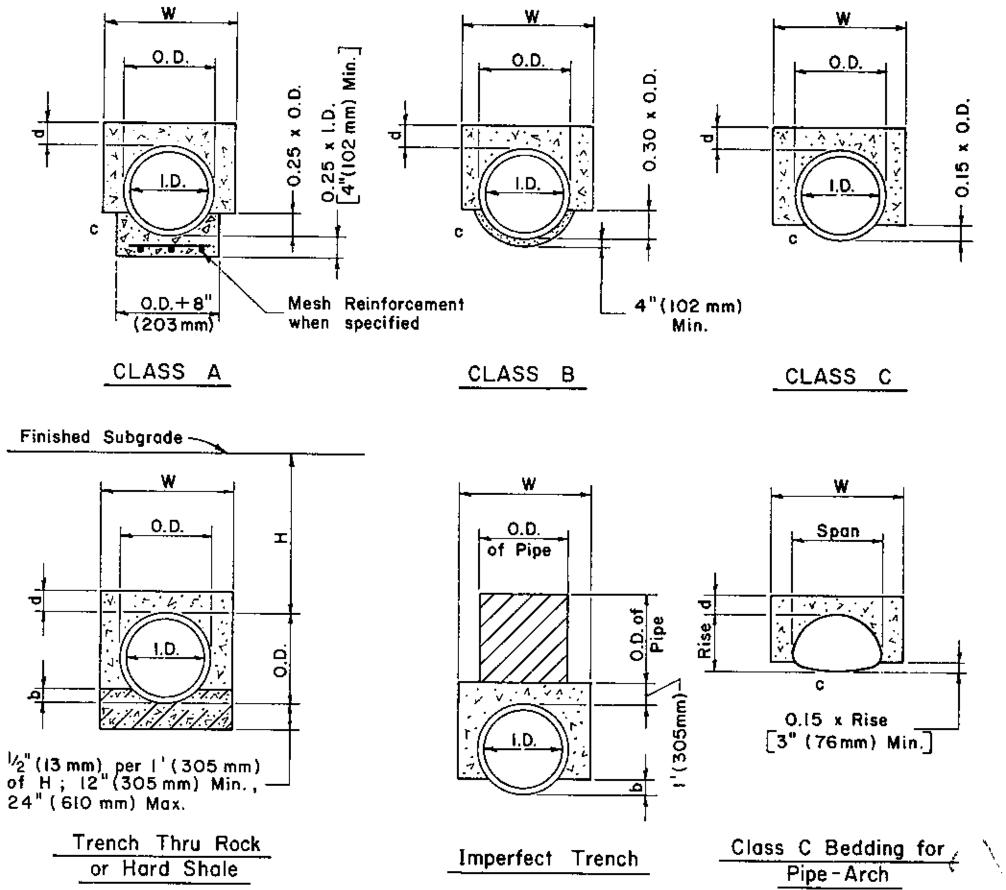
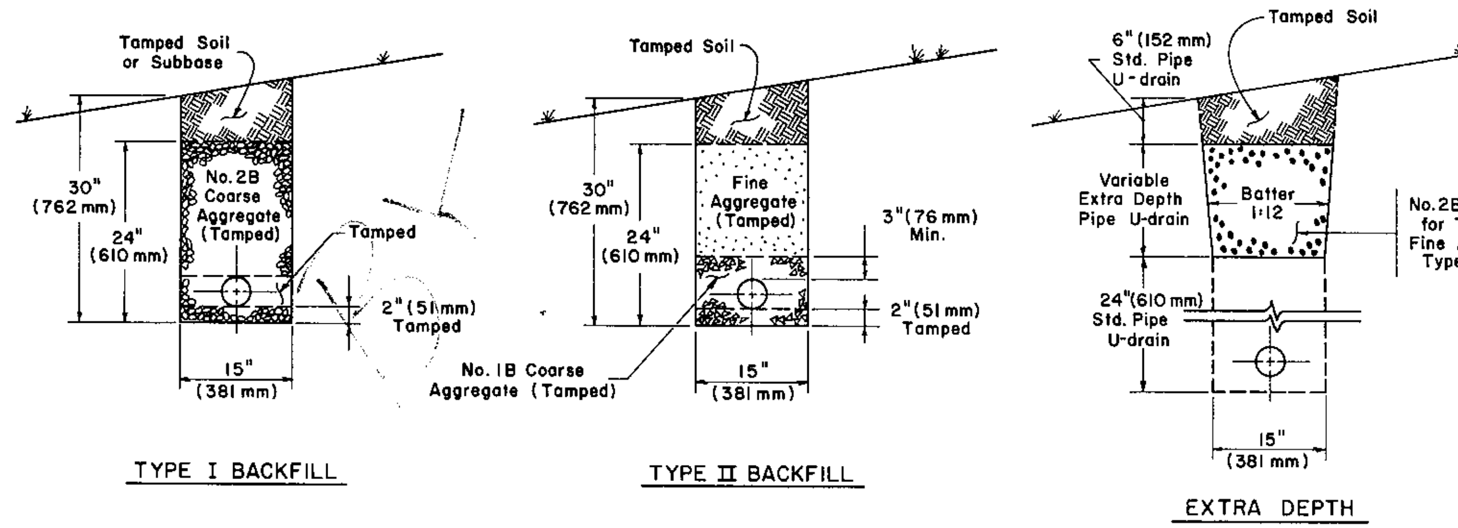
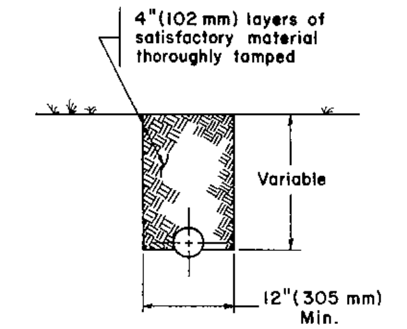
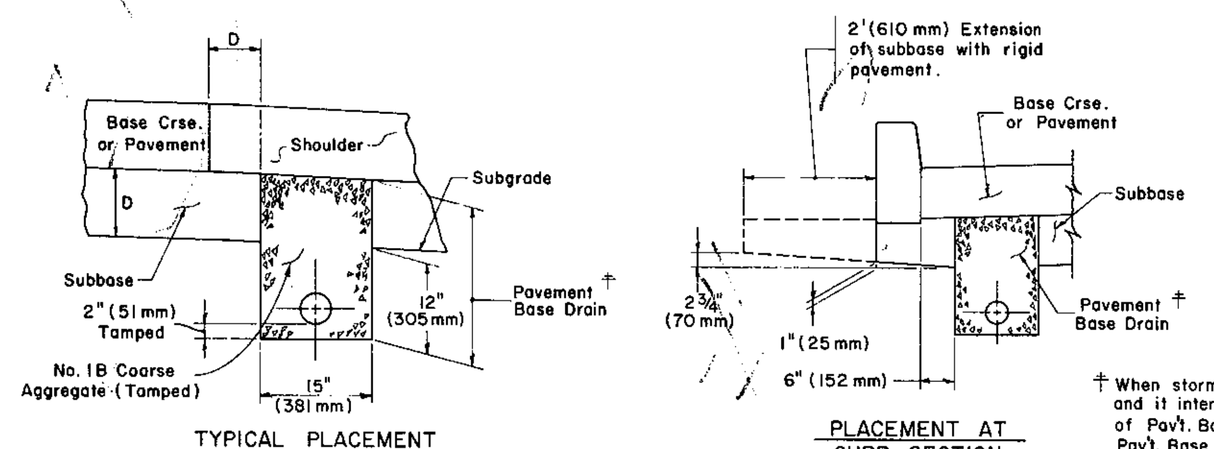




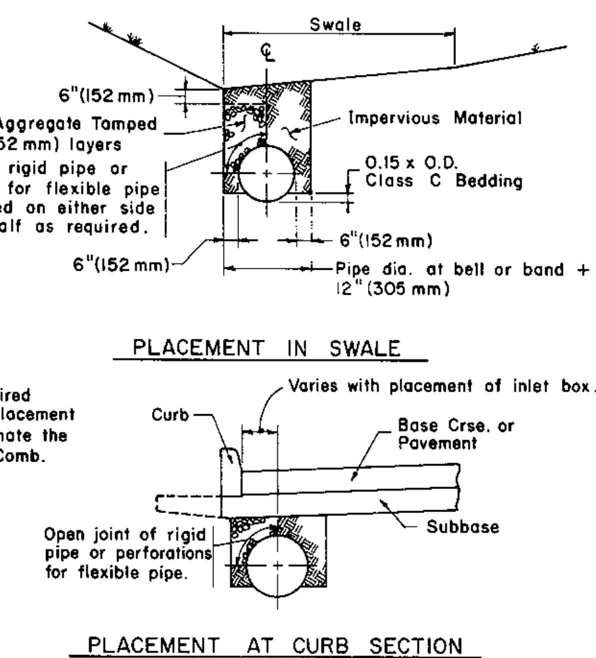


Excavation over 36"(914 mm) in depth and for a maximum width of 24"(610mm) is payable as Class 4 Excavation. Subsurface Drain Outlets shall be used for Pipe Underdrain and Pavement Base Drain.

SUBSURFACE DRAIN OUTLETS



† 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.



COMBINATION STORM SEWER AND UNDERDRAIN

[symbol]	COARSE AGGREGATE FOR PIPE TRENCH BACKFILL.
[symbol]	CEMENT CONCRETE
[symbol]	FINE AGGREGATE FOR CLASS B BEDDING
[symbol]	SELECTED FINE COMPRESSIBLE MATERIAL or when directed COARSE AGGREGATE
[symbol]	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.
2.0 ft. (610 mm) + H.D. for pipes or pipe-arches not exceeding 48"(1220 mm) I.D or Span, respectively.
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.

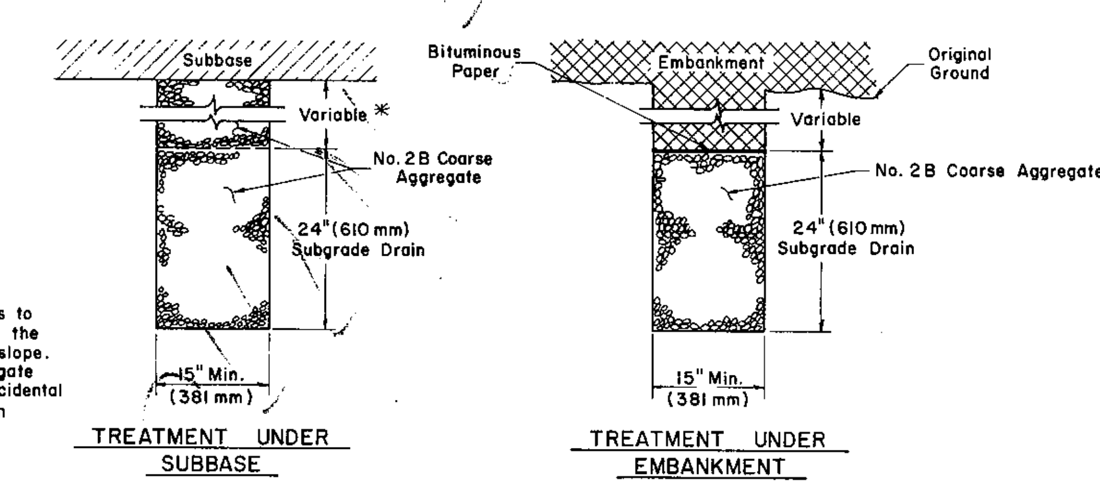
Note: The use of Coarse Aggregate for pipe backfill will be based upon the location and type of pipe installation. The material and method of backfill shall be in accordance with Section 601.3(d) and it will be used for all pipes carrying surface drainage under the roadway in cut sections for the full 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

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

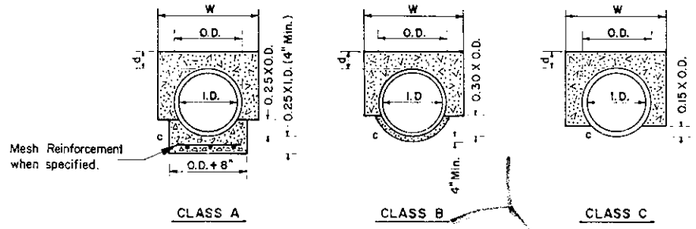


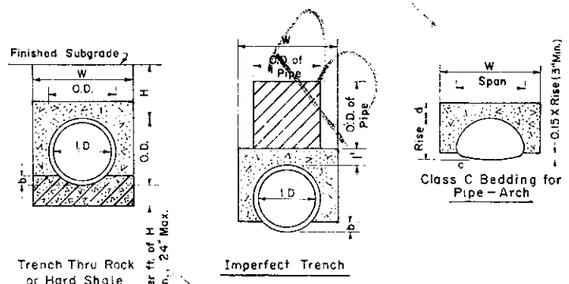
SUBGRADE DRAIN

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

SUBSURFACE DRAINS

Recommended Nov. 15, 1977	Approved Nov. 15, 1977	Sht. 1 Of 1
B. D. [signature] Director, Bureau of Design	J. M. Sebastian Deputy Chief Hwy. Engr.	RC-30





PIPE BEDDING AND BACKFILL

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 — 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
d — 1.0 ft. minimum, where practicable.
H — Height of fill over top of pipe.

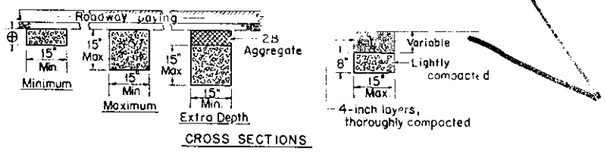
Note. The use of Coarse Aggregate for pipe backfill will be based upon the location and type of pipe installation. The material and method of backfill shall be in accordance with Section 601.3(d) and it will be used for all pipes carrying surface drainage under the roadway in cut sections for the full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

The exceptions are.
(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) Combination storm sewer and underdrain.
(6) Pipes located in graded sections of interchange areas.
(7) Storm sewer outside shoulder area.

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

* The trench width for combination storm sewer and underdrain shall have a specified width of I.O ft. + H.D.

BEDDING FOR PIPE CULVERTS & METAL PIPE-ARCH CULVERTS

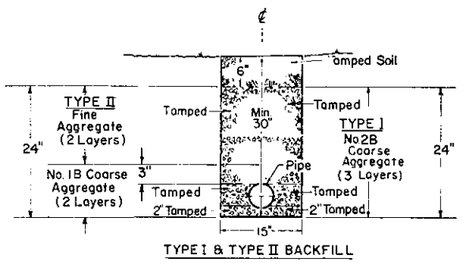


⊕ — Six (6) inches minimum or depth of adjacent insulation material or Subbase

▨ — Aggregate in excess of 15-inch depth is payable as No. 2B Coarse Aggregate
Excavation in excess of 15-inch depth is payable as Class 4 Excavation.

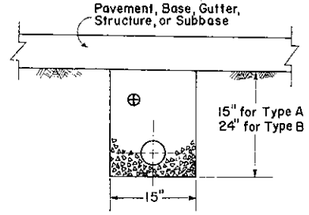
The top of aggregate under concrete pavement, base or gutter and through the shoulder area shall be covered with either one (1) layer of approved Bit. paper or one (1) layer of subgrade paper twenty-four (24) inches in width.

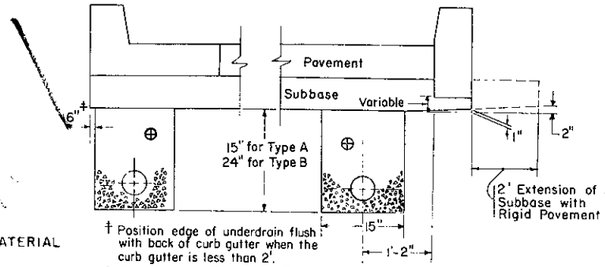
SUBGRADE DRAINS



TYPE I & TYPE II BACKFILL

PIPE UNDERDRAIN



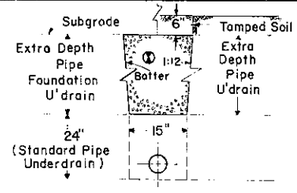


† Position edge of underdrain flush with back of curb gutter when the curb gutter is less than 2'.

⊕ For details of Type I and II Backfill, see PIPE UNDERDRAIN

Where placed under rigid base, pavement, gutter, or other structures, the top of the aggregate shall be covered with one(1) layer of approved bituminous paper.

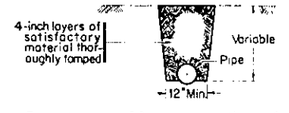
PIPE FOUNDATION UNDERDRAIN



Ⓒ No. 2B coarse aggregate used over Pipe Underdrain Type I Backfill is payable as Coarse Aggregate for Extra Depth U'drain.

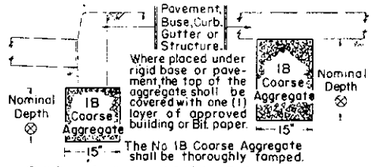
Fine aggregate used over Pipe Underdrain - Type II Backfill is payable as Fine Aggregate for Extra Depth Underdrain

EXTRA DEPTH UNDERDRAIN



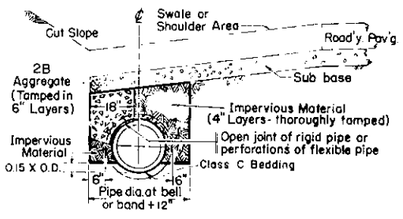
Excavation over 36 inches in depth and for a maximum width of 24 inches is payable as Class 4 Excavation.

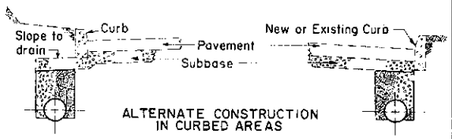
PIPE UNDERDRAIN OUTLETS



⊗ 15" for TYPE A and 24" for TYPE B.

STONE FOUNDATION UNDERDRAIN TYPES A & B





ALTERNATE CONSTRUCTION IN CURBED AREAS

The pipe shall be in accordance with the type specified in Section 604 of the Specifications (Form 408)

Where required, pipe perforations shall be grouped as follows:

125° for 15" pipe	80° for 30" pipe
110° for 18" pipe	75° for 33" pipe
90° for 24" pipe	70° for 36" pipe
85° for 27" pipe	60° for 48" pipe

Aggregate shall be No. 2B Coarse Aggregate for backfill and will be paid for at the contract unit price per cu. yd. compacted and complete in place.

Excavation shall be Class 4 with a trench width equal to the outside diameter of the pipe at the bell or band plus one (1) foot.

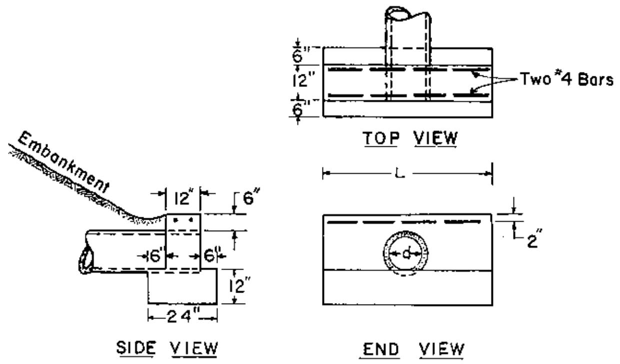
COMBINATION STORM SEWER & U'DRAIN

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

SUB SURFACE DRAINS

Recommended June 1, 1976 — Director, Bureau of Design	Approved June 1, 1976 — Deputy Chief Hwy. Engr.	Sht. 1 Of 1 — RC-30

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	W_1	L	ℓ	W_1	L	ℓ	W_1	L	ℓ	W_1	W_2	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	W_1	L	ℓ	W_1	L	ℓ	W_1	L	ℓ	W_1	W_2	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

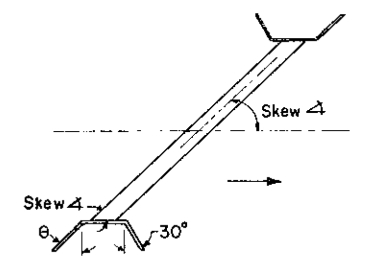
$SD = \frac{d}{\text{Cos. }\theta} = \frac{d}{\text{Sin Skew }\measuredangle}$

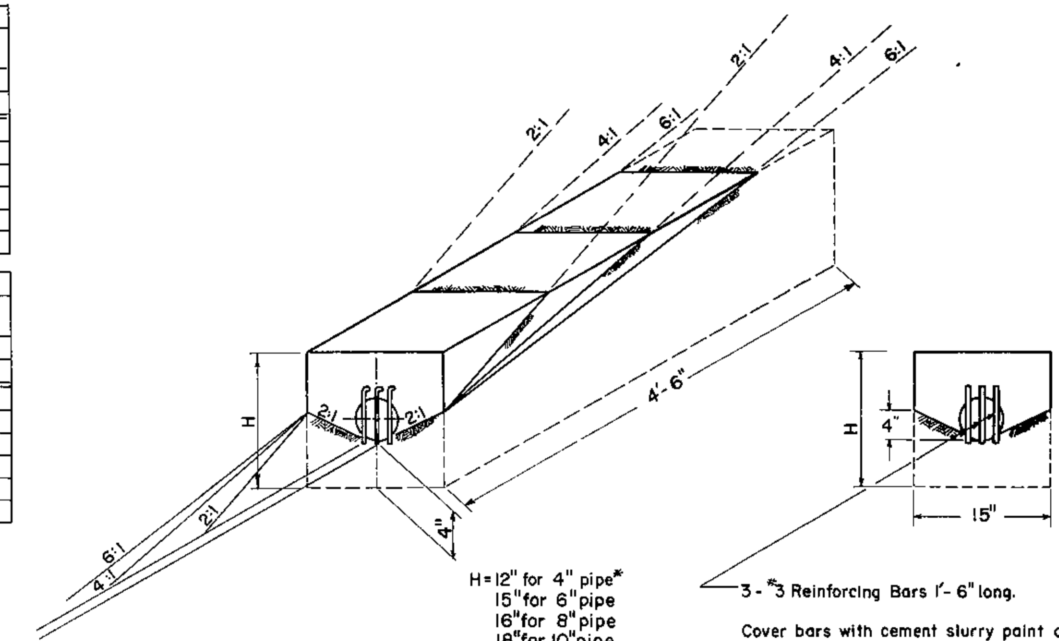
$L = SD + 2.3'$

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

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

$W = \frac{X}{\text{Cos.}\theta}\left(d-0.5-\frac{1.0}{X}\right)$





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

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

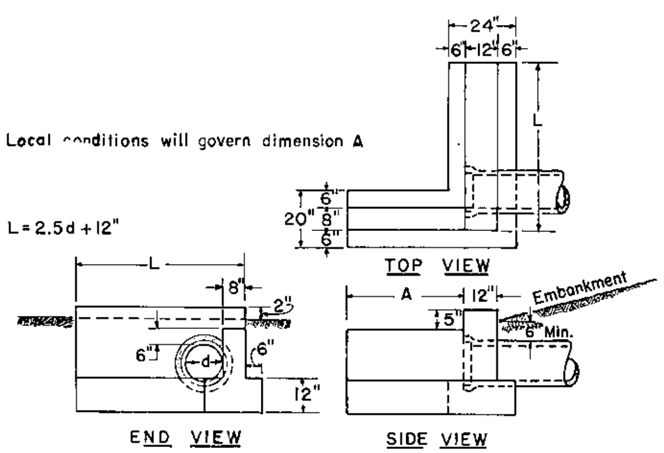
Cover bars with cement slurry paint or bituminous paint.

SUBSURFACE DRAIN OUTLET ENDWALL

*Includes 4⅝" Semi-circular

Local conditions will govern dimension A

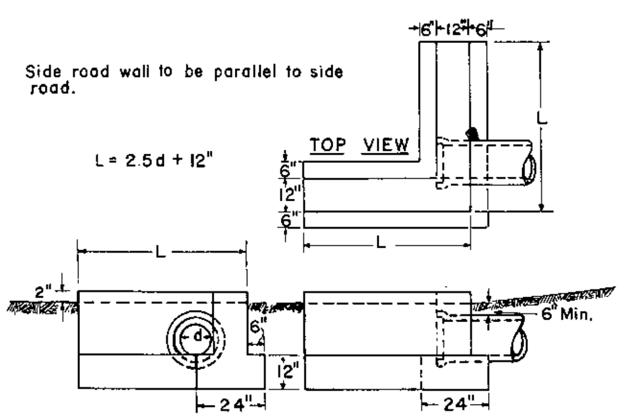
L = 2.5d + 12"



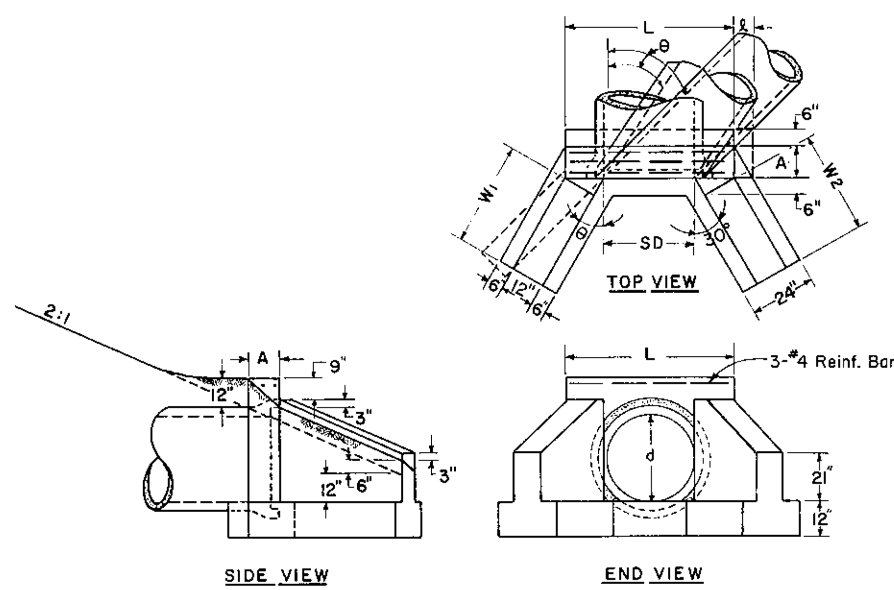
TYPE D-E ENDWALL

Side road wall to be parallel to side road.

L = 2.5d + 12"



TYPE E-S ENDWALL



TYPE D-W ENDWALL

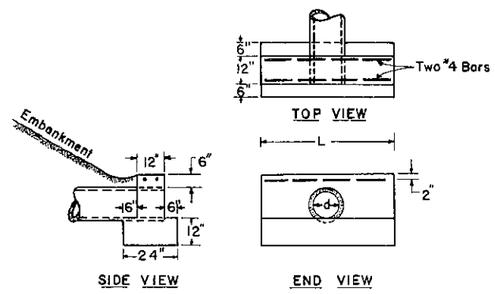
NOTE:
All exposed edges shall be chamfered (1) one inch.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

ENDWALLS

Recommended May 31, 1979	Approved May 31, 1979	Sht. 1 of 1
Director, Bureau of Design	Chief Hwy. Engr.	RC-31

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	X	W1	L	X	W1	L	X	W1	L	X	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	X	W1	L	X	W1	L	X	W1	L	X	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

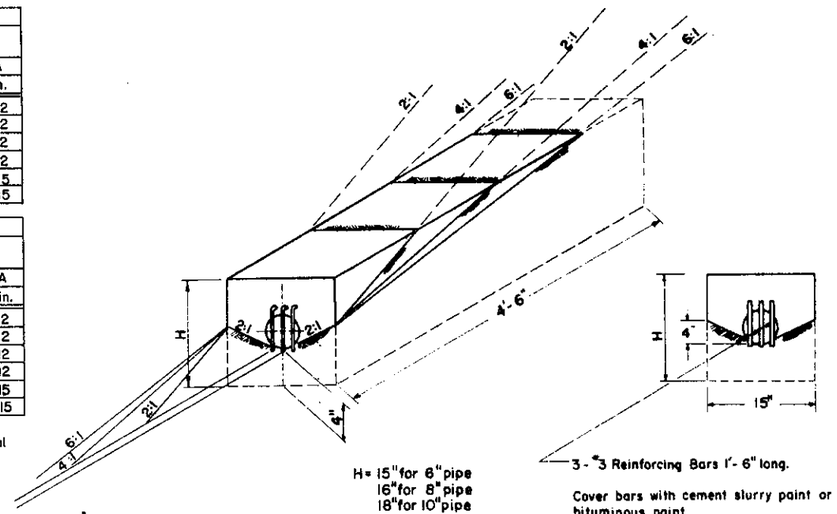
$SD = \frac{d}{\text{Cos.}\theta} = \frac{d}{\text{Sin Skew } \measuredangle}$

$L = SD + 2.3'$

W_1 for 2:1 Slope $= \frac{2d - X}{\text{Cos.}\measuredangle}$

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

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



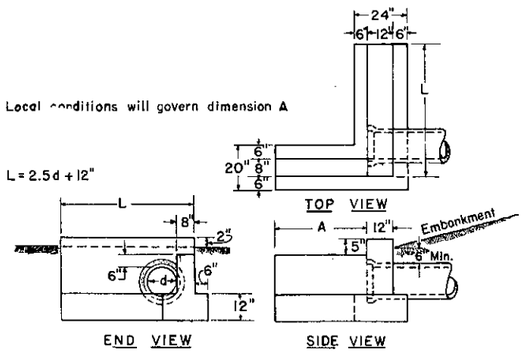
H = 15" for 6" pipe
16" for 8" pipe
18" for 10" pipe

Cover bars with cement slurry paint or bituminous paint.

SUBSURFACE DRAIN OUTLET ENDWALL

Local conditions will govern dimension A

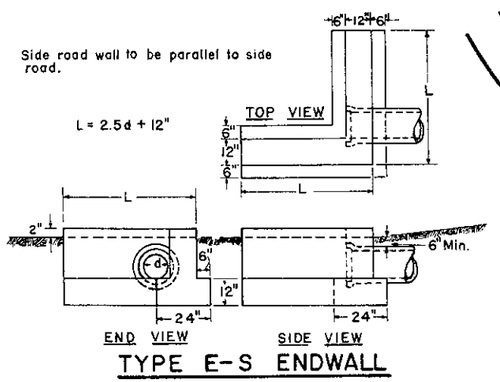
L = 2.5d + 12"



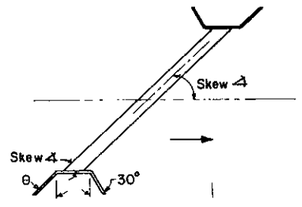
TYPE D-E ENDWALL

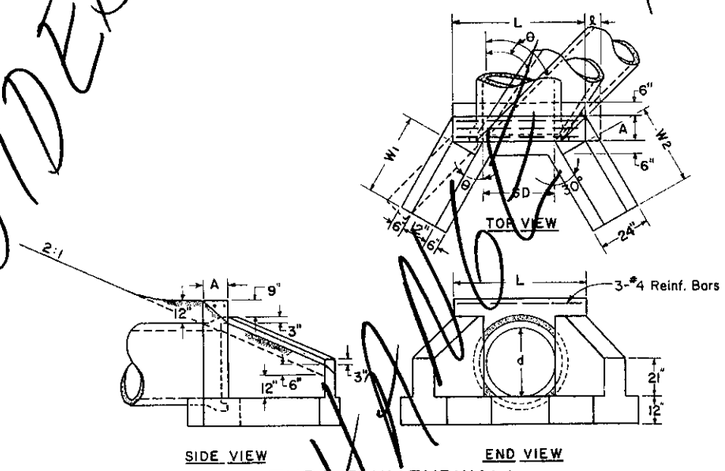
Side road wall to be parallel to side road.

L = 2.5d + 12"



TYPE E-S ENDWALL





TYPE D-W ENDWALL

NOTE:
All exposed edges shall be chamfered (1) one inch.

VOIDED

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

ENDWALLS

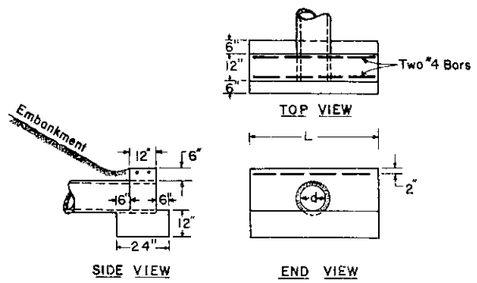
Recommended Nov. 15, 1977
B.D. Lourkis
Director, Bureau of Design

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

Sht. 1 Of 1

RC-31

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



TYPE D ENDWALL

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

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

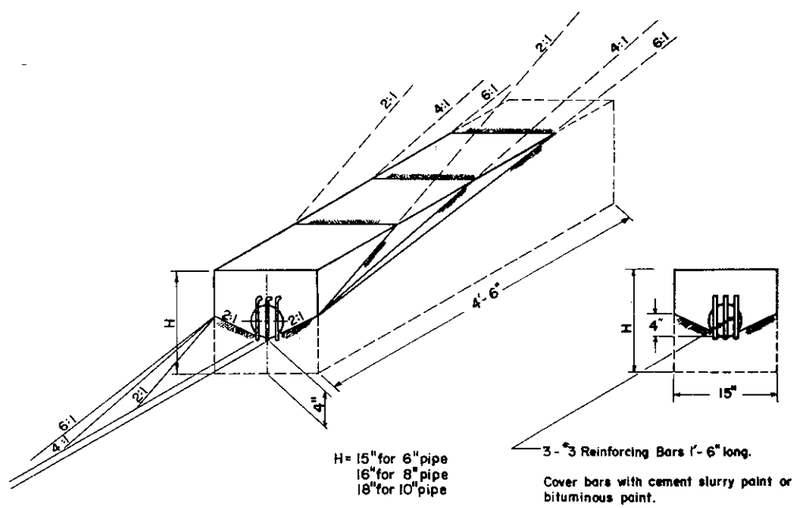
$SD = \frac{d}{Cos.\theta} = \frac{d}{Sin\ Skew\ \angle}$

$L = SD + 2.3'$

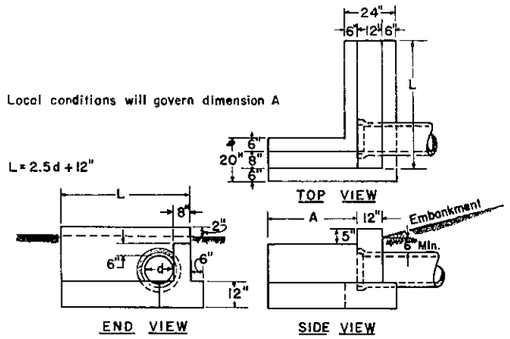
W_1 for 2:1 Slope $= \frac{2d-2'}{Cos.\theta}$

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

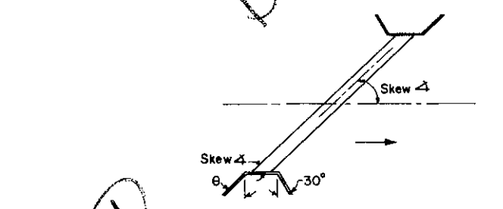
$W = \frac{X}{Cos.\theta}(d - 0.5 - \frac{1.0}{X})$

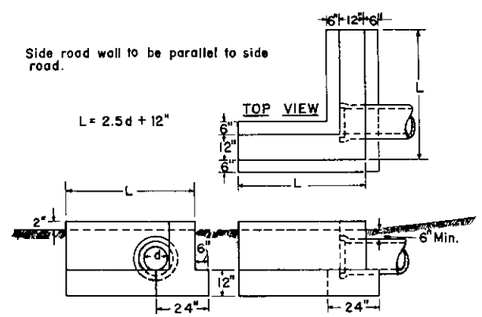


PIPE UNDERDRAIN OUTLET ENDWALL

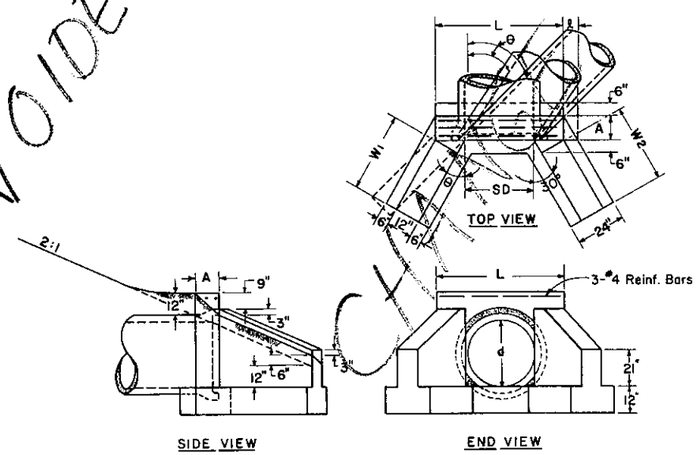


TYPE D-E ENDWALL





TYPE E-S ENDWALL



TYPE D-W ENDWALL

VOIDED

NOTE:
All exposed edges shall be chamfered (1) one inch.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

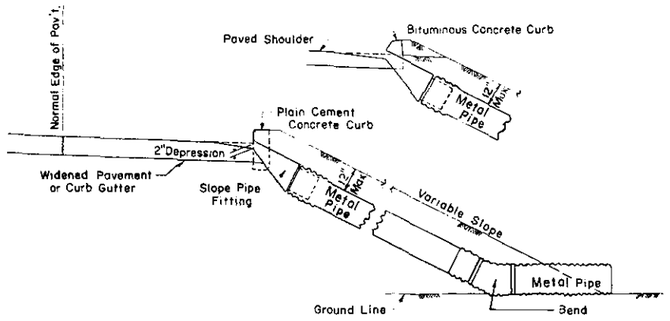
ENDWALLS

Recommended Dec. 1, 1971
R R Miller
Location & Design Engineer

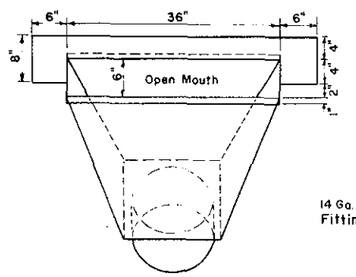
Approved Dec. 6, 1971
W. J. Ravin
Deputy Chief Hwy. Engr.

Sht. 1 Of 1

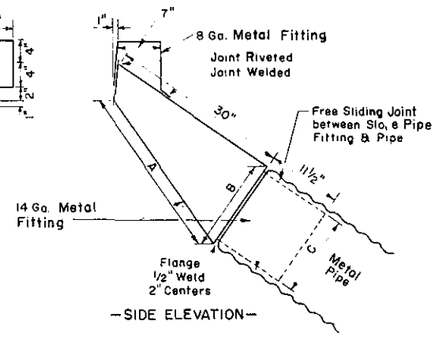
RC-31



ADJACENT TO STRUCTURE AND/OR PAVED SHOULDER



—FRONT ELEVATION—



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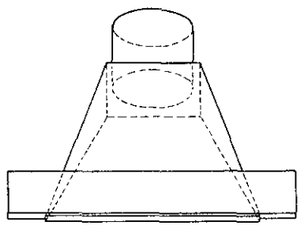
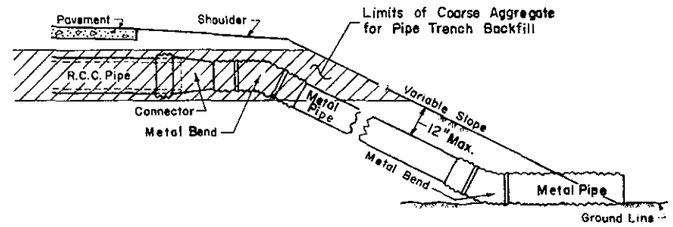


—PLAN—

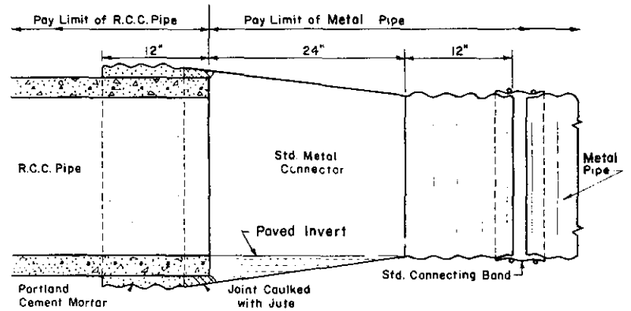
Nominal Diameter of Pipe*	Dimensions (Inches) for 2:1 Slopes		
	A	B	C
12"	$28\frac{15}{16}$	13	11
15"	$29\frac{13}{16}$	16	14
18"	$31\frac{5}{16}$	19	17

* 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

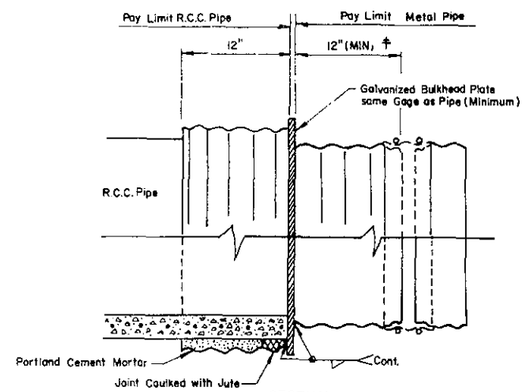


OUTLET PIPE THRU EMBANKMENT SLOPE



—SECTION—

METAL PIPE CONNECTOR



—SECTION—

ALTERNATE METAL PIPE CONNECTOR

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

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

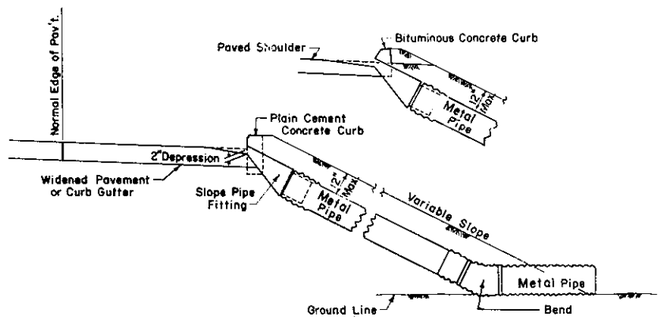
SLOPE PIPE FITTINGS AND CONNECTORS

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

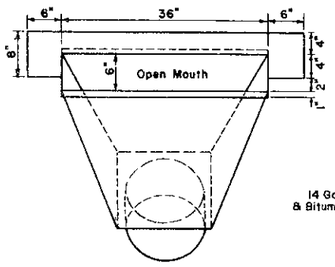
Approved
J. R. Dickinson
Deputy Chief Hwy. Engr.

Sht. 1 Of 1

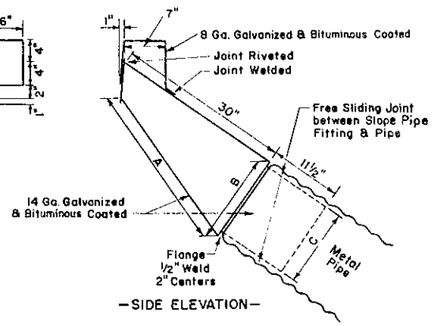
RC-32



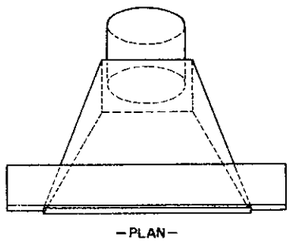
ADJACENT TO STRUCTURE AND/OR PAVED SHOULDER



—FRONT ELEVATION—



—SIDE ELEVATION—

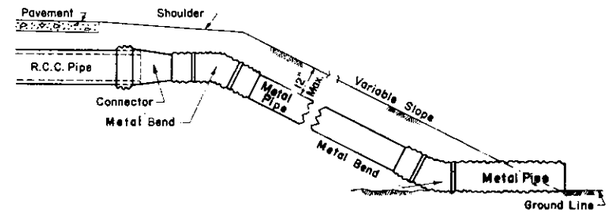


—PLAN—

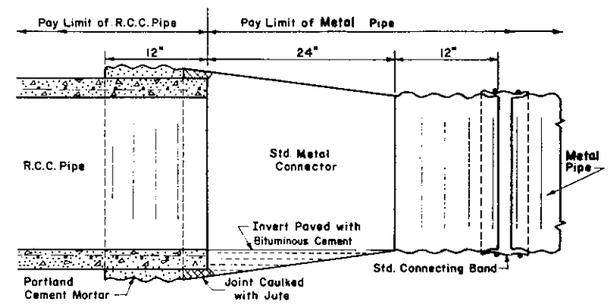
Nominal Diameter of Pipe*	Dimensions (Inches) for 2:1 Slopes		
	A	B	C
12"	28 5/16	13	11
15"	29 13/16	16	14
18"	31 5/16	19	17

* 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

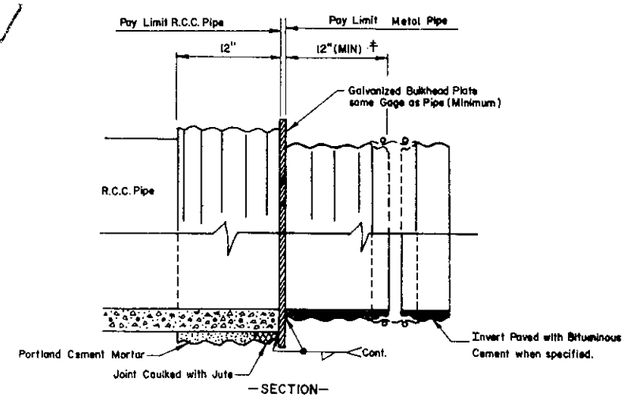


OUTLET PIPE THRU EMBANKMENT SLOPE



—SECTION—

METAL PIPE CONNECTOR



—SECTION—

ALTERNATE METAL PIPE CONNECTOR

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

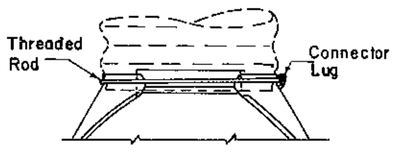
VOIDED BY CHANGE #1

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

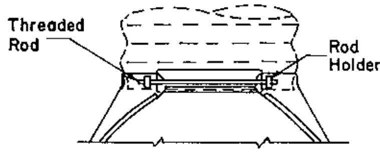
SLOPE PIPE FITTINGS AND CONNECTORS

Recommended Dec. 1, 1971	Approved Dec. 1, 1971	Sht. 1 Of 1
RR Mueser	W. J. Rover	RC-32
Location & Design Engineer	Deputy Chief Hwy. Engr.	

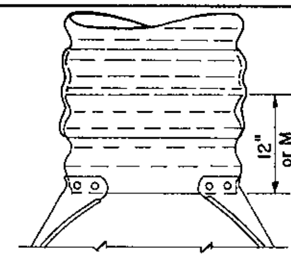
FORM 4337 REV 3-61



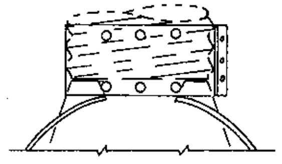
TYPE-1 CONNECTION
Sizes: 18"-24" Circular Pipe



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

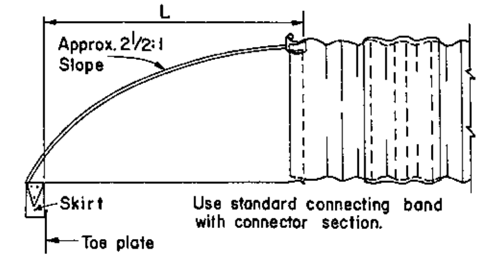


TYPE-3 CONNECTION
Sizes: 42" & Greater Circular Pipe & 65"x40" to 85"x54" Pipe-Arch

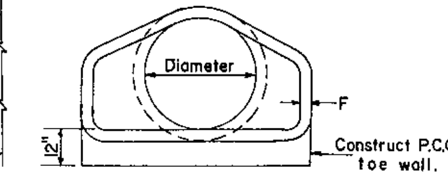


TYPE-D CONNECTION
Sizes: 18"-36" Circular Pipe & 18"x11" to 58"x36" Pipe Arch

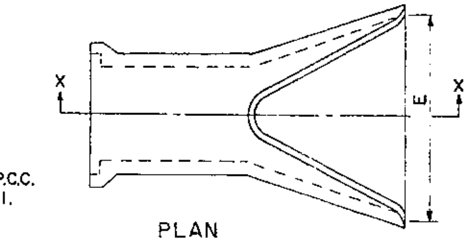
ALTERNATE TYPE CONNECTIONS FOR STEEL OR ALUMINUM



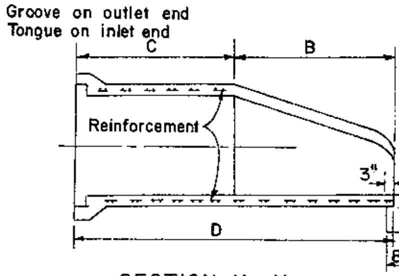
SIDE VIEW OF TYPE-3 CONNECTION



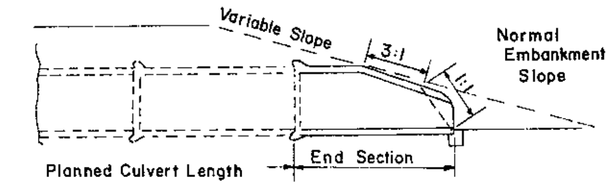
END VIEW



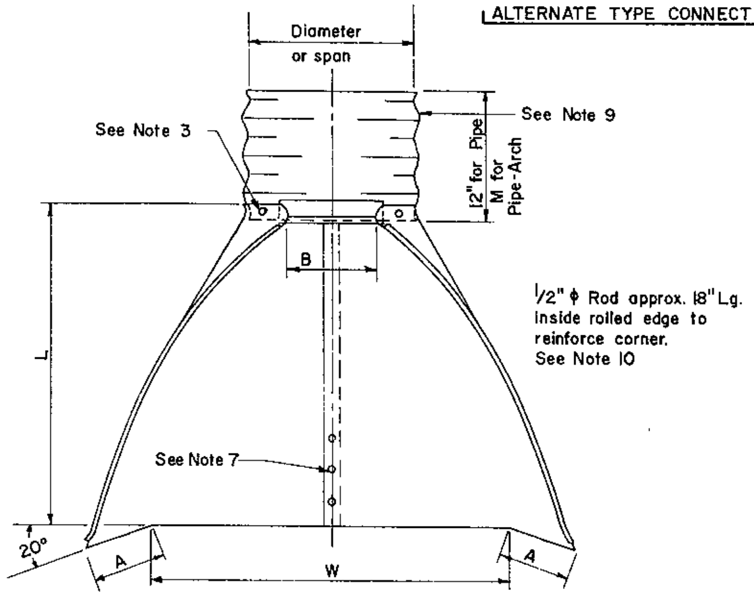
PLAN

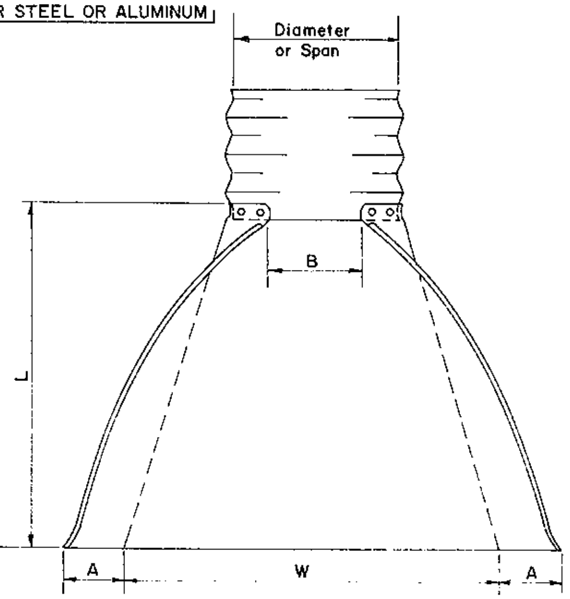


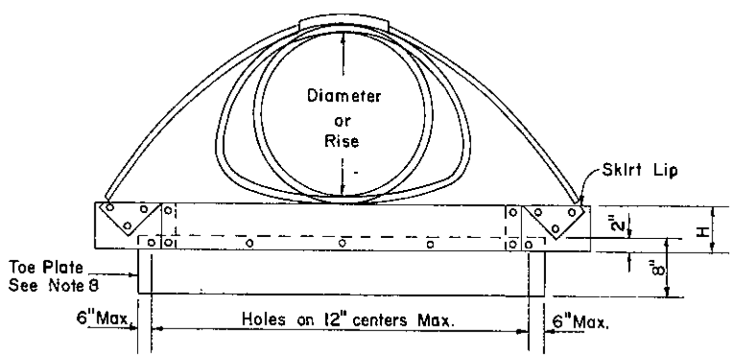
SECTION X-X



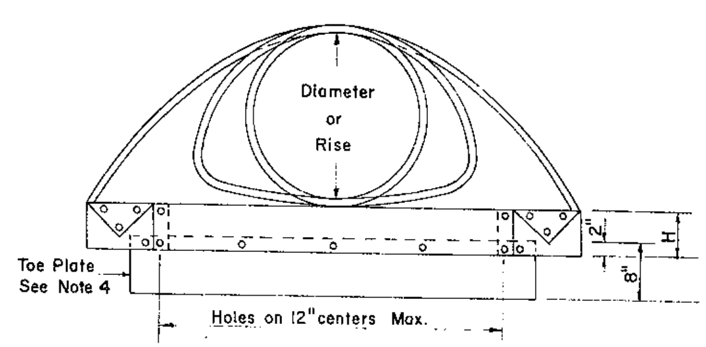
SLOPE DETAIL







ALUMINUM ALLOY END SECTION



STEEL END SECTIONS

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 2½"x2½"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.

CONCRETE END SECTION

CONCRETE END SECTION DIMENSIONS						
Diam"	A"	B'-"	C'-"	D'-"	E'-"	F"
18"	9"	2'-3"	3'-10"	6'-1"	3'-0"	2½"
21	9	2-11	3-2	6'-1	3-6	2¾
24	9½	3-7½	2-6	6-1½	4-0	3
27	10½	4-0	2-1½	6-1½	4-6	3¼
30	12	4-6	1-7¾	6-1¾	5-0	3½
33	13½	4-10½	3-3¼	8-1¾	5-6	3¾
36	15	5-3	2-10¾	8-1¾	6-0	4
42	21	5-3	2-11	8-2	6-6	4½
48	24	6-0	2-2	8-2	7-0	5
54	27	5-5	2-11	8-4	7-6	5½

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 ±1½"	W ±2"
18	16	7	9	6	31	36
21	16	8¼	11	6	36	42
24	14	9½	12	6	42	48
30	14	12	15	7½	52½	60
36	12	14	18	9	63	72
42	12	16	21	10½	73½	84
48	12	18	27	12	84	90

DIMENSIONS OF END SECTIONS FOR ALUMINUM ALLOY PIPE-ARCH

Pipe Arch in Inches		Gage	Dimensions – Inches					
Span	Rise		A ±1"	B Max.	H ±1"	L ±1½"	W ±2"	M
18	11	16	4½	9	6	19	30	12
22	13	16	5¼	10	6	23	36	12
25	16	16	6¼	11½	6	28	42	12
29	18	14	7	14	6	31½	48	12
36	22	14	8¾	16	6	38½	60	12
43	27	12	10¾	17½	7⅝	47	75	12
50	31	12	12¼	20	9⅛	54	85	12
58	36	12	14	26	10⅝	63	96	12
65	40	12	15¾	23	10⅝	70	112	24
72	44	10	17¼	24	12⅛	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 ±1½"	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

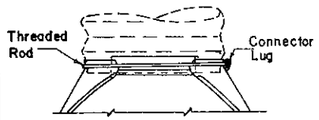
DIMENSIONS OF END SECTIONS FOR GALVANIZED STEEL PIPE-ARCH

Pipe Arch in Inches		Gage	Dimensions – Inches				
Span	Rise		A ±1"	B Max.	H ±1"	L ±1½"	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

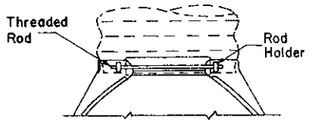
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

END SECTIONS FOR PIPE CULVERTS

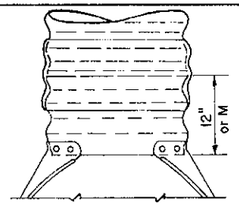
Recommended Nov. 15, 1977 — B.D. Rocuskie — Director, Bureau of Design
Approved Nov. 15, 1977 — J. N. Sebastian — Deputy Chief Hwy. Engr.
Sht. 1 Of 1
RC-33



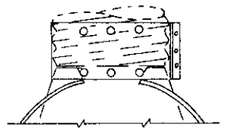
TYPE-1 CONNECTION
Sizes: 18"–24" Circular Pipe



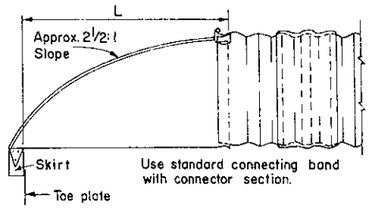
TYPE-2 CONNECTION
Sizes: 30"–36" Circular Pipe
& 18"x11" to 58"x36" Pipe-Arch



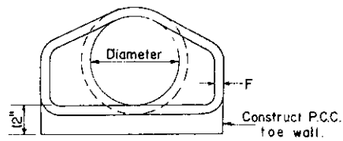
TYPE-3 CONNECTION
Sizes: 42" & Greater Circular Pipe
& 65"x40" to 85"x54" Pipe-Arch



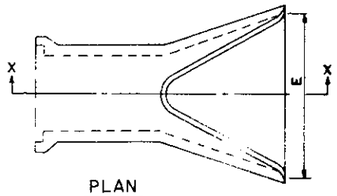
TYPE-D CONNECTION
Sizes: 18"–36" Circular Pipe
& 18"x11" to 58"x36" Pipe Arch



SIDE VIEW OF TYPE-3 CONNECTION

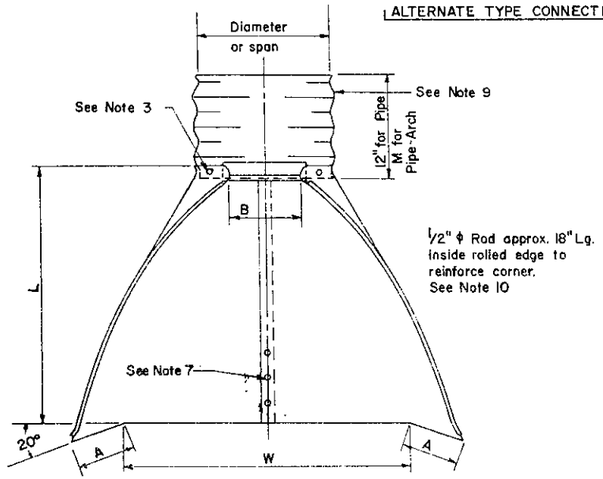


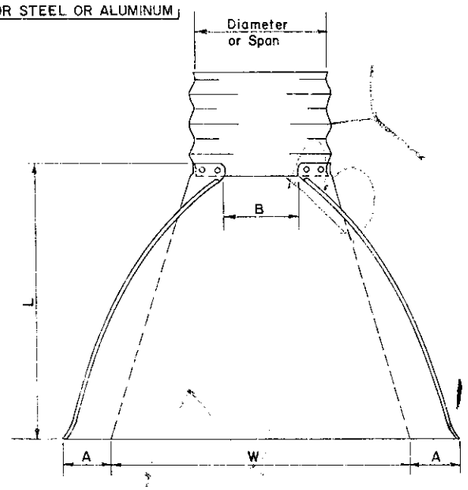
END VIEW

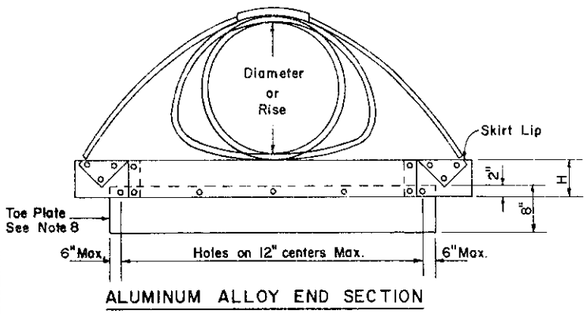


PLAN

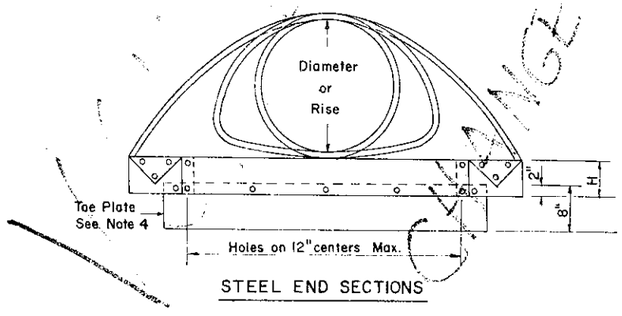
ALTERNATE TYPE CONNECTIONS FOR STEEL OR ALUMINUM







ALUMINUM ALLOY END SECTION



STEEL END SECTIONS

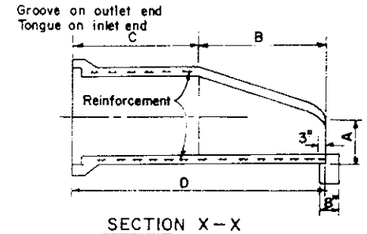
NOTES FOR STEEL END SECTIONS

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 2½"x2½"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.

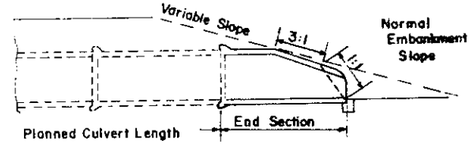
NOTES FOR ALUMINUM ALLOY END SECTION

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.



SECTION X–X



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"	2½"
21	9	2-11	3-2	6'-1	3-6	2¾
24	9½	3-7½	2-6	6-1½	4-0	3
27	10½	4-0	2-1½	6-1½	4-6	3¼
30	12	4-6	1-7¾	6-1¾	5-0	3½
33	13½	4-10½	3-3¼	8-1¾	5-6	3¾
36	15	5-3	2-10¾	8-1¾	6-0	4
42	21	5-3	2-11	8-2	6-6	4½
48	24	6-0	2-2	8-2	7-0	5
54	27	5-5	2-11	8-4	7-6	5½

GENERAL NOTES

1. End section shall be of the same material as the pipe or pipe arch culvert to which it is attached. No Bit. 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 ±1½"	W ±2"
18	16	7	9	6	31	36
21	16	8¼	11	6	36	42
24	14	9½	12	6	42	48
30	14	12	15	7½	52½	60
36	12	14	18	9	63	72
42	12	16	21	10½	73½	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 ±1½"	W ±2"	M
18	11	16	4½	9	6	19	30	12
22	13	16	5¼	10	6	23	36	12
25	16	16	6¼	11½	6	28	42	12
29	18	14	7	14	6	31½	48	12
36	22	14	8¾	16	6	38½	60	12
43	27	12	10¾	17½	7⅝	47	75	12
50	31	12	12¼	20	9⅛	54	85	12
58	36	12	14	26	10⅝	63	96	12
65	40	12	15¾	23	10⅝	70	112	24
72	44	10	17¼	24	12⅛	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 ±1½"	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 ±1½"	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

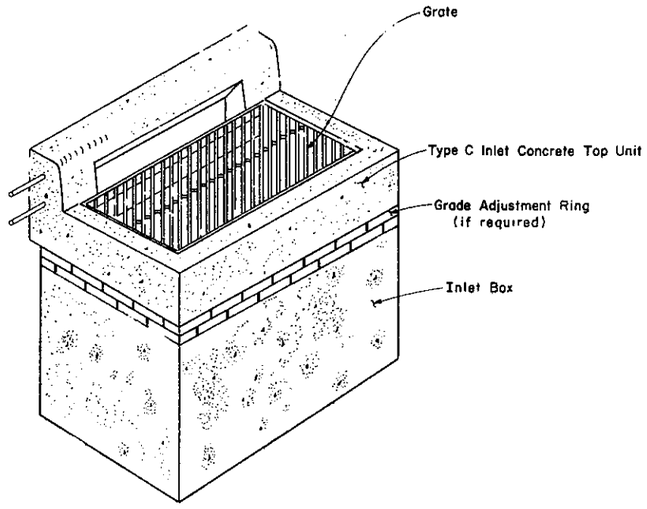
END SECTIONS FOR PIPE CULVERTS

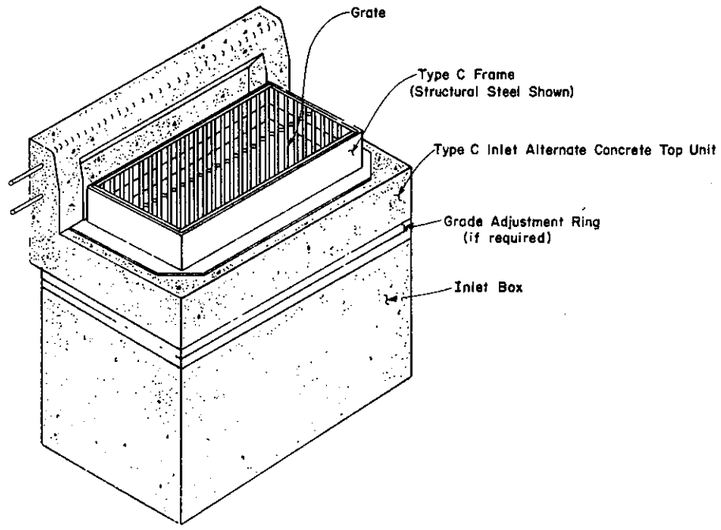
Recommended Mar. 1, 1973 — Director, Bureau of Design

Approved Mar. 7, 1973 — Deputy Chief Hwy. Engr.

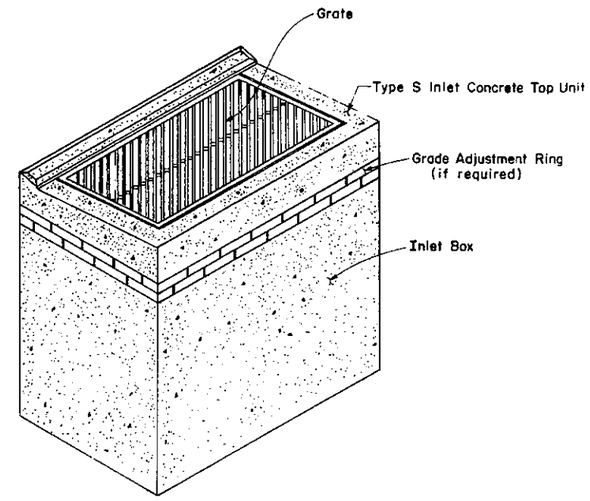
Sht 1 Of 1

RC-33

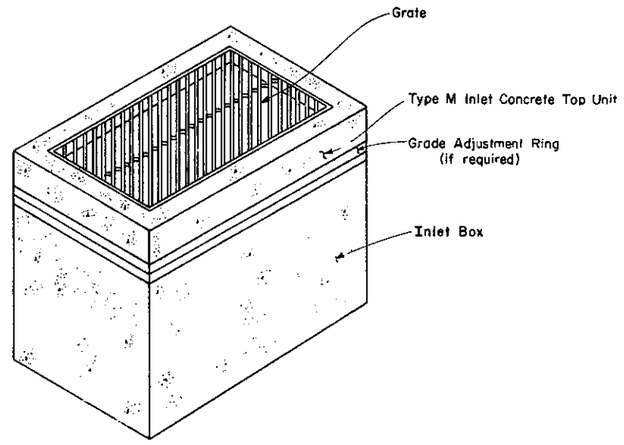


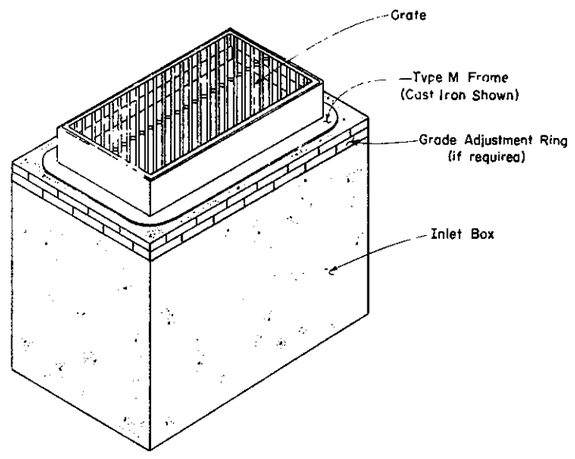


TYPE C INLET



TYPE S INLET





TYPE M INLET

NOTES:

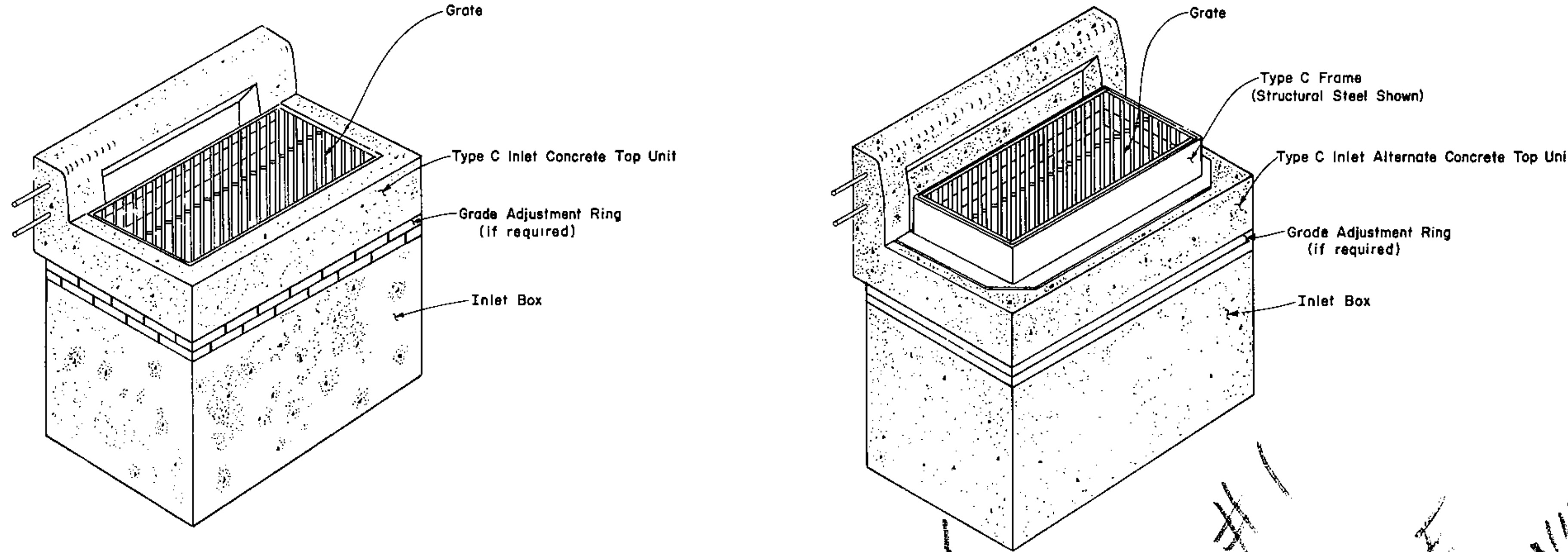
1. This drawing is intended to depict the various components required in a complete inlet. For the details of the various items see the following sheets:
   - Sheet 2 - Concrete Top Units
   - Sheet 3 - Grates
   - Sheet 4 - Frames
   - Sheet 5 - Inlet Boxes
   - Sheet 6 Modified Boxes
2. Each type of 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. Change → A Light Weight grate may be specified for installation in the Type M and S Inlets, providing that the inlet is located more than 30 feet from the edge of the roadway. The inlet that will accommodate the light weight grate shall be designated with the suffix "LW" such as Type M-LW Inlet.
4. The selection of components to achieve a specified inlet type is the contractor's responsibility.
5. Pipes will be located as required.
6. Weep holes shall be installed as required by Section 605, Form 406.
7. Grade Adjustment Rings may be of masonry or precast concrete construction.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

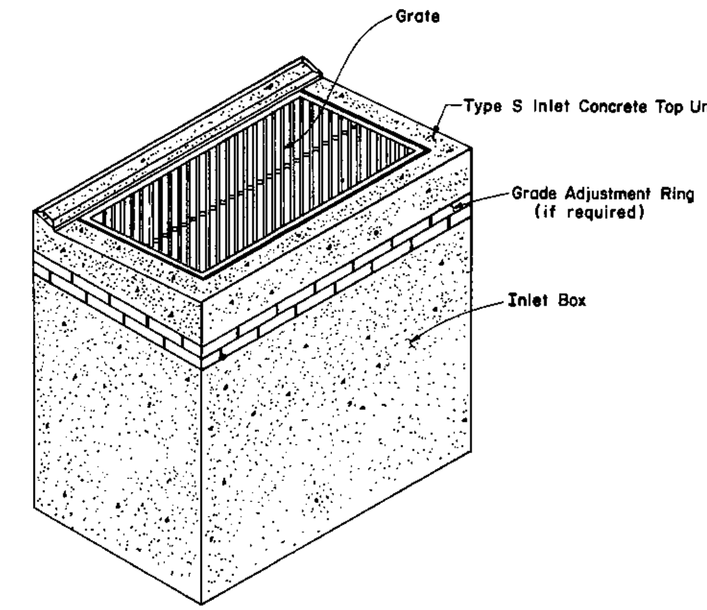
INLETS
INLET ASSEMBLIES

May 31, 1979

Recommended Nov. 15, 1977	Approved [illegible]	Sht. 1 Of 6
R.D. Rumble	J. M. Sabatini	RC-34
Director, Bureau of Design	Deputy Chief Hwy. Engr.	

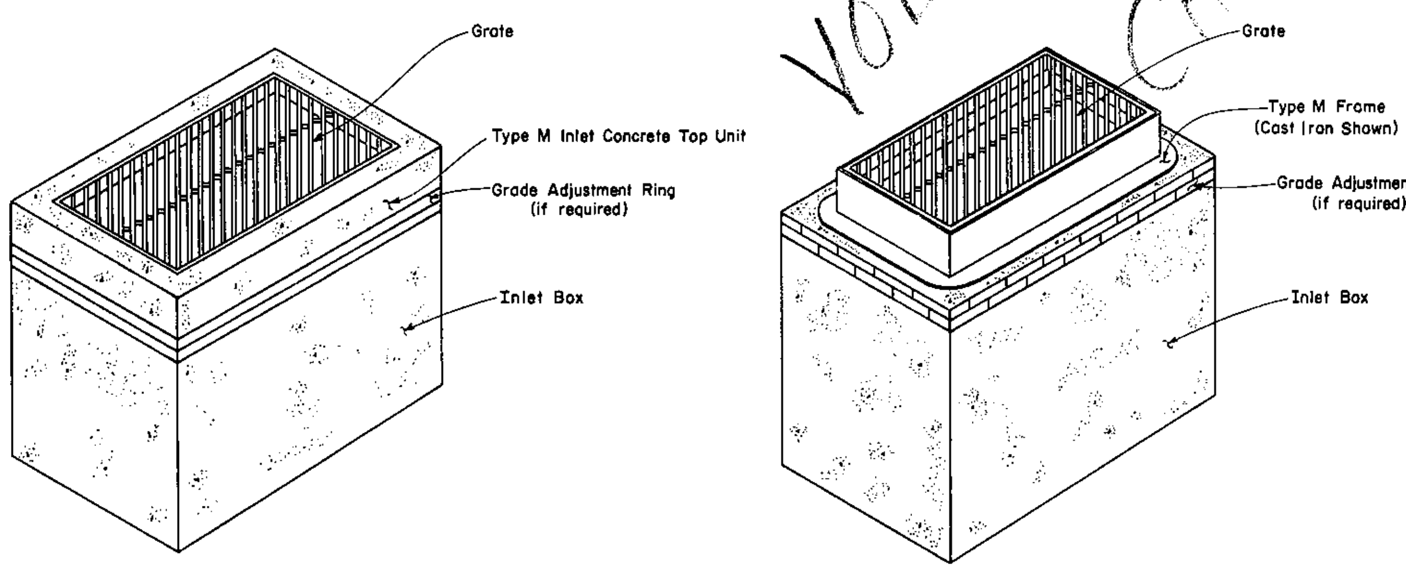


TYPE C INLET



TYPE S INLET

VOIDED BY CHANGE #1 FOR DATE CHANGE ONLY



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. A Light Weight grate may be specified for installation in the Type M and S Inlets, providing that the inlet is located more than 30 feet from the edge of the roadway. The inlet that will accommodate the light weight grate shall be designated with the suffix "LW" such as Type M-LW Inlet.
4. The selection of components to achieve a specified inlet type is the contractor's responsibility.
5. Pipes will be located as required.
6. Weep holes shall be installed as required by Section 605, Form 408.
7. Grade Adjustment Rings may be of masonry or precast concrete construction.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

INLETS
INLET ASSEMBLIES

Nov. 15, 1977

Recommended June 1, 1976	Approved ~~June 1, 1976~~	Sht. 1 Of 5
B.D. Rourke — Director, Bureau of Design	Deputy Chief Hwy. Engr.	RC-34

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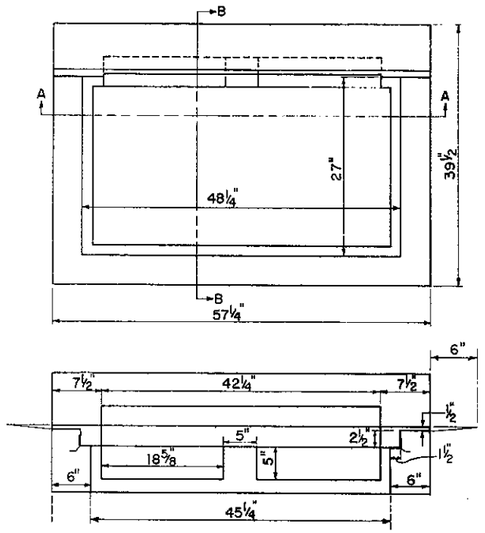
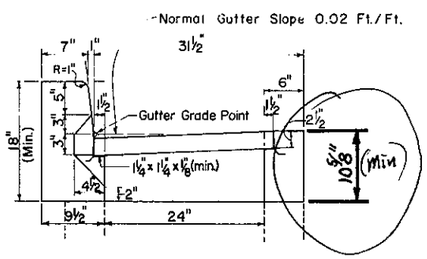
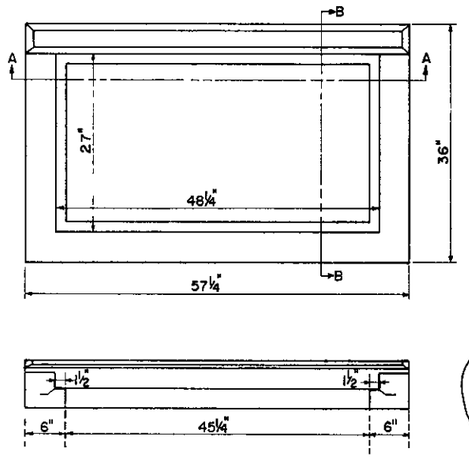


SECTION A-A



SECTION B-B

TYPE C



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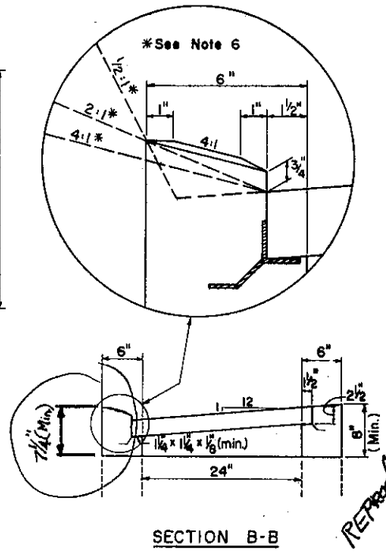
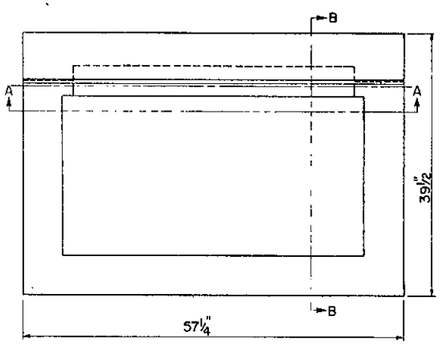


SECTION B-B

TYPE S

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" (~~550 mm x 914 mm~~) shop drawing to the Bur. of Materials, Testing & Research 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.



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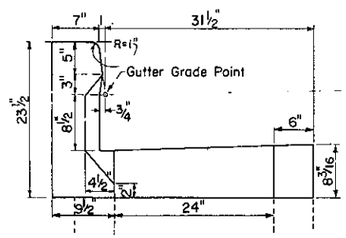
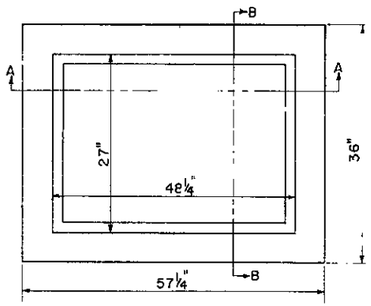
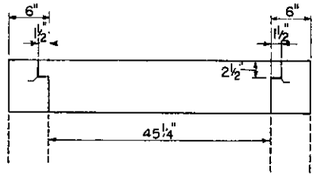


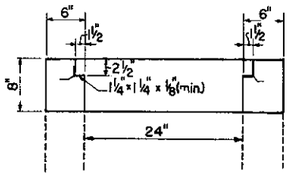
SECTION B-B

TYPE C ALTERNATE





SECTION A-A



SECTION B-B

TYPE M

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

INLETS
CONCRETE TOP UNITS

May 31, 1979

Recommended Nov. 15, 1977	Approved	Sht. 2 Of 6
B.O. Bowser	J. M. Sciarra	RC-34
Director, Bureau of Design	Deputy Chief Hwy. Engr.	

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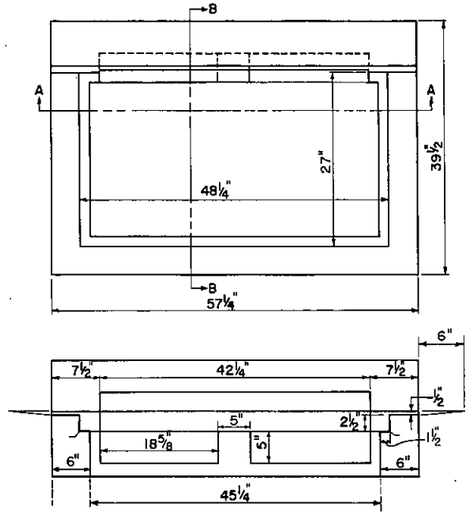

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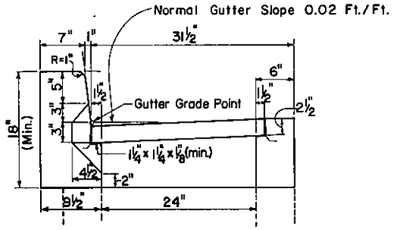
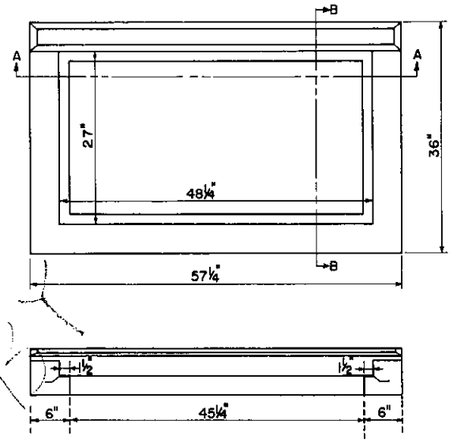


SECTION B-B

TYPE C



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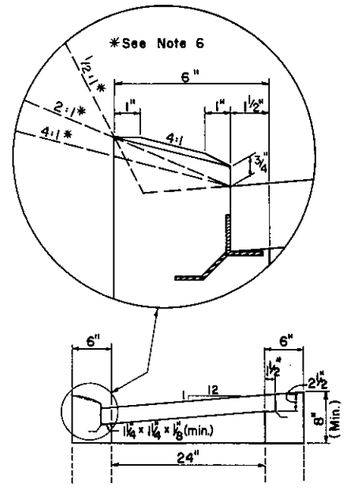
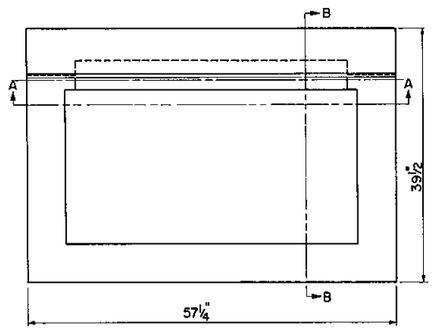
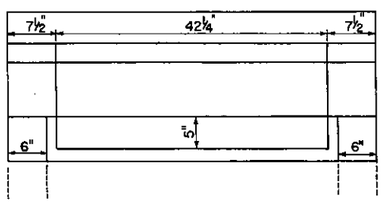


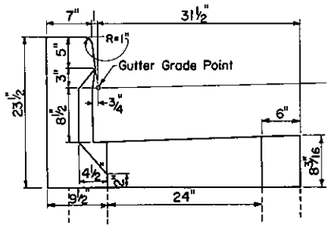
SECTION B-B

TYPE S



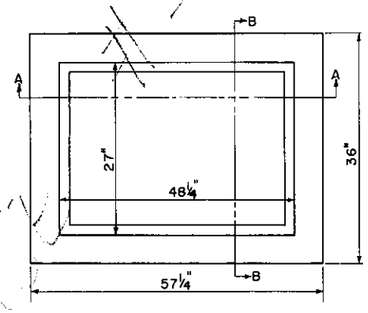


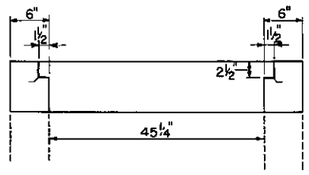
SECTION A-A



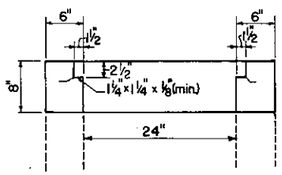
SECTION B-B

TYPE C ALTERNATE





SECTION A-A



SECTION B-B

TYPE M

NOTES:

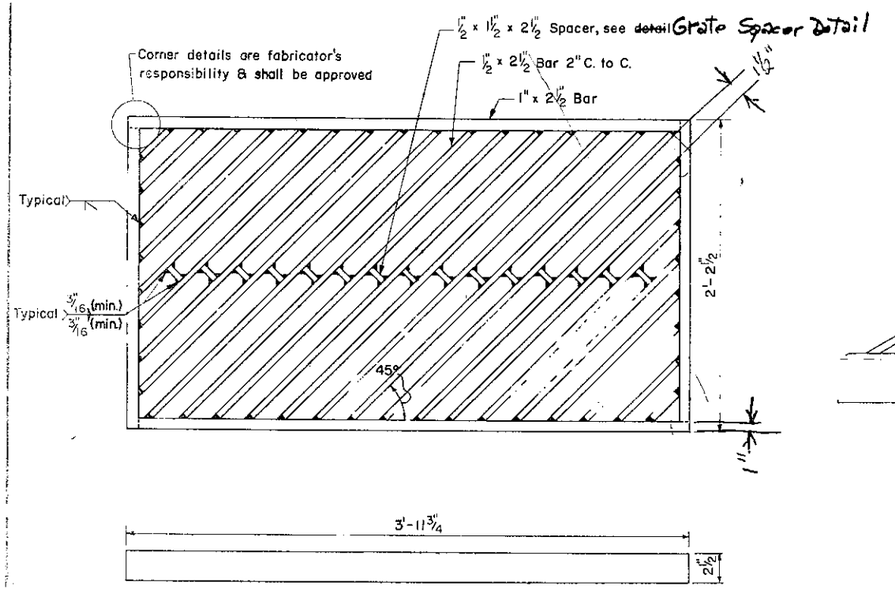
1. All Inlet Tops that are Cast-In-Place shall conform to the shape and dimensions as shown on the standard and, at the option of the contractor, may be monolithic with the Inlet Box.
2. Concrete Top Units which seat the grate directly within the unit shall utilize 1¼" x 1¼" angles embedded in the concrete 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. Only those items which are supplied by an approved manufacturer as listed in Bulletin No. 15 will be permitted.
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

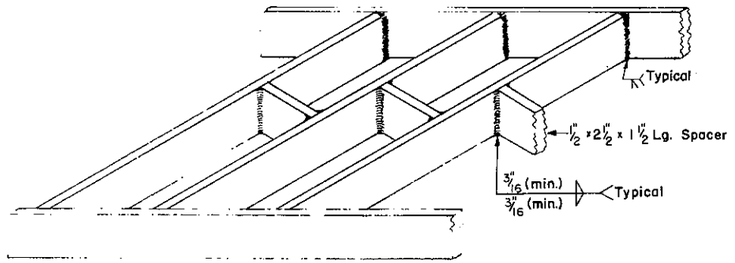
INLETS
CONCRETE TOP UNITS

Recommended	Approved	Sht. 2 Of 5
June 1, 1976 B.D. Lawkis Director, Bureau of Design	June 1, 1976 Deputy Chief Hwy. Engr.	RC-34

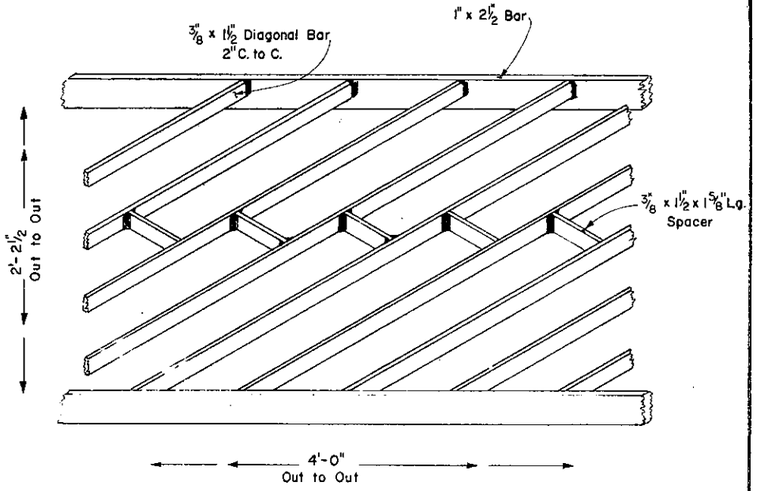
TRACED BY
FINAL BY



STRUCTURAL STEEL GRATE

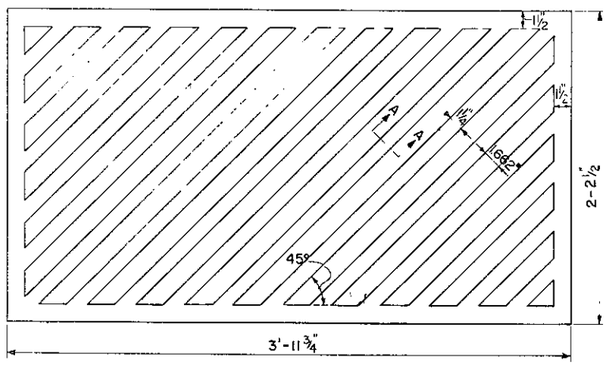


GRATE SPACER DETAIL

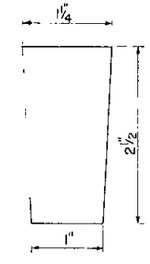


LIGHT-WEIGHT GRATE

(For use in Type M and S Inlets when located more than 30 feet from edge of the roadway. Inlets utilizing such grate will be designated by the suffix-LW such as Type M-LW or Type S-LW Inlet.)



CAST IRON GRATE



SECTION A-A

NOTES:

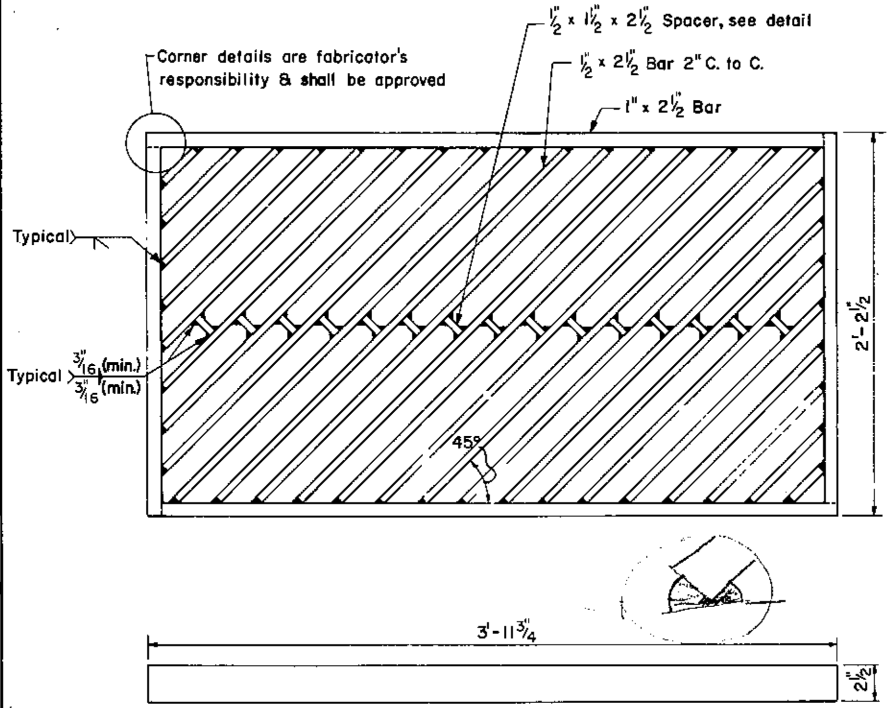
1. Grates shall be ductile or malleable cast iron or structural grade steel. Grates manufactured from Gray Cast Iron shall be submitted for approval.
2. All welding required for the ~~fabricated grates~~ fabrication of structural steel grates shall be accomplished ~~by a welder certified as required in~~ in accordance with Section 1053.21, Form 408 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" ~~(559 mm x 914 mm)~~ shop drawing to the ~~Bureau of Materials, Testing & Research for approval~~. Reproducible The shop drawing must show all details including dimensions, tolerances, welding symbols, casting fillets, etc. Bureau of Contract Quality Control, Materials & Testing Division

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

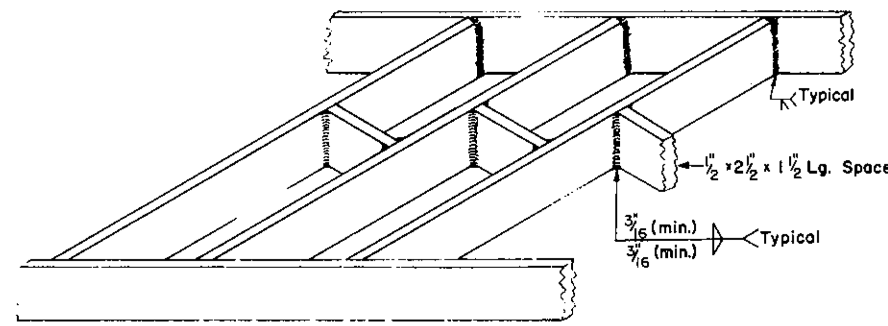
INLETS
GRATES

May 31, 1979

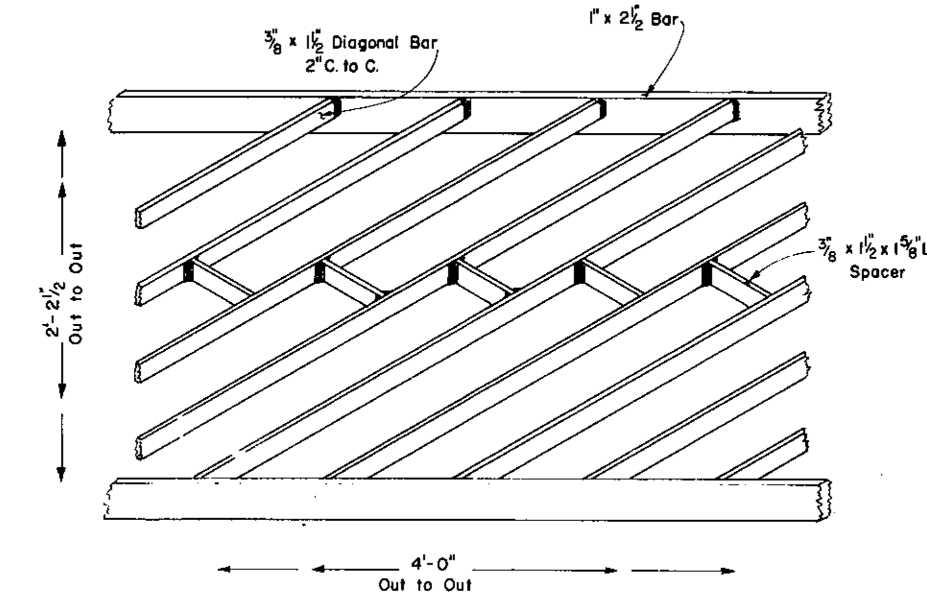
Recommended Nov. 15, 1977	Approved ~~November 1977~~	Sht. 3 Of 6
B.D. Rourke	J. M. Sebastian	RC-34
Director, Bureau of Design	Deputy Chief Hwy. Engr.	



STRUCTURAL STEEL GRATE



GRATE SPACER DETAIL

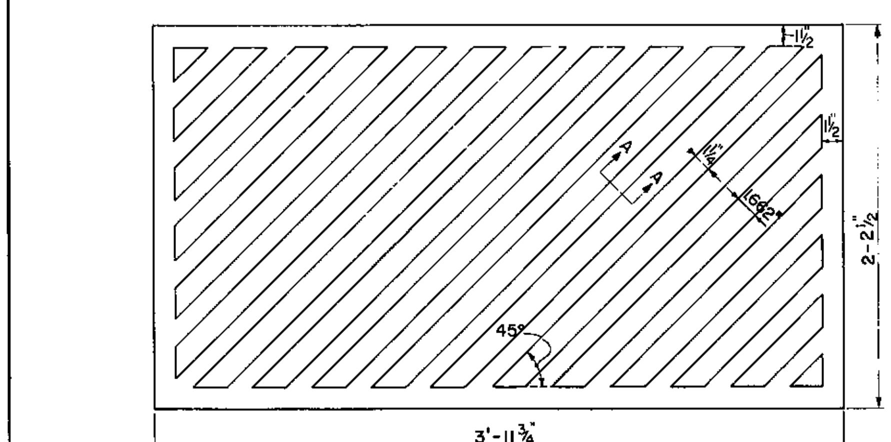


LIGHT-WEIGHT GRATE

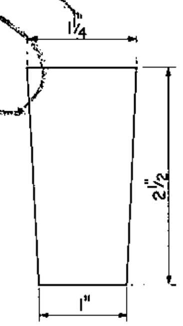
(For use in Type M and S Inlets when located more than 30 feet from edge of the roadway. Inlets utilizing such grate will be designated by the suffix-LW such as Type M-LW or Type S-LW Inlet.)

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 fabricated grates shall be accomplished by a welder certified as required in Section 1053.21, Form 409.
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.



CAST IRON GRATE



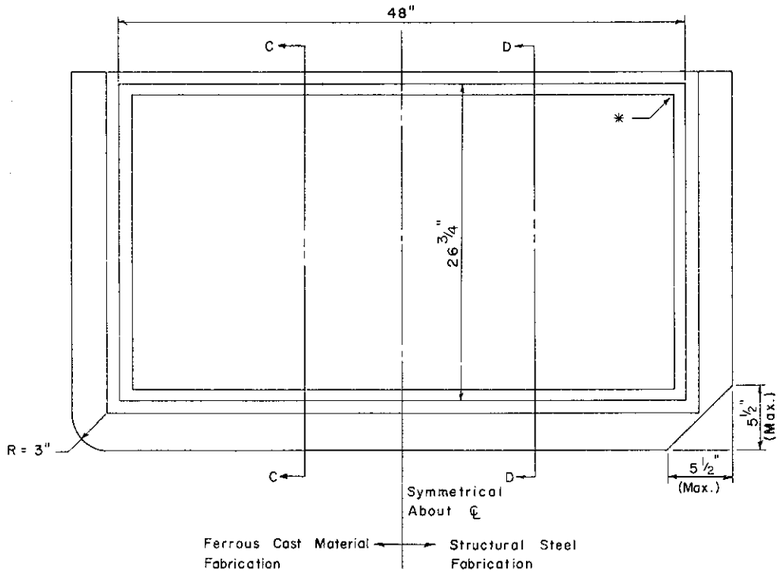
SECTION A-A

VOIDED BY CHANGE #1

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

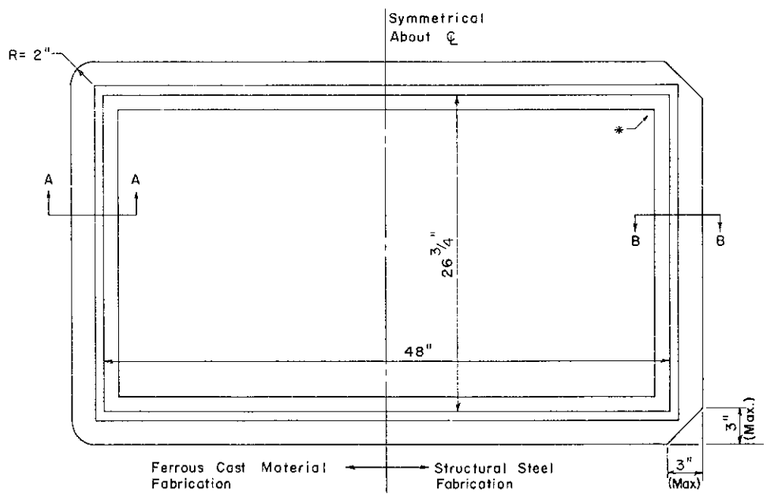
INLETS
GRATES

Recommended June 1, 1976 B.D. Rourke Director, Bureau of Design	Approved June 1, 1976 Deputy Chief Hwy. Engr.	Sht. 3 Of 5 RC-34

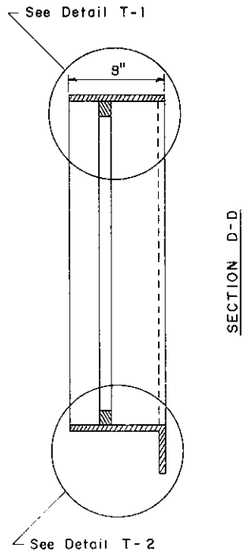


TYPE C FRAME

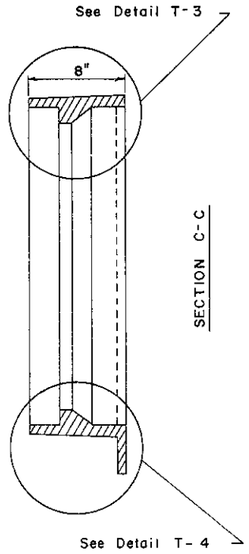
* Corner configuration details are fabricators responsibility & shall be approved



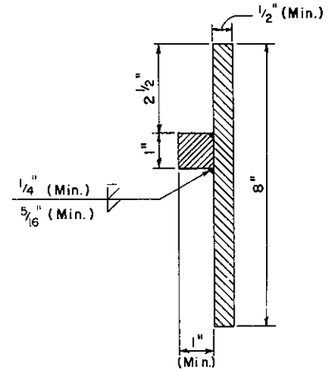
TYPE M FRAME



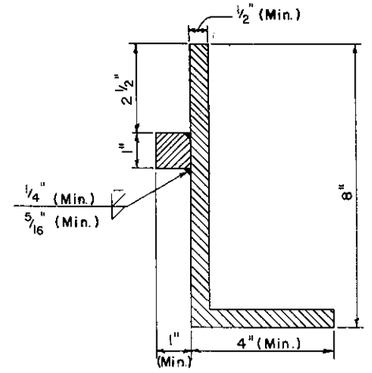
SECTION D-D



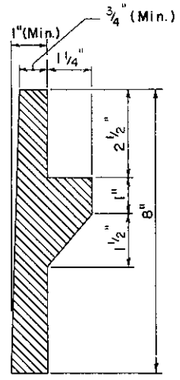
SECTION C-C



DETAIL T-1



DETAIL T-2



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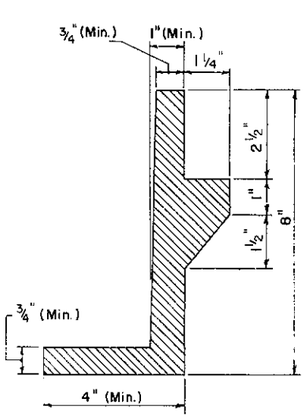

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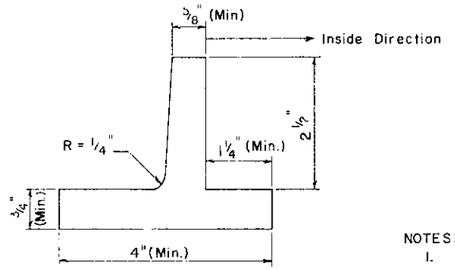
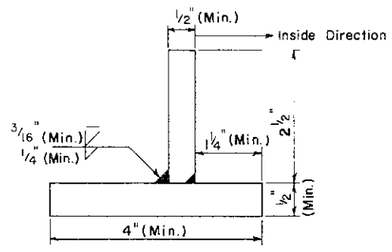


SECTION A-A



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 fabricated frame shall be accomplished by a welder certified as required in Section 1053.21, Form 409.
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" ~~(559 mm x 914 mm)~~ shop drawing to the Bureau of Materials, Testing & Research for approval. The shop drawing must show all details including dimensions, tolerances, welding symbols, casting fillets, etc.

change as per note 2 on new Sheet 3 of 6

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

INLETS
FRAMES

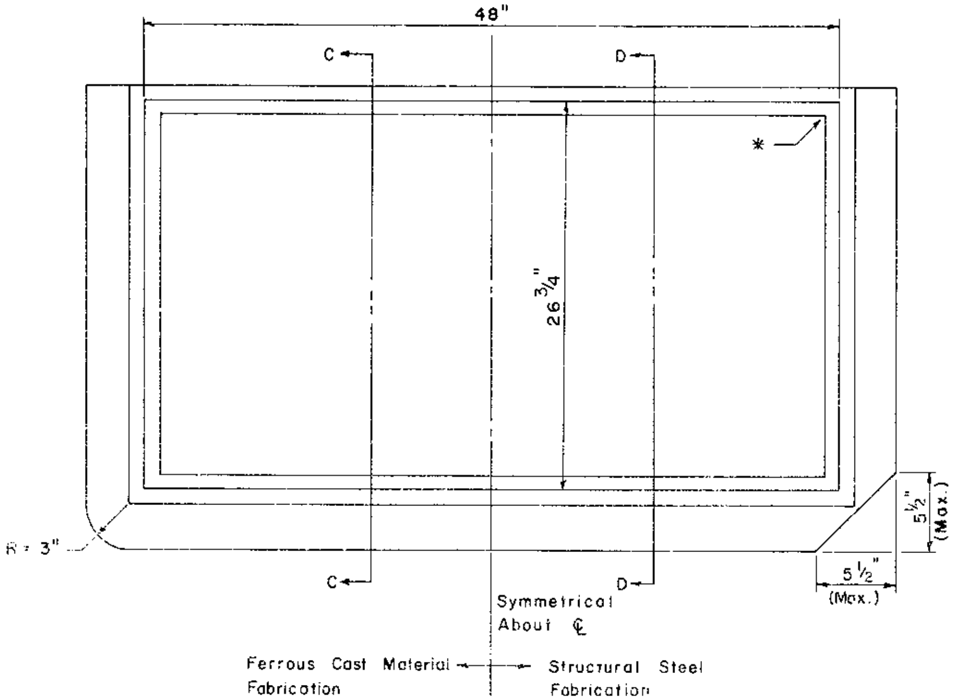
May 31, 1979

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

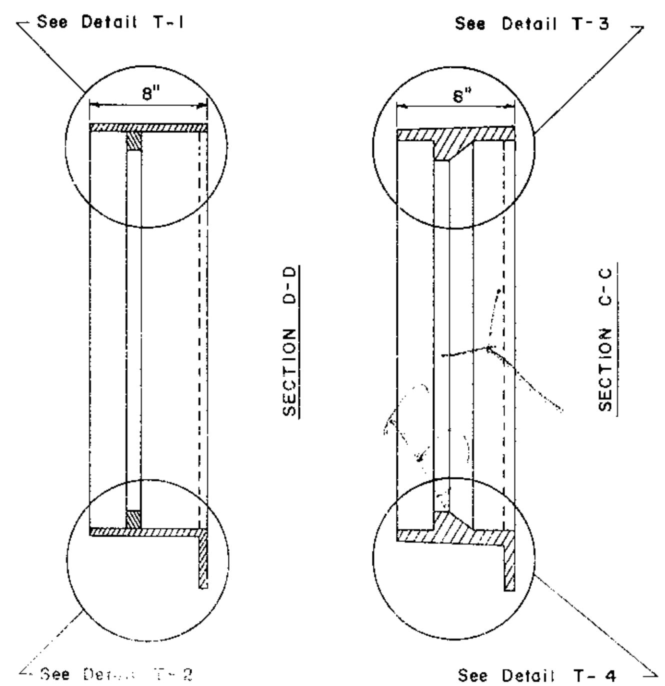
Approved ~~June 15, 1978~~
J.M. Sebastian
Deputy Chief Hwy. Engr.

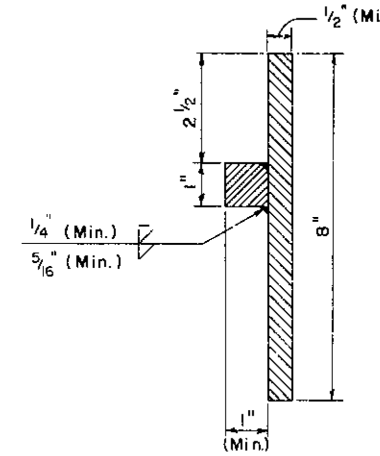
Sht. 4 Of 6

RC-34

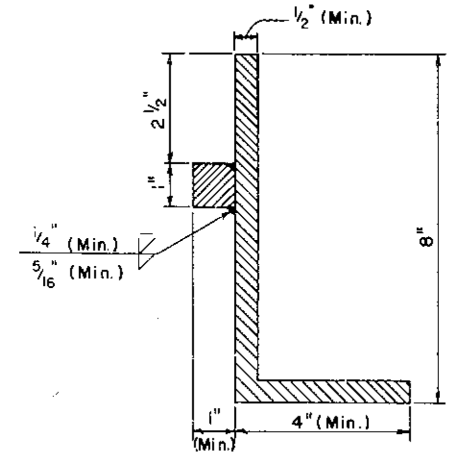


TYPE C FRAME



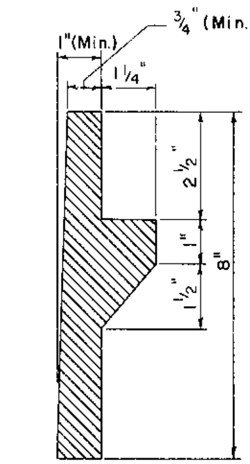


DETAIL T-1

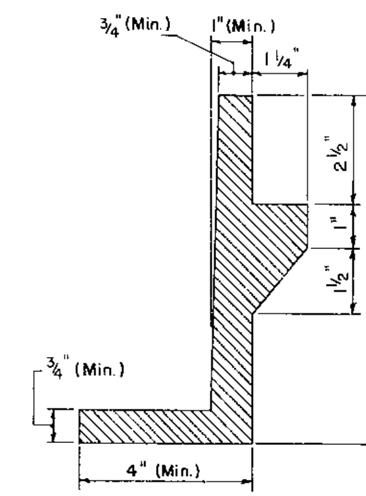


DETAIL T-2

* Corner configuration details are fabricators responsibility & shall be approved



DETAIL T-3



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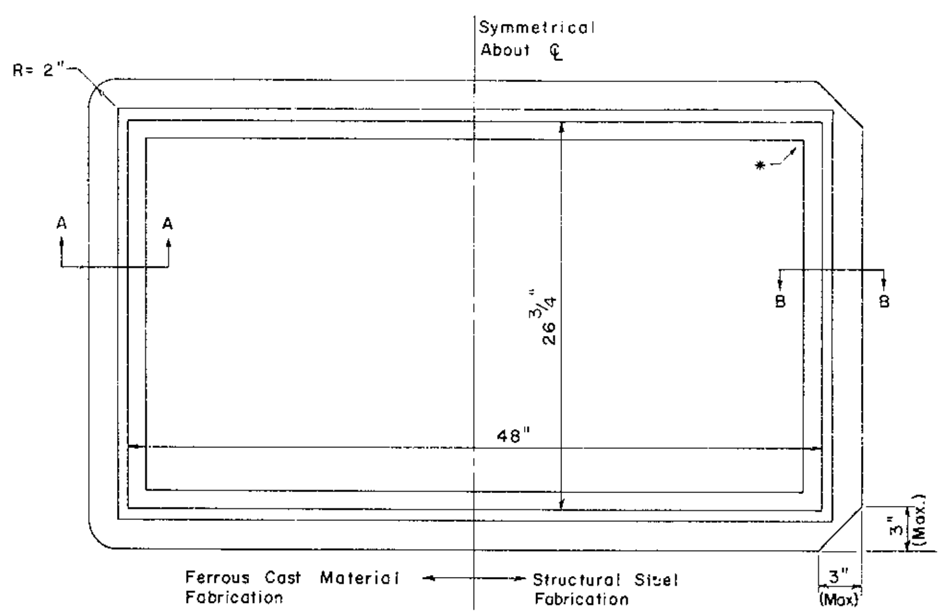
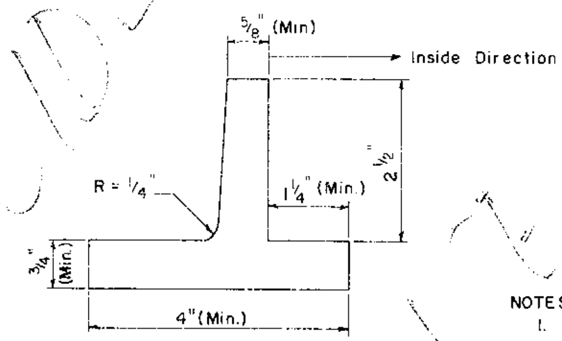
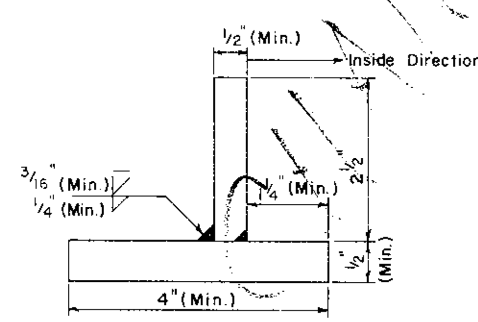


TYPE M FRAME



SECTION A-A



SECTION B-B

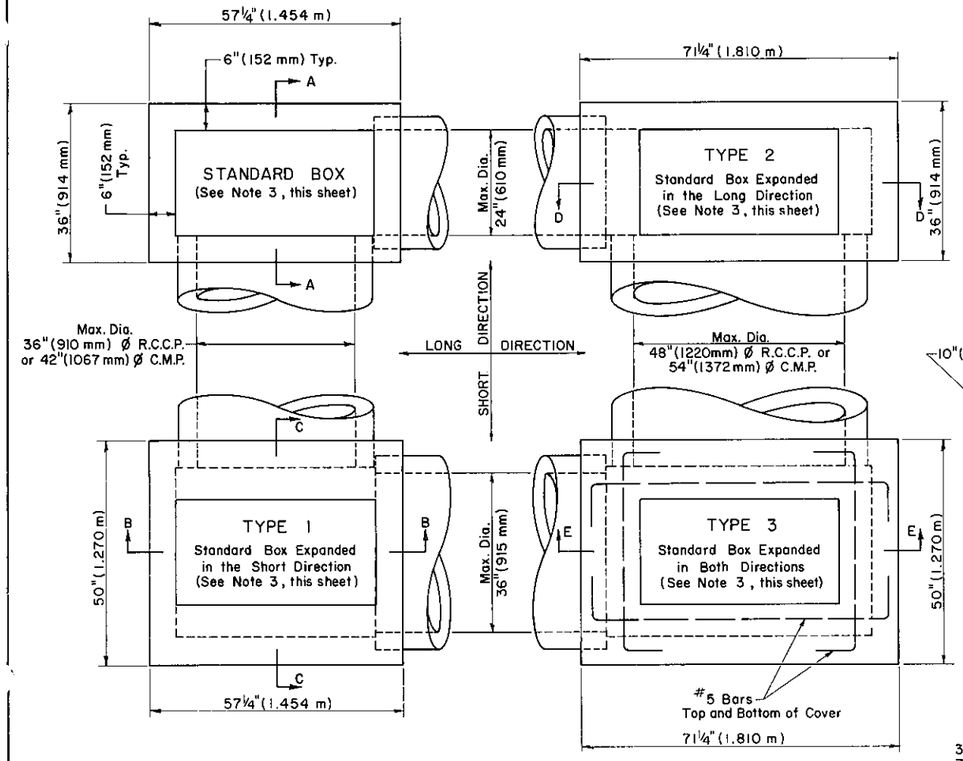
NOTES:

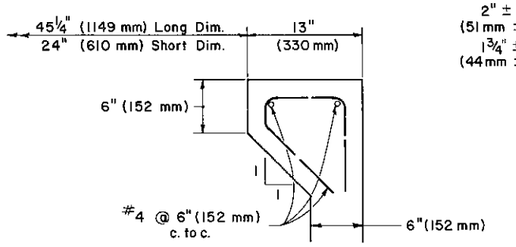
1. Frames shall be either gray, ductile or malleable cast iron or structural grade steel.
2. All welding required for the fabricated frame shall be accomplished by a welder certified as required in Section 1053.21, Form 409.
3. This standard depicts the dimensions required for uniformity and interchangeability. 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.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

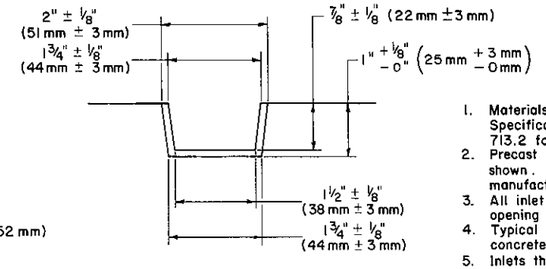
INLETS
FRAMES

Recommended June 1, 1976 — B.O. Roudie, Director, Bureau of Design	Approved June 1, 1976 — Deputy Chief Hwy. Engr.	Sht. 4 Of 5 RC-34





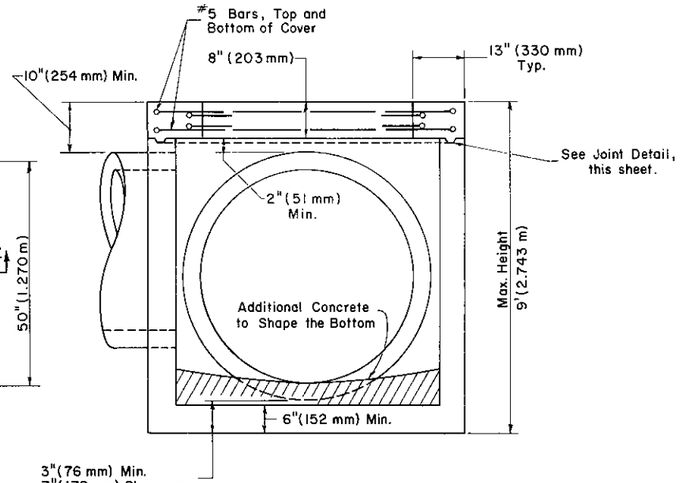
EXPANDED WALL DETAIL



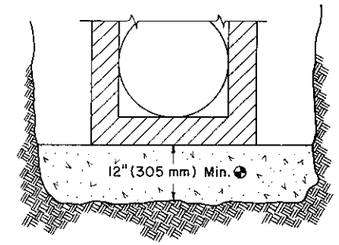
JOINT DETAIL

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) shop drawing to the Bureau of Materials, Testing & Research for approval. 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.

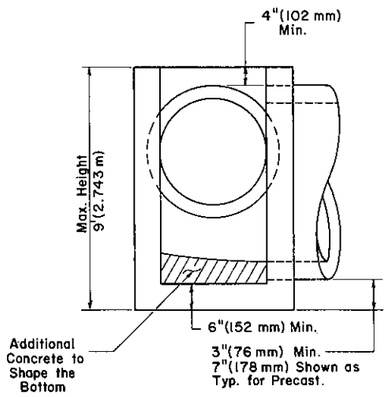


SECTION E-E
Type 3 Only
For larger diameter pipes a special design is required.

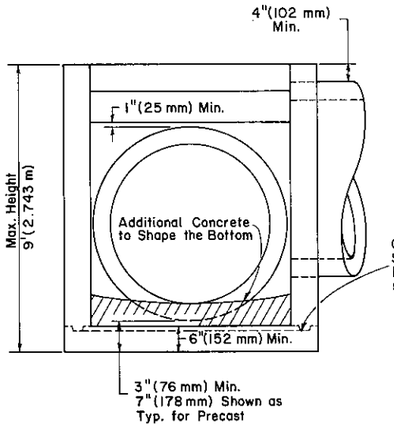


PRECAST INLET BOX
BASE PREPARATION DETAIL

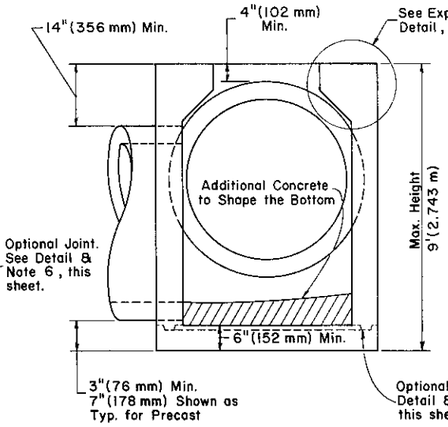
◔ Material shall meet the requirements of Form 408, Section 350.2 and be placed in 4" (102 mm) layers, thoroughly compacted to a density satisfactory to the engineer, and shall be incidental to the inlet pay item.



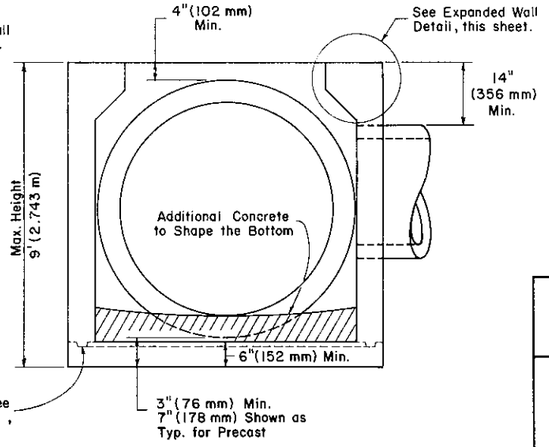
SECTION A-A



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.

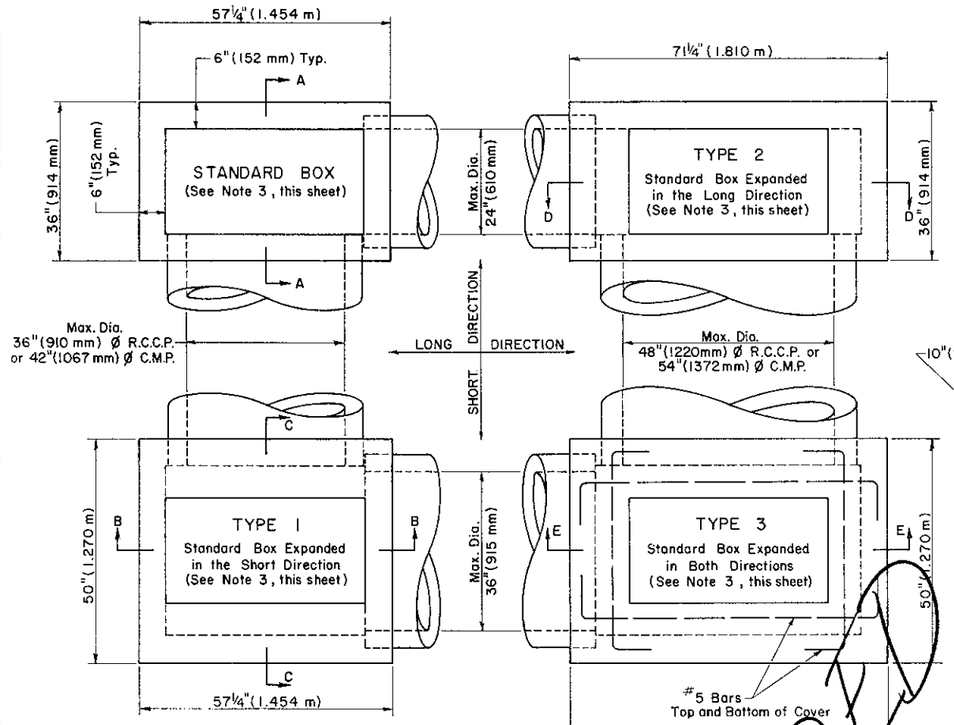


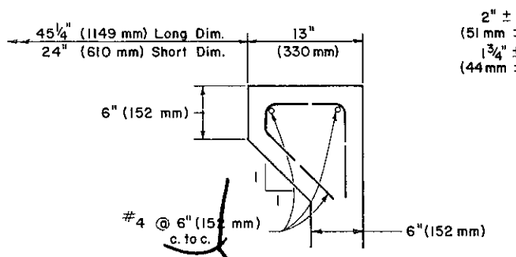
SECTION D-D
For Pipe Diameters larger than 48" (1220 mm) R.C.C.P. or 54" (1372 mm) C.M.P. in this wall use Modified Type II Inlet Box, RC-34, sheet 6 of 6.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

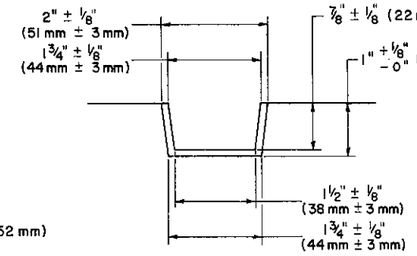
INLETS
INLET BOXES

Recommended May 31, 1979	Approved May 31, 1979	Sht. 5 Of 6
B.D. Swokie	David C. Sisco	RC-34
Director, Bureau of Design	Chief Hwy. Engr.	





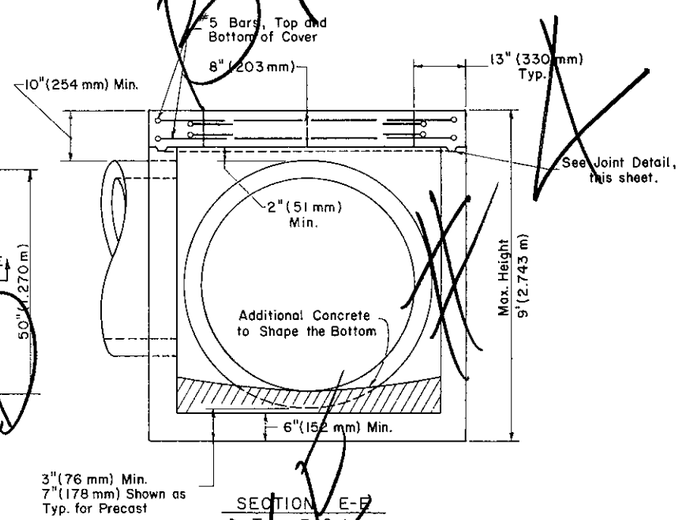
EXPANDED WALL DETAIL



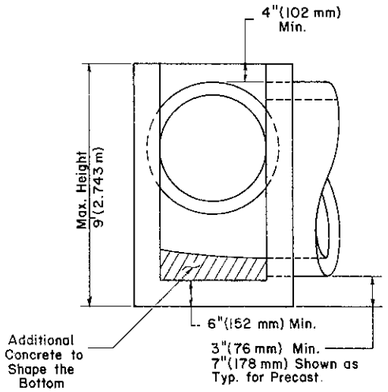
JOINT DETAIL

NOTES

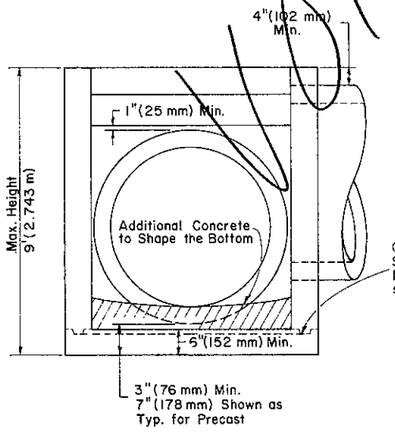
1. Materials and construction shall comply with the requirements of Specifications Form 408, Section 605 for Cast-in-Place, and Section 713.2 for Precast Cement Concrete Units.
2. Precast Concrete Inlet Boxes may be used in lieu of Cast-in-Place Boxes shown. If precast inlet boxes are used, only items 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) shop drawing to the Bureau of Materials, Testing & Research for approval. The shop drawing must show all details including dimensions, tolerances, handling reinforcement, and any manufacturing drafts.



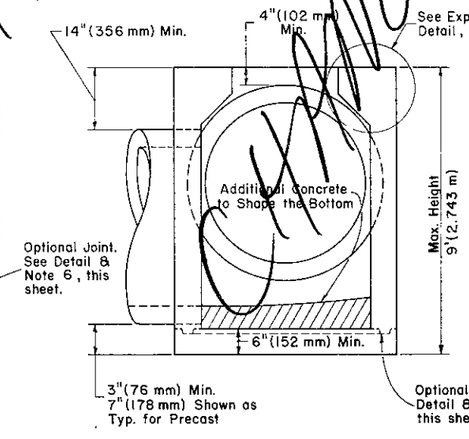
SECTION E-E
Type 3 Only
For larger diameter pipes a special design is required.



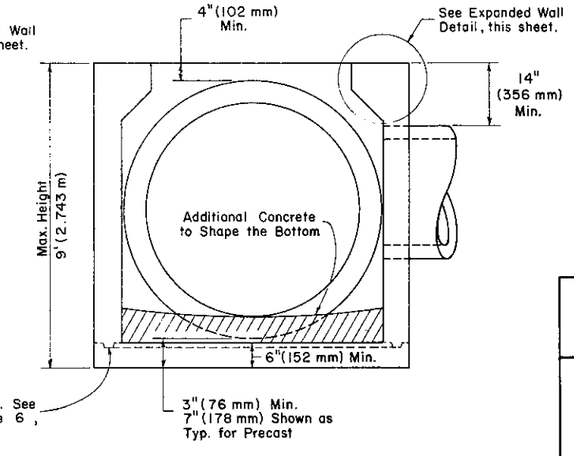
SECTION A-A



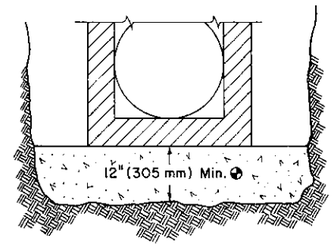
SECTION B-B



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.

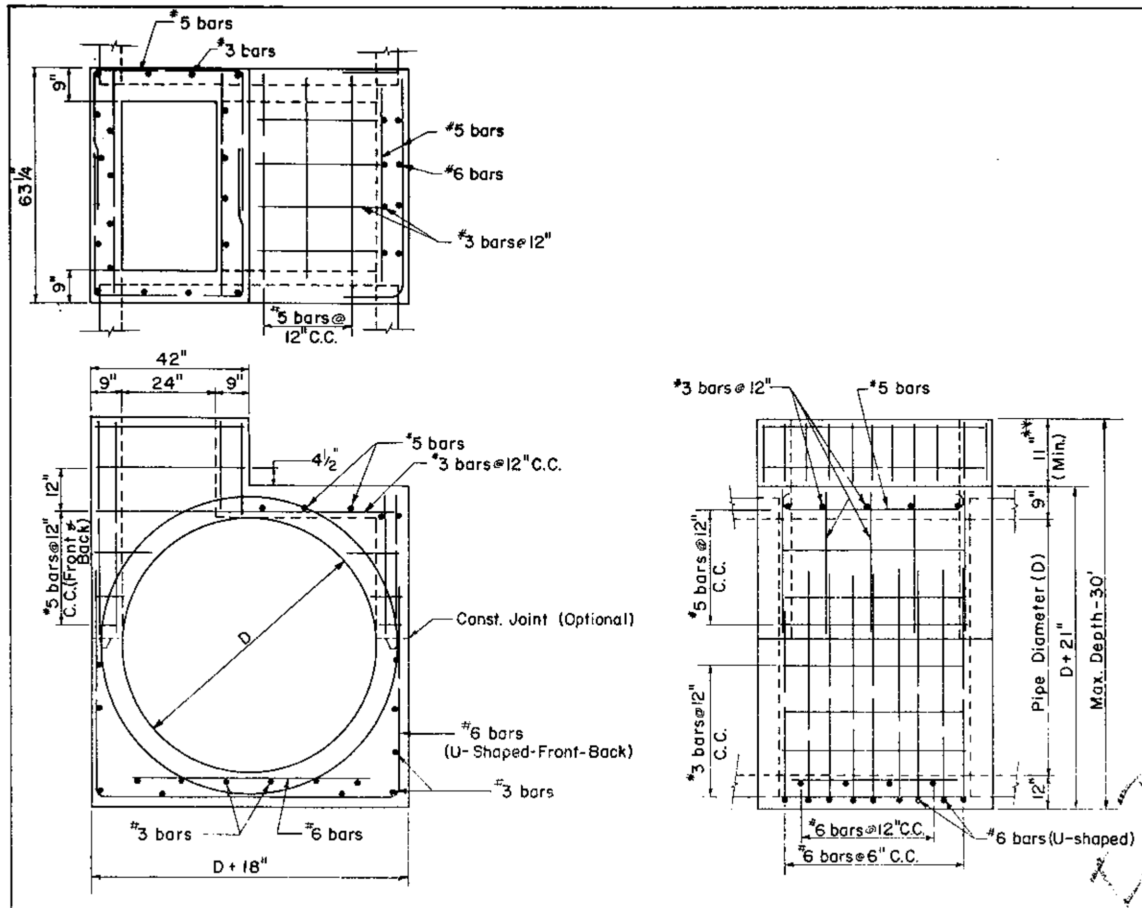
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

INLETS
INLET BOXES

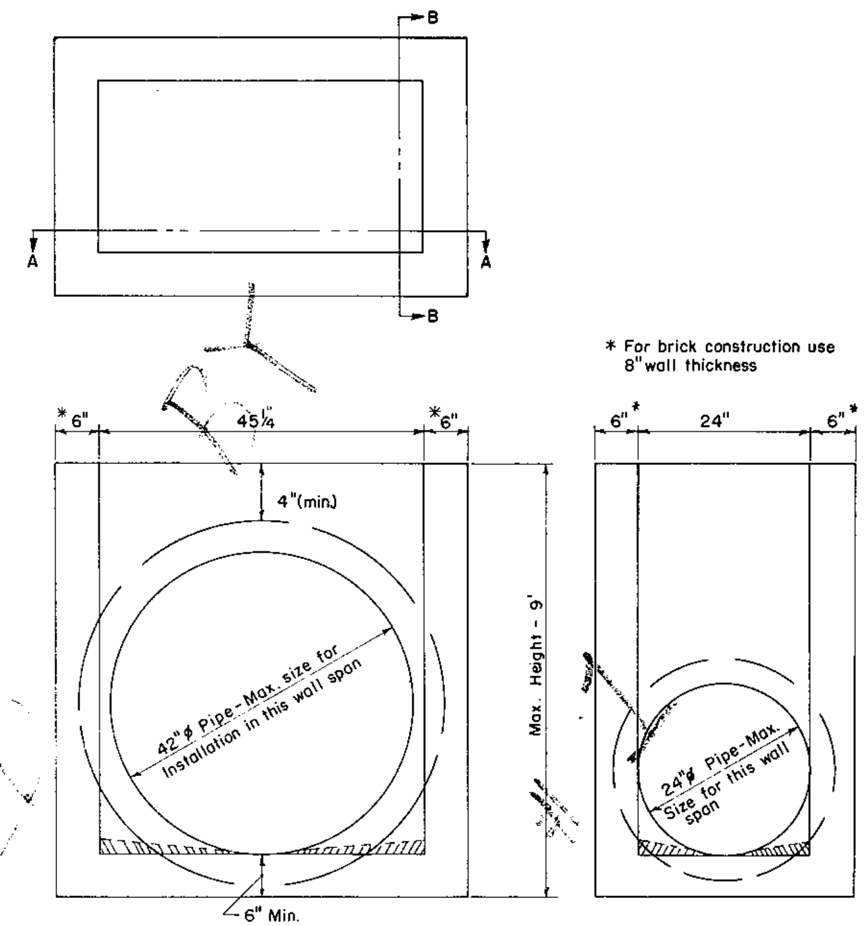
May 31, 1979

Recommended Nov. 15, 1977	Approved ~~Nov. 15, 1977~~	Sht. 5 Of 8
B. D. Lawkie	J. R. Sebastian	RC-34
Director, Bureau of Design	Deputy Chief Hwy. Engr.	

TRACED BY
FINAL BY



INLET BOX
MODIFIED TYPE I



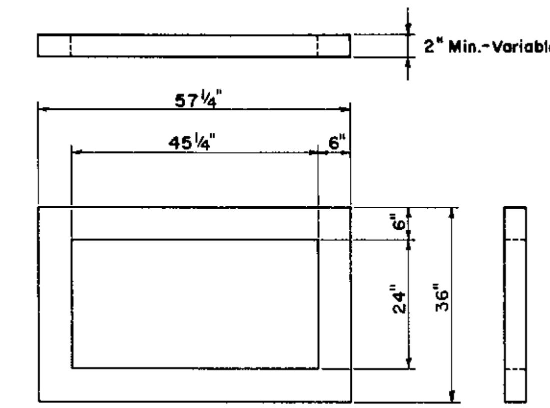
For Pipe Dia. over 42" see Modified Type II

SECTION A-A

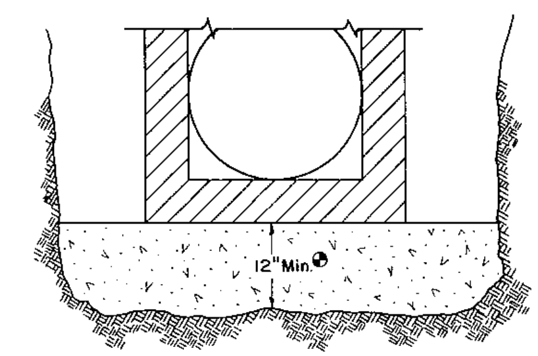
For Pipe Dia. over 24" see Modified Type I

SECTION B-B

INLET BOX

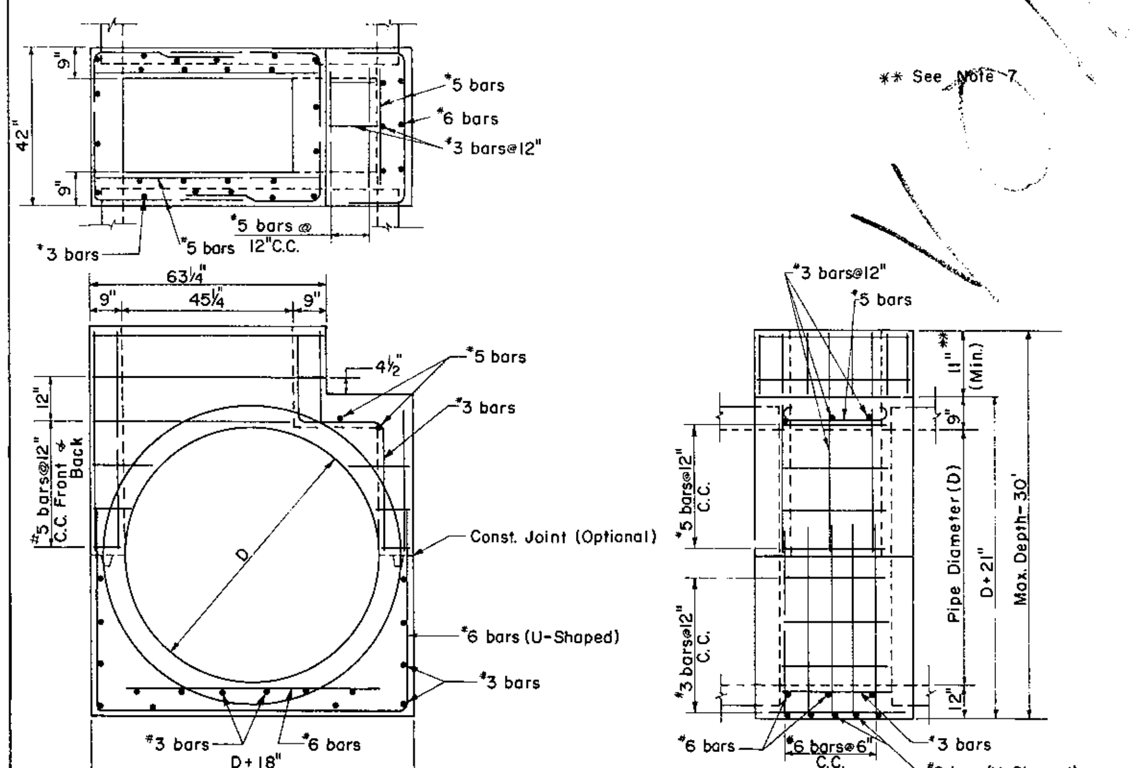


GRADE ADJUSTMENT RING (PRECAST)



PRECAST INLET BOX
BASE PREPARATION DETAIL

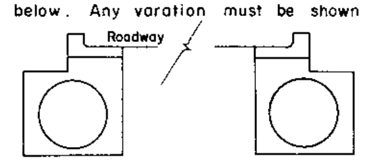
Material shall meet the requirements of Form 408, Section 350.2 and be placed in 4" layers, thoroughly compacted to a density satisfactory to the engineer.



INLET BOX
MODIFIED TYPE II

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. Pipe or pipes shall be located as required, with the inlet bottom shaped to channel the flow toward the outlet pipe.
3. Precast Concrete Inlet Boxes may be used in lieu of Cast-in-Place Boxes. 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. If precast inlet boxes are used, only items supplied by an appoved manufacturer as listed in Bulletin 15 will be permitted.
4. Inlets that exceed the maximum depth as shown shall require a special detail and design for the inlet walls and base.
5. When pipes which are to be installed in adjacent walls have diameters exceeding the normal span for both walls, special details and design must be provided.
6. For orientation of the Type C Inlet with Modified Type I Inlet Box, the typical installation details are shown below. Any varation must be shown on the construction drawings by special details.

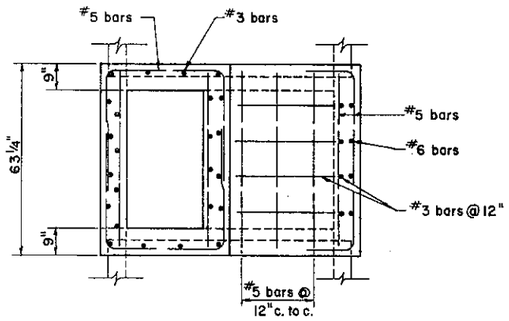


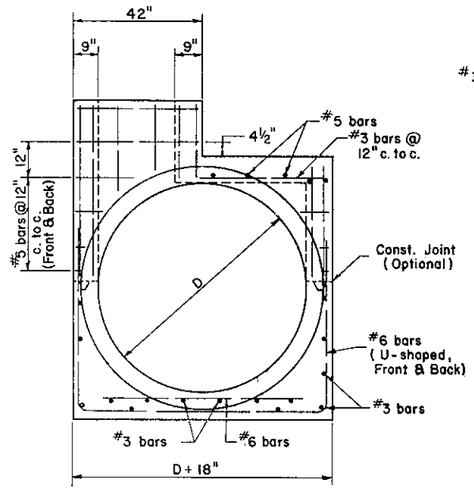
7. When the top unit and box are constructed monolithically (no construction joint), a minimum depth of 20" must be measured from the top surface of the top unit to the inside top of the pipe.
8. Precast Boxes shall be placed on a properly prepared base as shown in the above details; incidental to the inlet pay item.

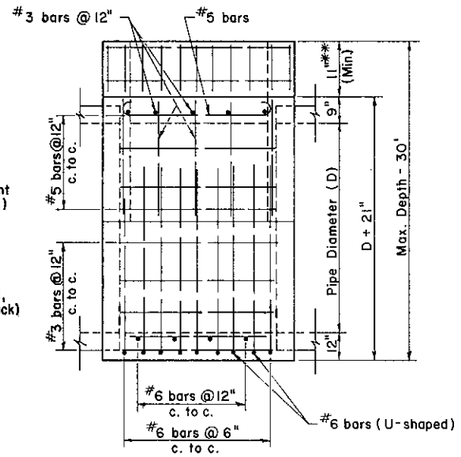
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

INLETS
INLET BOXES

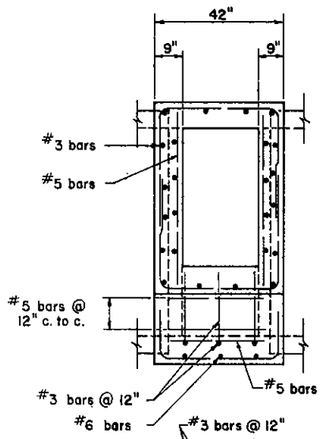
Recommended June 1, 1976 B.O. Rouski Director, Bureau of Design	Approved June 1, 1976 Deputy Chief Hwy. Engr.	Sht. 5 Of 5 RC-34

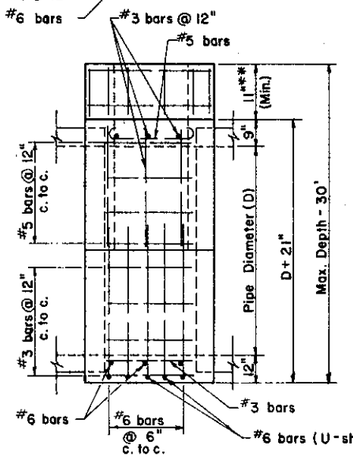


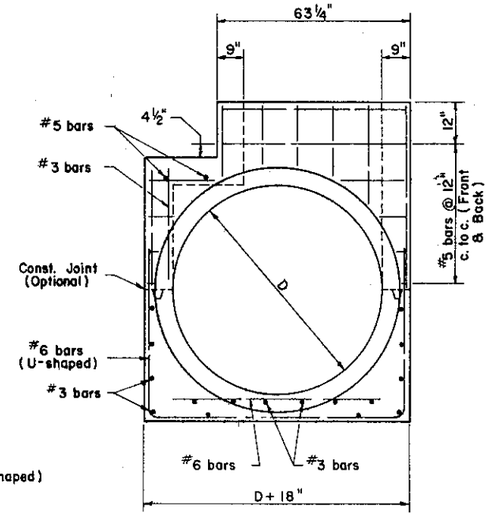




**See Note 5

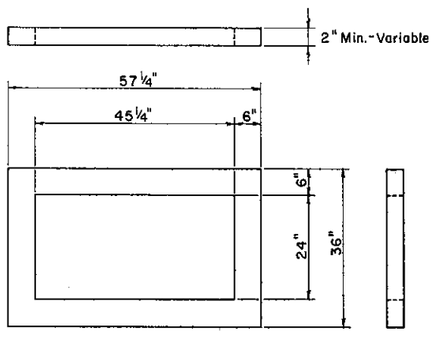






INLET BOX
MODIFIED TYPE I

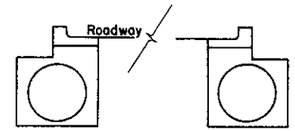
INLET BOX
MODIFIED TYPE II



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 variation 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

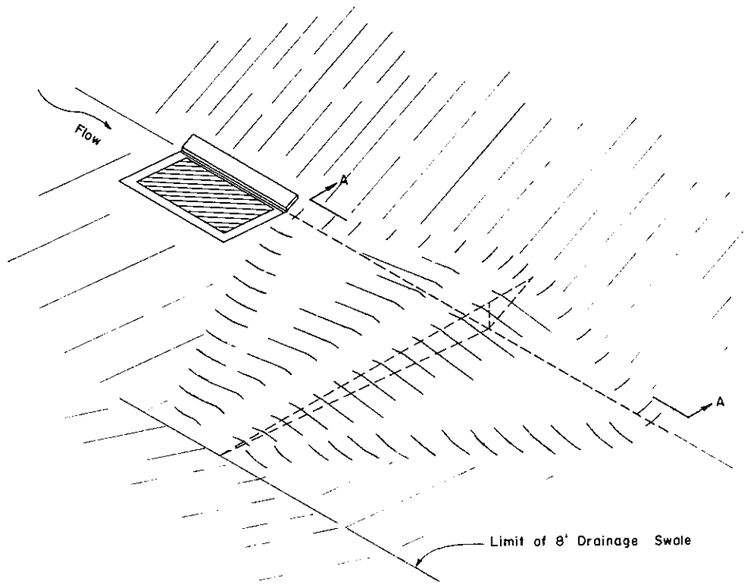
INLETS
MODIFIED INLET BOXES

May 31, 1979

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

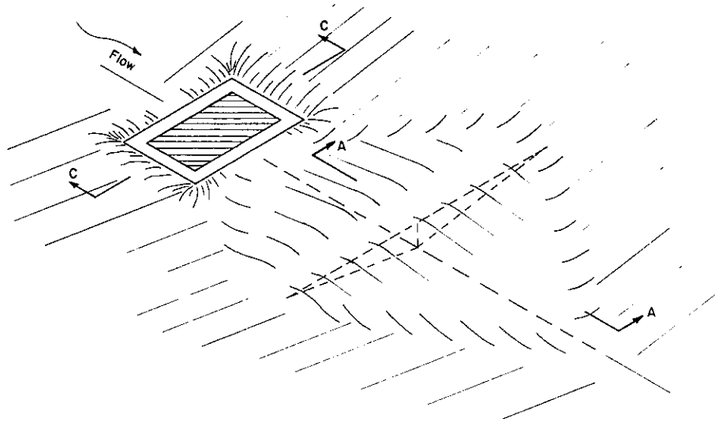
Approved ~~Nov. 15, 1977~~
J. M. Sebastian
Deputy Chief Hwy. Engr.

Sht. 6 Of 6
RC-34



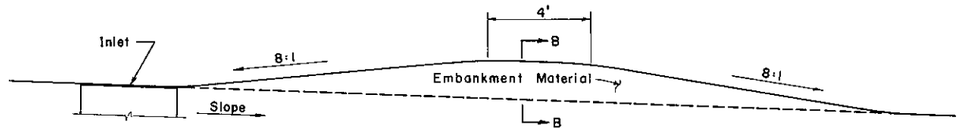
SWALE INSTALLATION

DRAINAGE DIKE

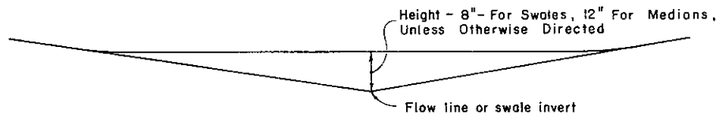


MEDIAN INSTALLATION

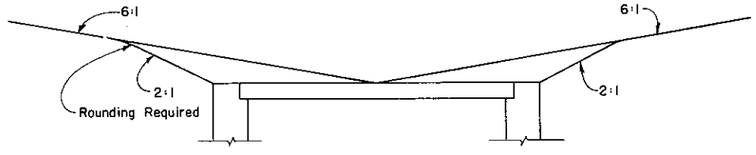
DRAINAGE DIKE



SECTION A-A



SECTION B-B



SECTION C-C

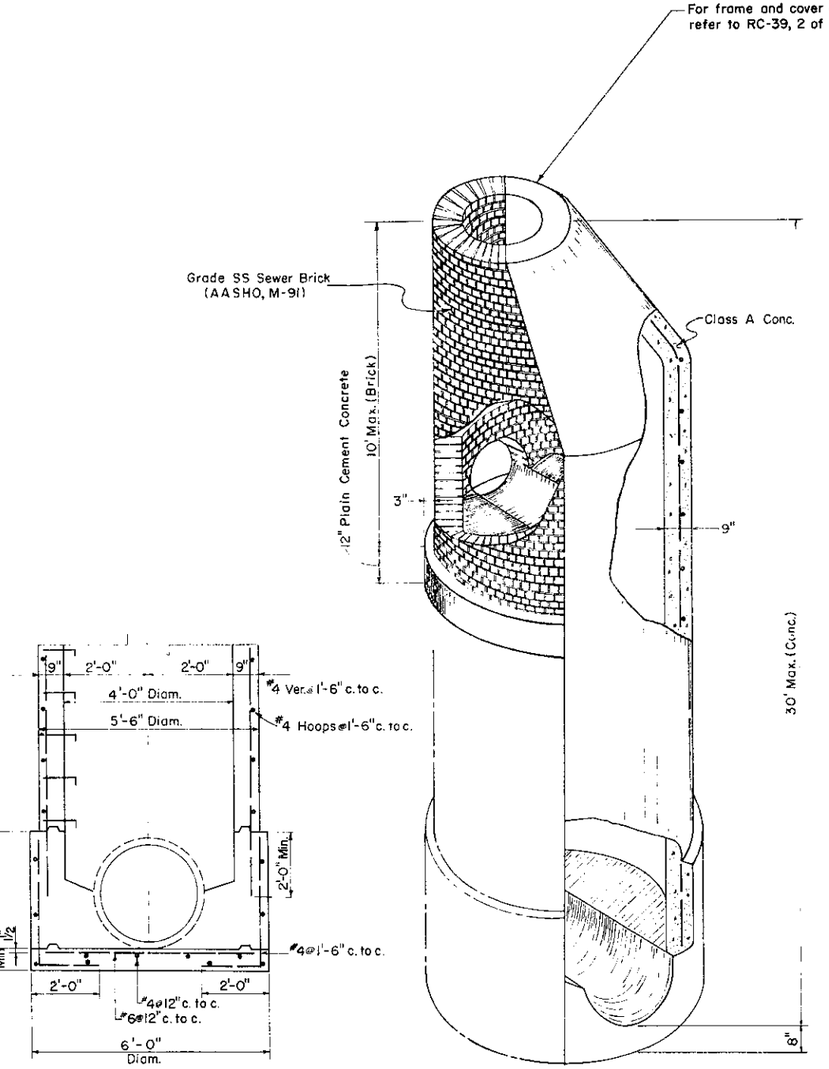
NOTES

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 1 Excavation.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

DRAINAGE DIKE

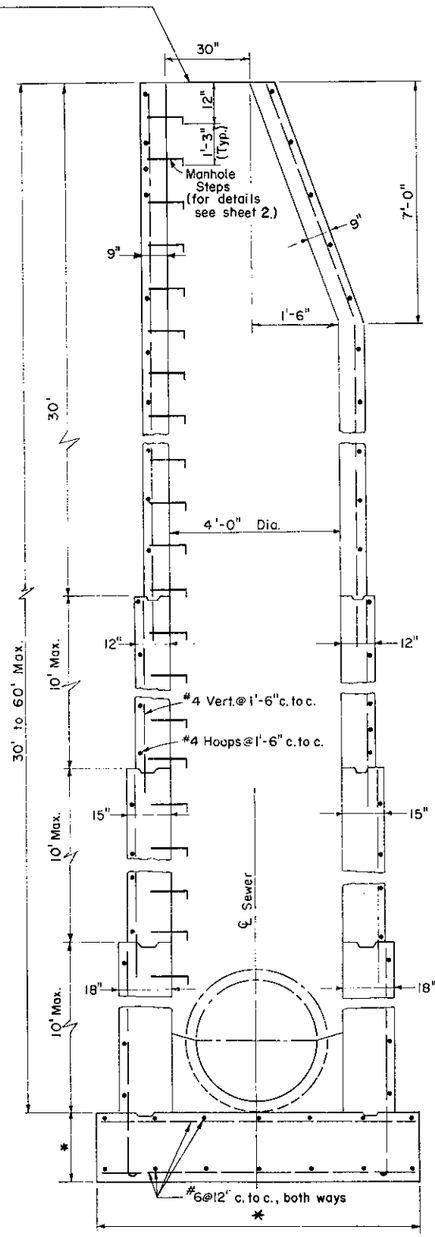
Recommended Jan. 31, 1977	Approved Jan. 31, 1977	Sht. 1 Of 1
Director, Bureau of Design	Deputy Chief Hwy. Engr.	RC-35



FOUNDATION DETAIL FOR CONCRETE MANHOLE, TYPE A

TYPE A

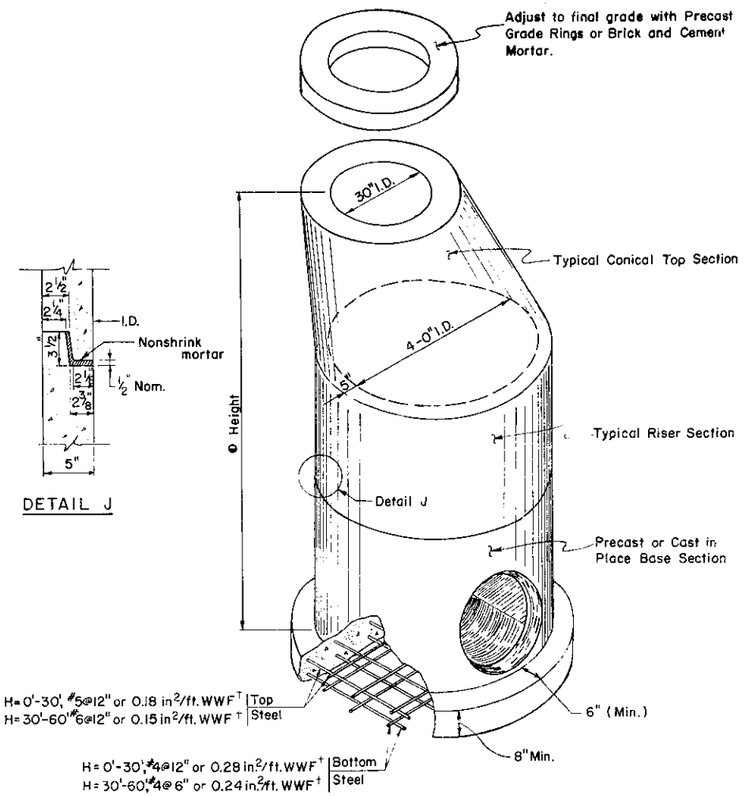
(IN PLACE CONSTRUCTION)



TYPE B

(IN PLACE CONSTRUCTION)

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



DETAIL J

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
Director, Bureau of Design

Approved Jan. 31, 1977
Deputy Chief Hwy. Engr.

Sht. 1 Of 2

RC-39

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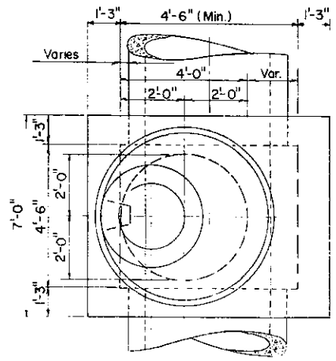
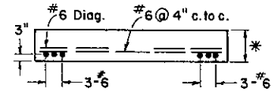
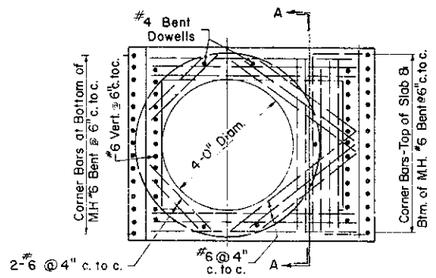


PLAN



SECTION A-A



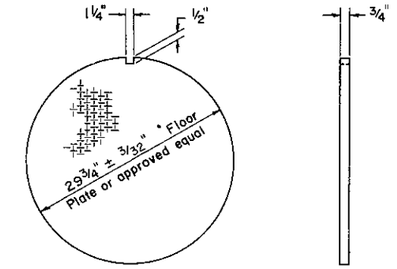
PLAN OF SLAB OVER PIPE

(Indicating Placing of Bars)

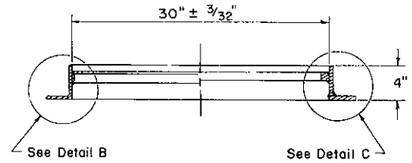
* 1'-3" for 30" Total Depth.
1'-6" for Total Depth greater than 30'.

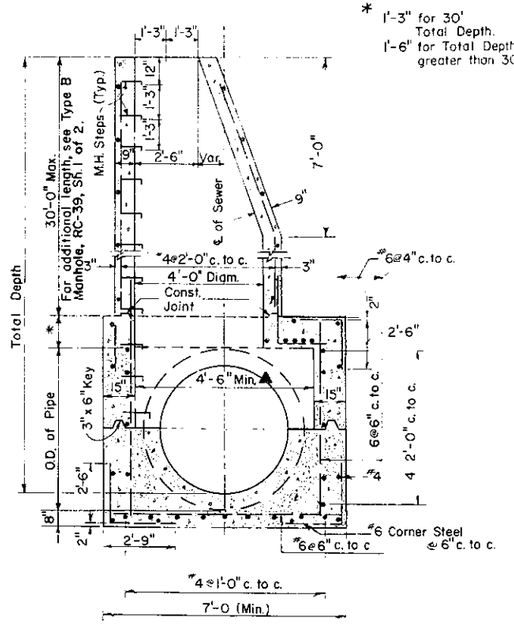
TABLE OF BASE SLAB DIMENSIONS					
Maximum Diam. of Pipe	Type of Manhole	Depth from Top of Manhole to Invert of Pipe	As Designed ** Tons per Sq. ft.	Minimum width of Base	Min. thickness of Base below the bottom of the pipe
30"	A	Max. 10'-0"	0.65	6'-6"	0'-8"
30"	A	Max. 20'-0"	0.82	7'-0"	0'-8"
30"	A	Max. 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" 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





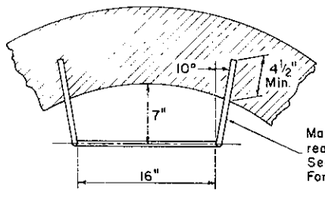
SECTION

MODIFIED MANHOLE ▲

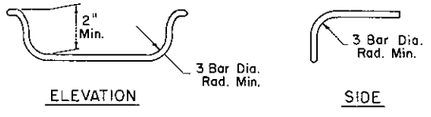
(For pipes 36" Dia. and greater)

▲ 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.



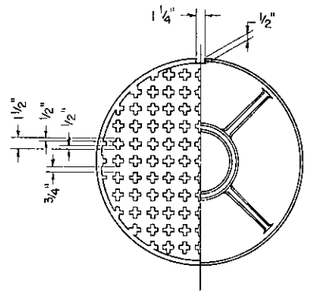
PLAN



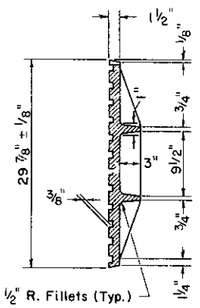
ELEVATION SIDE

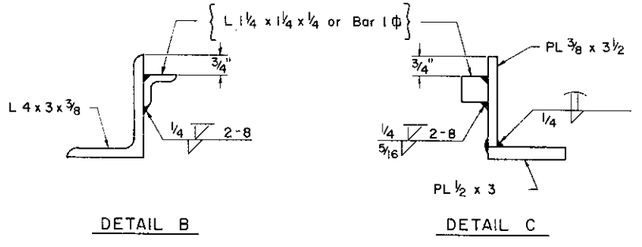
MANHOLE STEPS

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



CAST IRON COVER



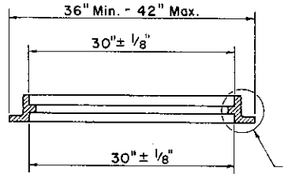


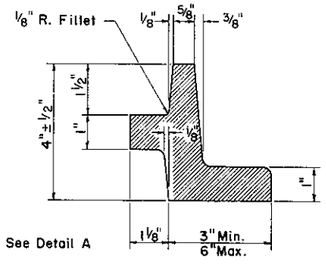
DETAIL B DETAIL C

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

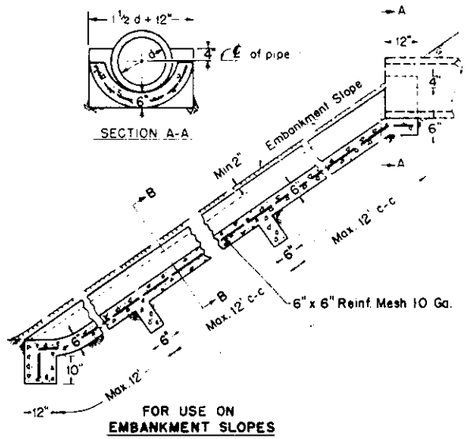
Recommended Jan. 31, 1977
P.O. Conklin
Director, Bureau of Design

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

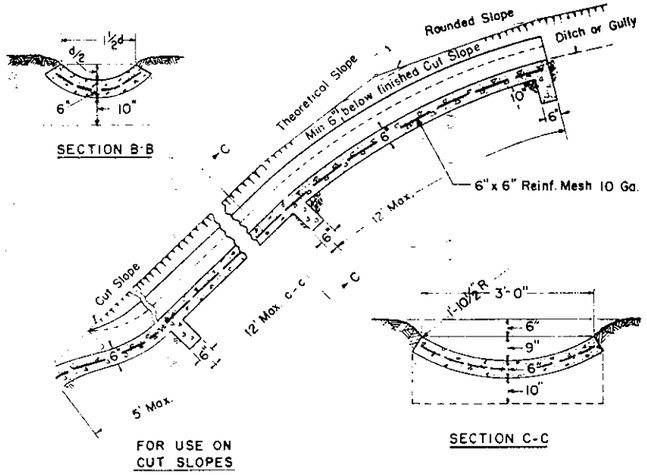
Sht. 2 Of 2

RC-39

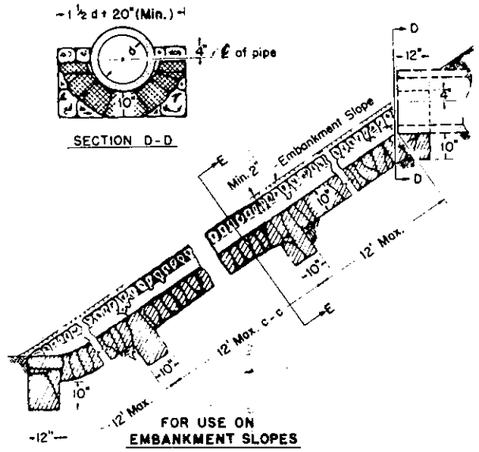
TRACED BY
FINAL BY



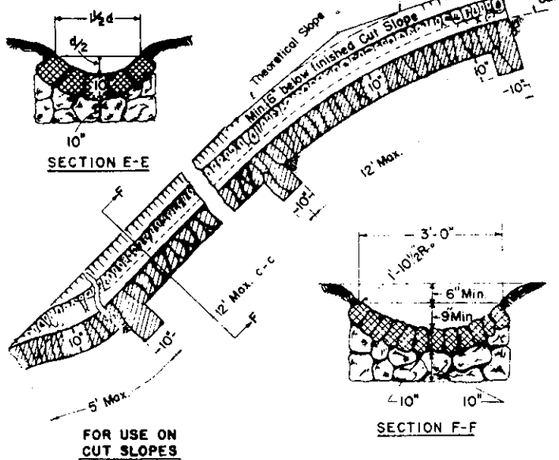
FOR USE ON
EMBANKMENT SLOPES



FOR USE ON
CUT SLOPES



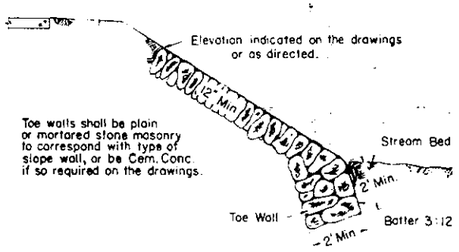
FOR USE ON
EMBANKMENT SLOPES



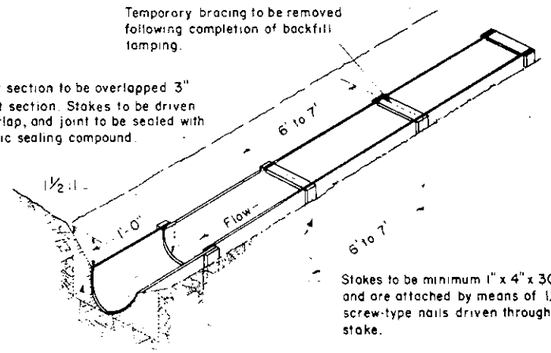
FOR USE ON
CUT SLOPES

MORTARED STONE SPILLWAYS

CEMENT CONCRETE SPILLWAYS

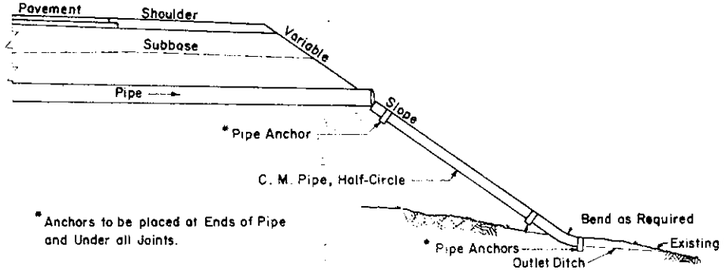


PLAIN AND MORTARED
STONE SLOPE WALL

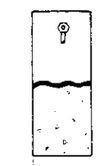


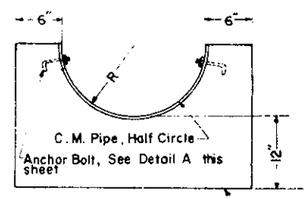
Stakes to be minimum 1" x 4" x 30", creosoted and are attached by means of 1½" galvanized screw-type nails driven through fiber pipe into stake.

INSTALLATION OF HALF SECTION BITUMINIZED
FIBER PIPE



SKETCH OF HALF CIRCLE PIPE IN FILL SLOPE

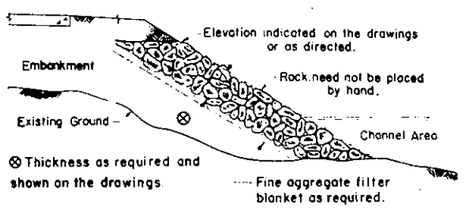




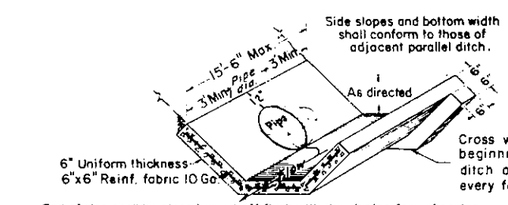
DETAIL OF PIPE ANCHOR

NOTES

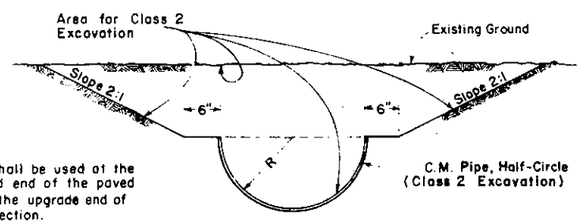
1. All items shall conform to the requirements of Form 408.



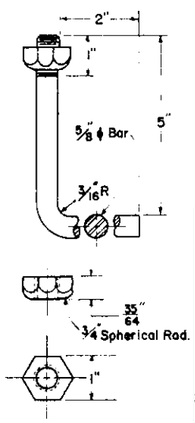
ROCK EMBANKMENT
FOR SLOPE PROTECTION



CEMENT CONCRETE PAVING for STREAM BEDS
(PAVED PARALLEL DITCH)



INSTALLATION DETAIL FOR
HALF-CIRCLE PIPE

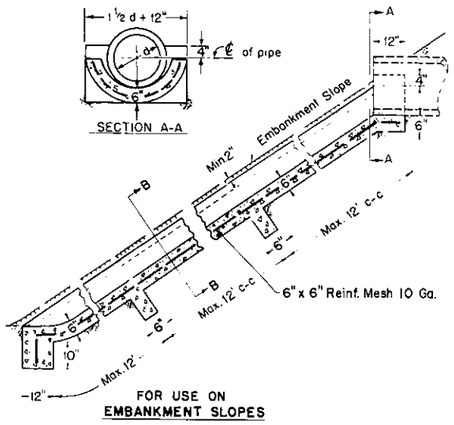


DETAIL A - ANCHOR BOLT

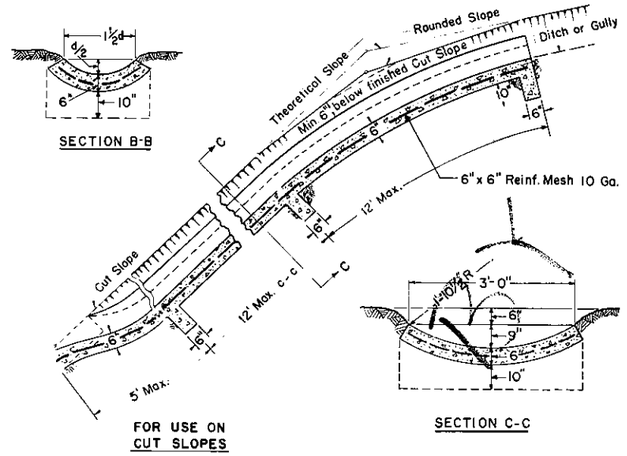
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

SLOPE PROTECTION

Recommended Nov. 15, 1977	Approved Nov. 15, 1977	Sht. 1 Of 1
B.Q. Rambo	J. M. Sebastian	RC-40
Director, Bureau of Design	Deputy Chief Hwy. Engr.	

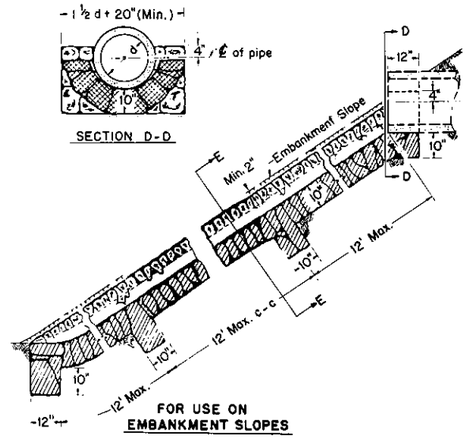


FOR USE ON
EMBANKMENT SLOPES

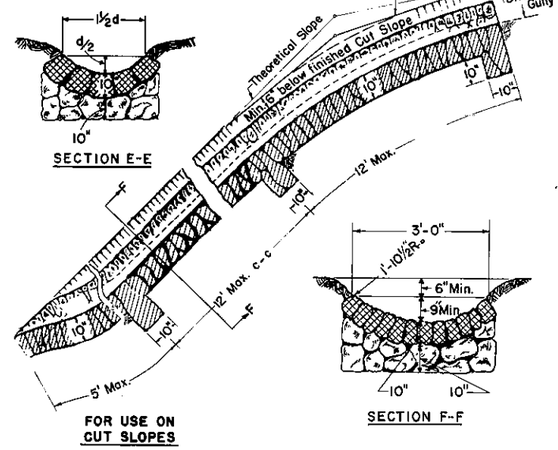


FOR USE ON
CUT SLOPES

SECTION C-C



FOR USE ON
EMBANKMENT SLOPES

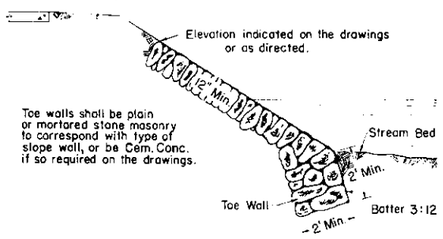


FOR USE ON
CUT SLOPES

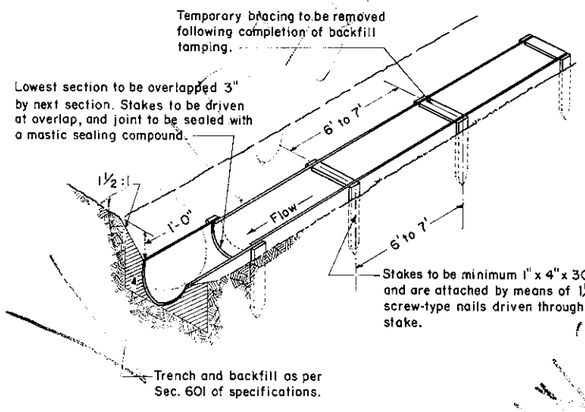
SECTION F-F

MORTARED STONE SPILLWAYS

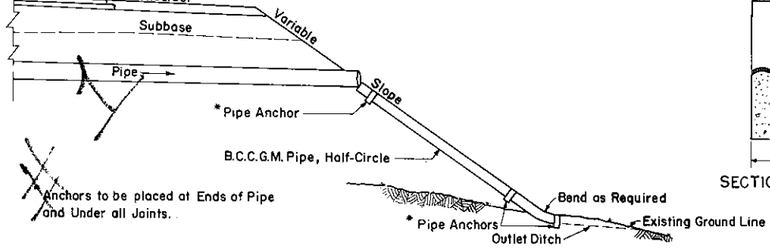
CEMENT CONCRETE SPILLWAYS



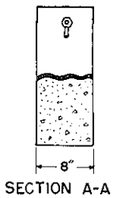
PLAIN AND MORTARED
STONE SLOPE WALL

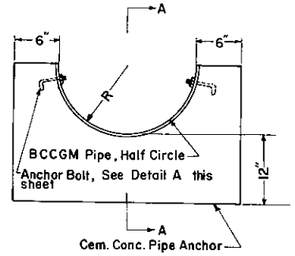


INSTALLATION OF HALF SECTION BITUMINIZED
FIBER PIPE



SKETCH OF HALF CIRCLE PIPE IN FILL SLOPE

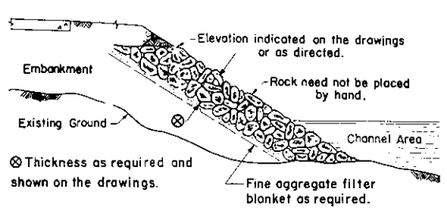




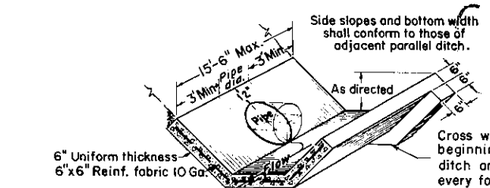
DETAIL OF PIPE ANCHOR

NOTES

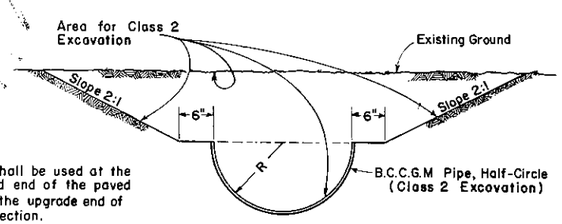
1. All items shall conform to the requirements of Form 408.



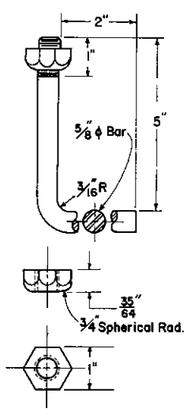
ROCK EMBANKMENT
FOR SLOPE PROTECTION



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 Jan. 31, 1977
B.O. Austin
Director, Bureau of Design

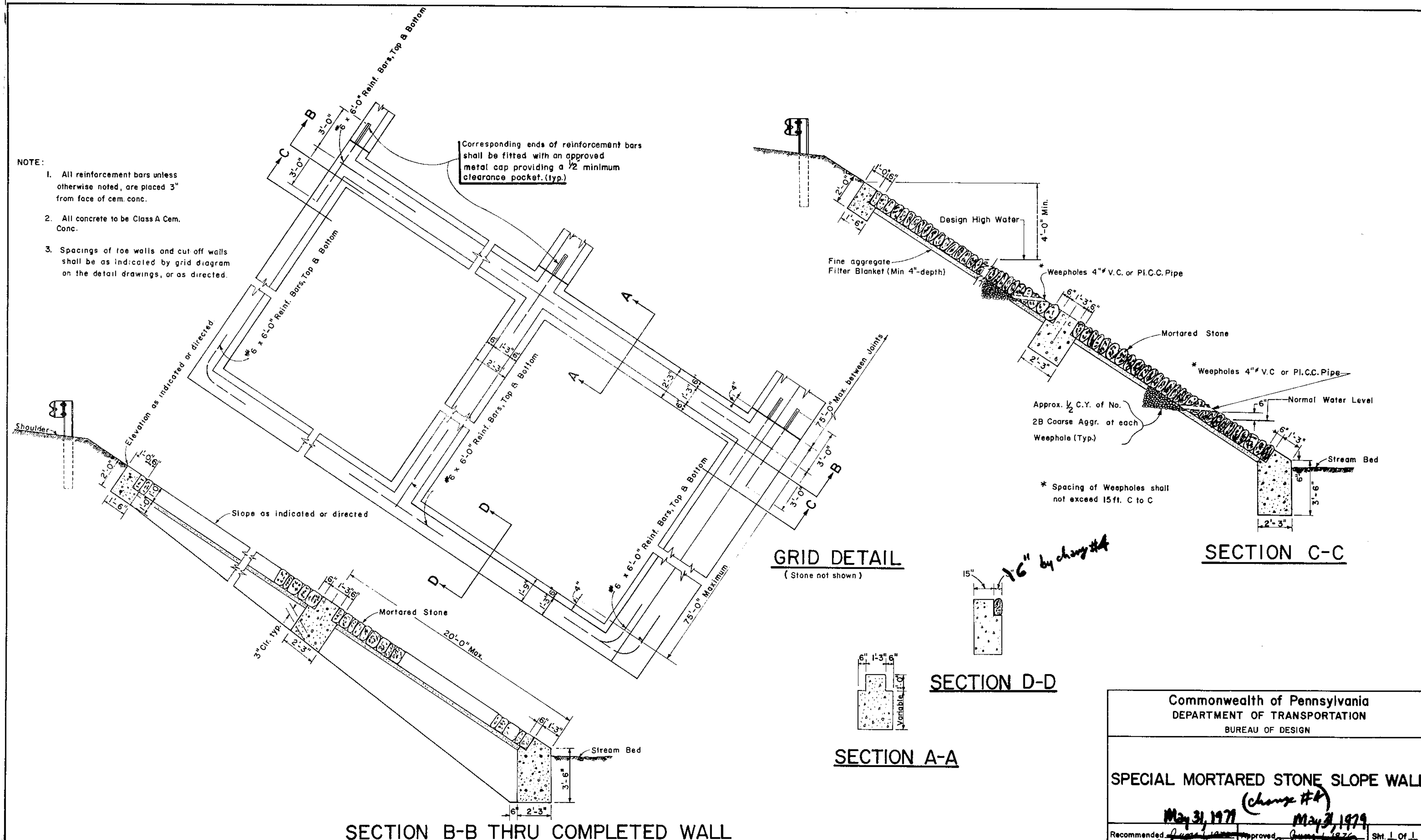
Approved Jan. 31, 1977
James R. Wilson
Deputy Chief Hwy. Engr.

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.



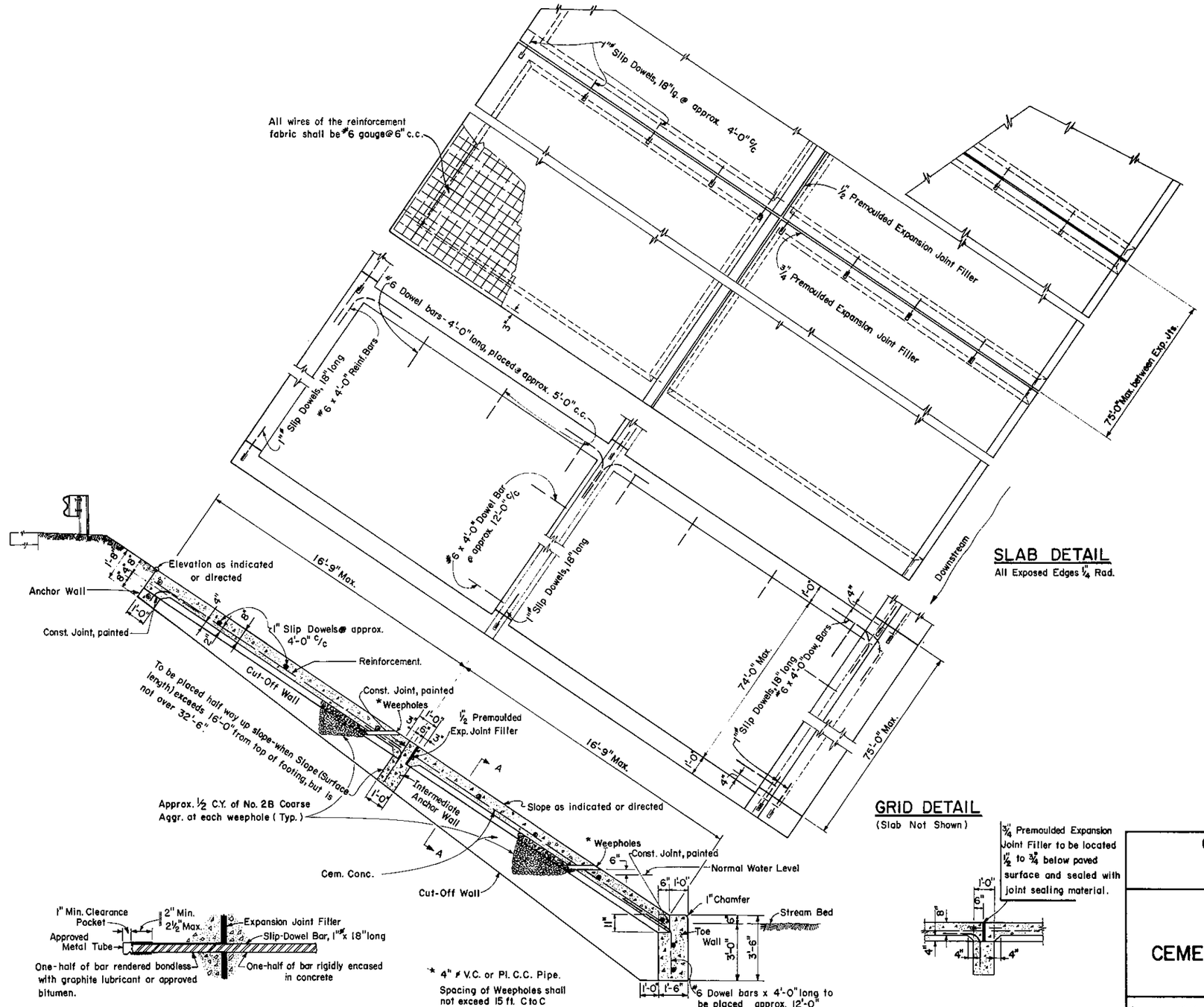
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

SPECIAL MORTARED STONE SLOPE WALL

(change #4)

Recommended May 31, 1979	Approved May 31, 1979	Sht. 1 Of 1
B.D. Rendie / Director, Bureau of Design	Deputy Chief Hwy. Engr.	RC-41

FORM 4237 REV. 7-68



SLAB DETAIL

All Exposed Edges 1/4" Rad.

GRID DETAIL

(Slab Not Shown)

SLIP DOWEL BAR DETAIL

SECTION THRU COMPLETED WALL

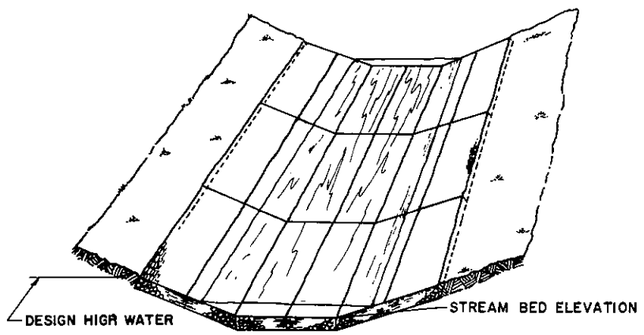
SECTION A-A

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

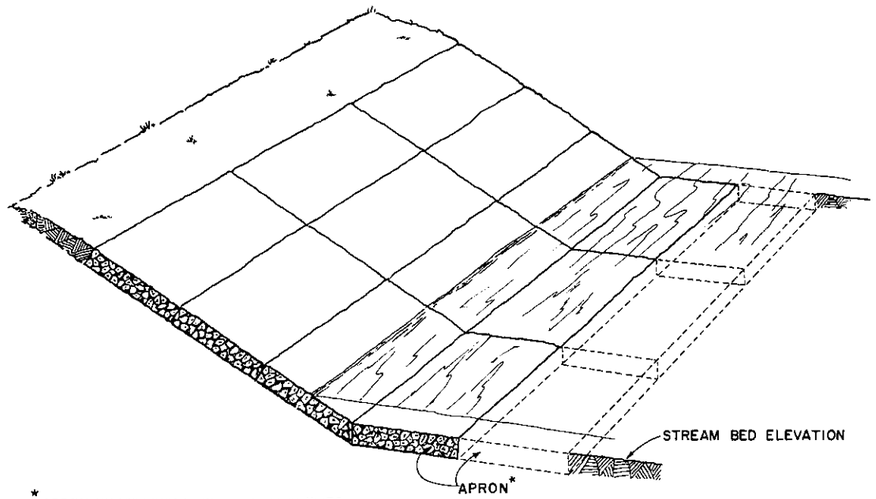
REINFORCED CEMENT CONCRETE SLOPE WALL

Recommended June 1, 1976 B.D. Bowles Director, Bureau of Design	Approved June 1, 1976 Deputy Chief Hwy. Engr.	Sht. 1 of 1 RC-42

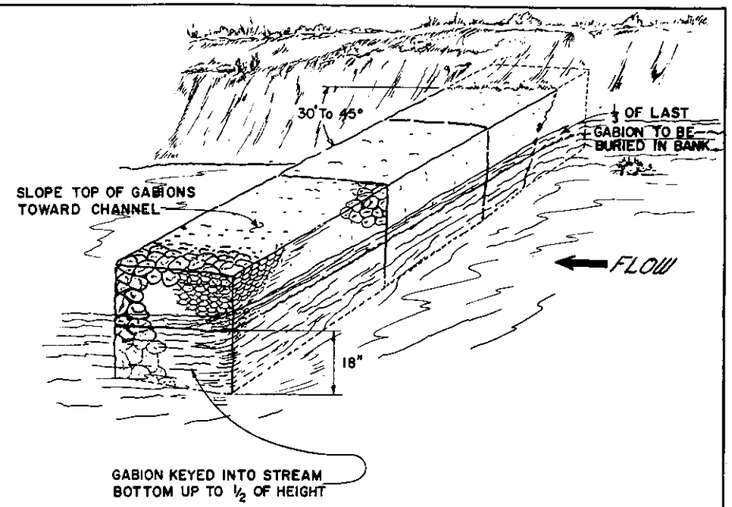
TRACED BY
FINAL BY



CHANNEL LINING

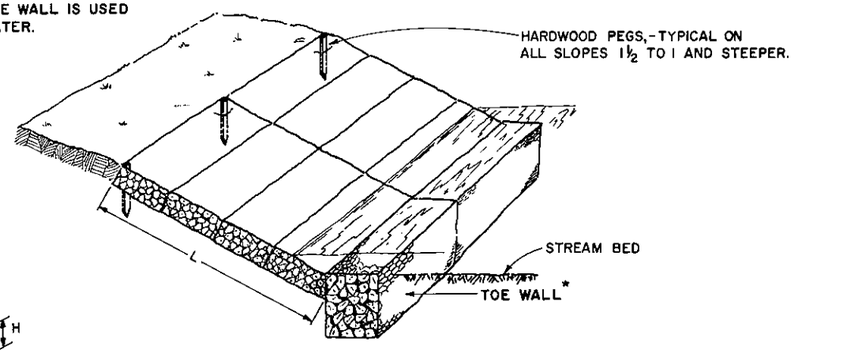


* APRON OR TOE WALL WILL BE REQUIRED WHERE THE SLOPE WALL IS USED ADJACENT TO WATER.

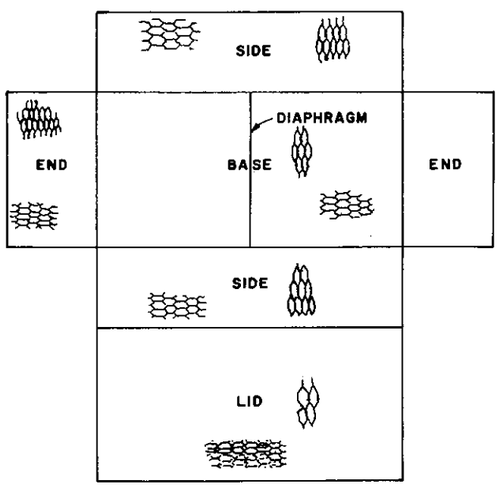


CHANNEL DEFLECTOR

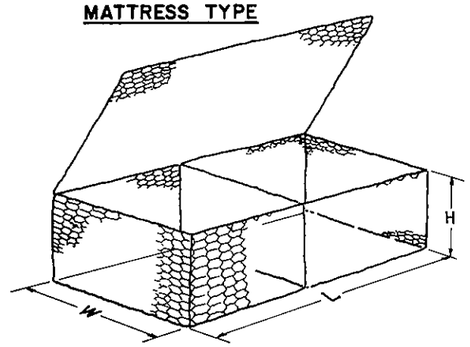
- Type A Gabions shall consist of wire baskets filled by hand placement of coarse aggregate at least along the exposed faces for a uniform appearance.
- Type B Gabions shall consists of wire baskets filled completely with small power equipment or by hand.
- Corrosion Resistant Type A and B Gabions shall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



SLOPE WALLS



MATTRESS TYPE



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"

change #4

* 9" For Corrosion Resistant

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

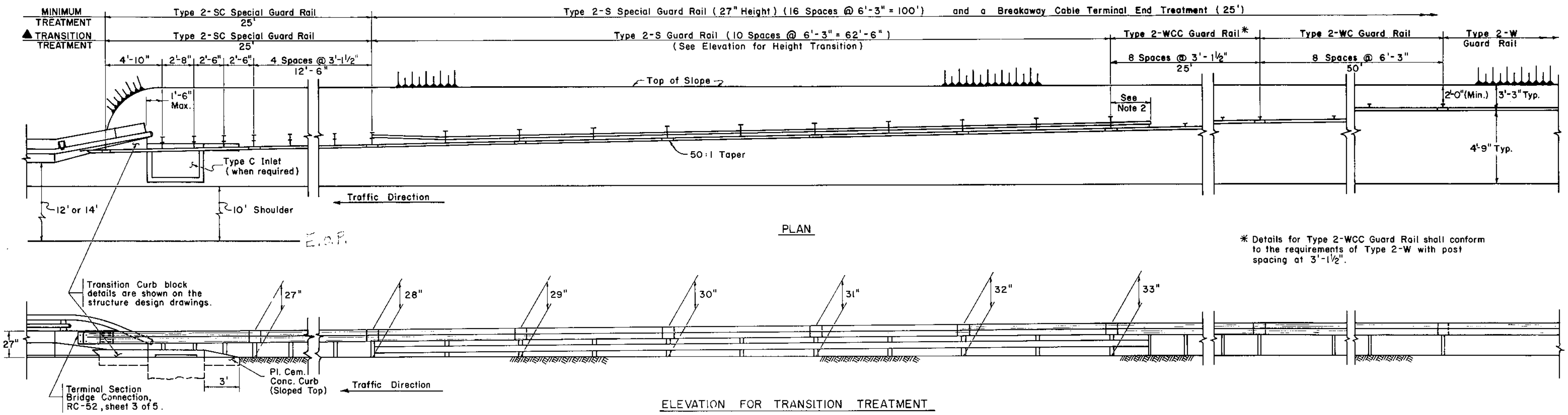
GABIONS
change #4

May 31, 1979 — Recommended ~~May 7, 1973~~
B.D. Rinaldi
Director, Bureau of Design

May 31, 1979 — Approved ~~May 7, 1973~~
R.R. Maser
Deputy Chief Hwy Engr.

Sht. 1 Of 1
RC-43

TRACED BY
PROOF BY

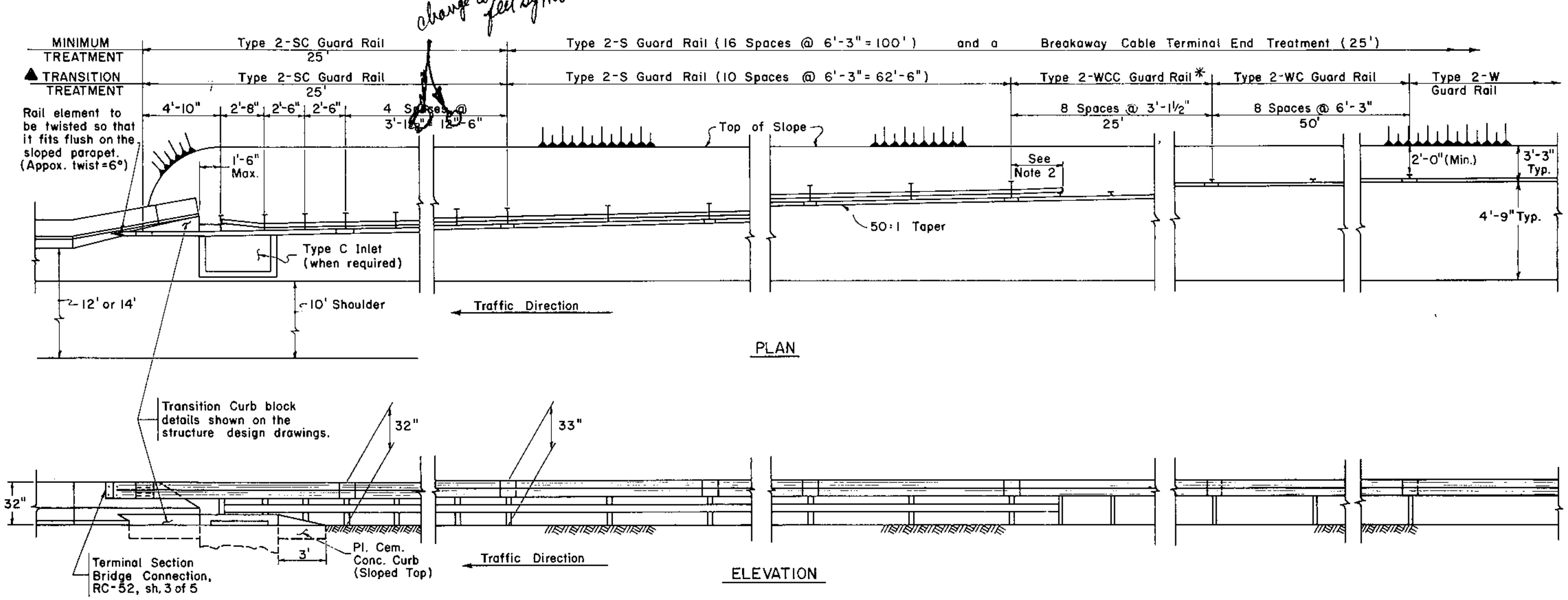


* Details for Type 2-WCC Guard Rail shall conform to the requirements of Type 2-W with post spacing at 3'-1½".

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

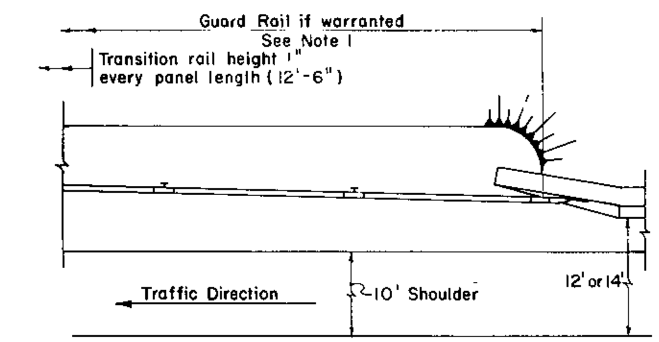
APPROACH END GUARD RAIL TRANSITION AT SLOPED CURB PARAPET

(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)

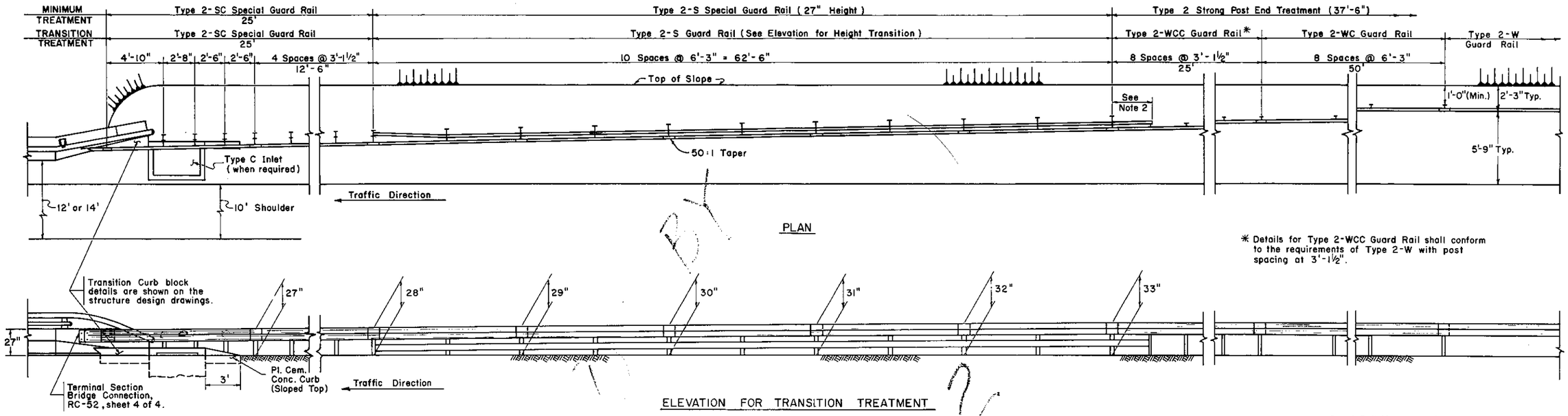
NOTES

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.

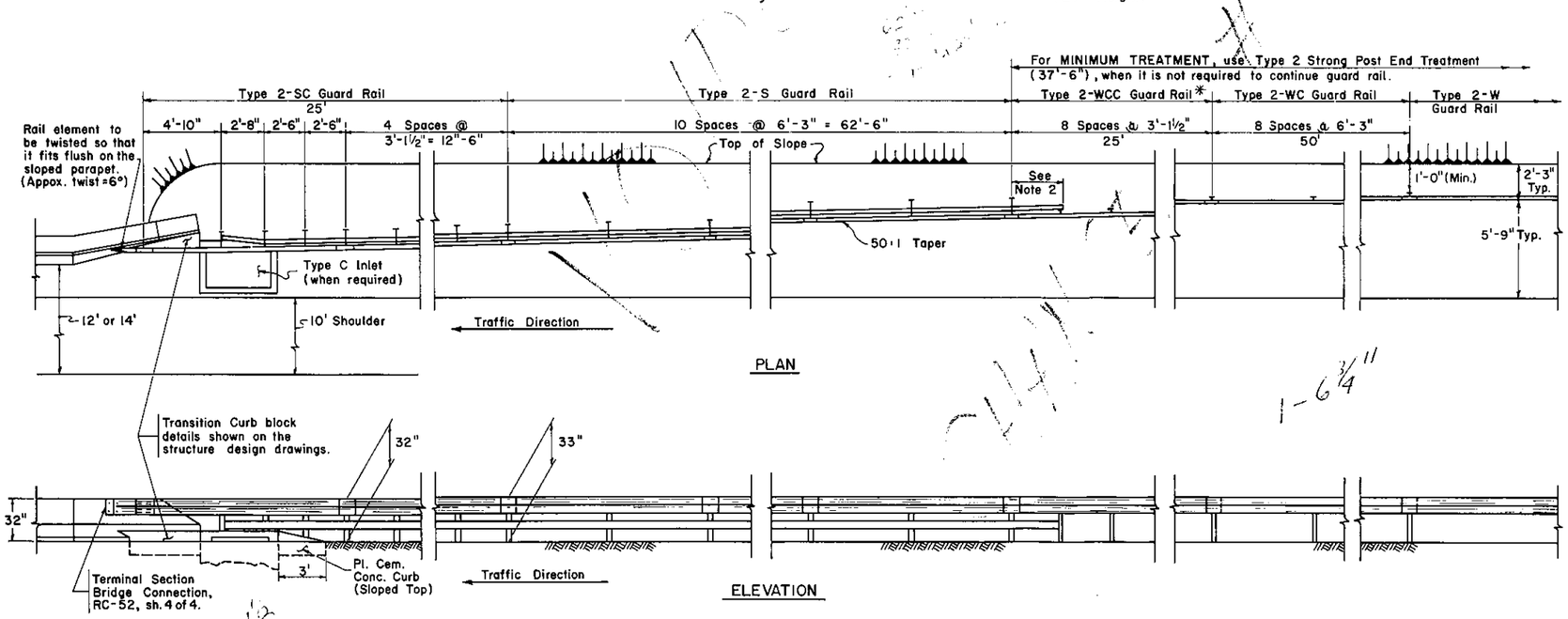
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

GUARD RAIL TRANSITION AT END OF STRUCTURES

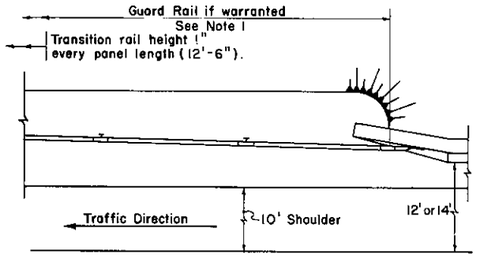
Recommended May 1, 1978 B.O. Rosenkrie Director, Bureau of Design	Approved May 1, 1978 James W. Sebastian Deputy Chief Hwy. Engr.	Sht. 1 Of 1 RC-50



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

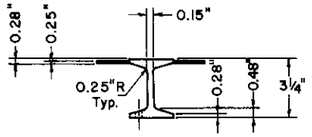
1. Approach End Guard Rail Treatment should be provided at both the Approach and Trailing Ends of Structure Parapets on two lane facilities with two way traffic. On four lane divided highways guard rail is not required on trailing ends of parapets unless warranted by other obstructions.
2. This length 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

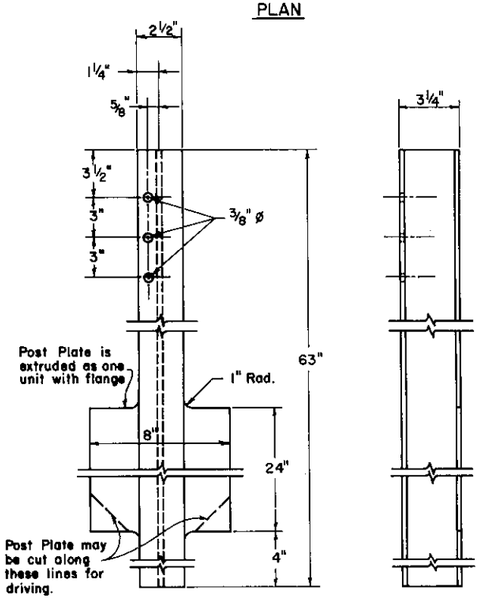
GUARD RAIL TRANSITION AT END OF STRUCTURES

Recommended June 1, 1976	Approved June 1, 1976	Sht. 1 Of 1
B.O. Rowskie, Director, Bureau of Design	Deputy Chief Hwy. Engr.	RC-50

TRACED BY
FINAL BY

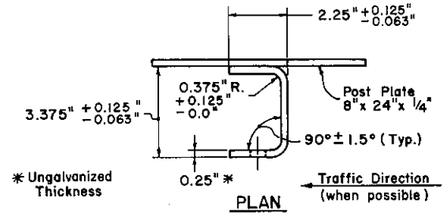


PLAN

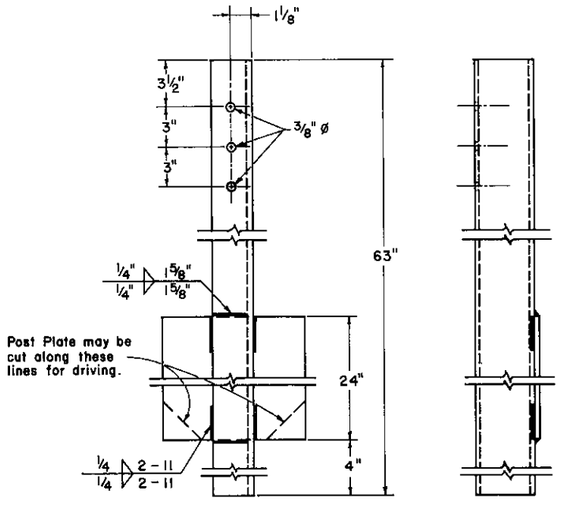


ELEVATION SIDE

ALUMINUM ALLOY POST



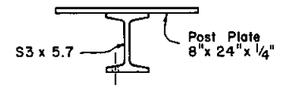
PLAN



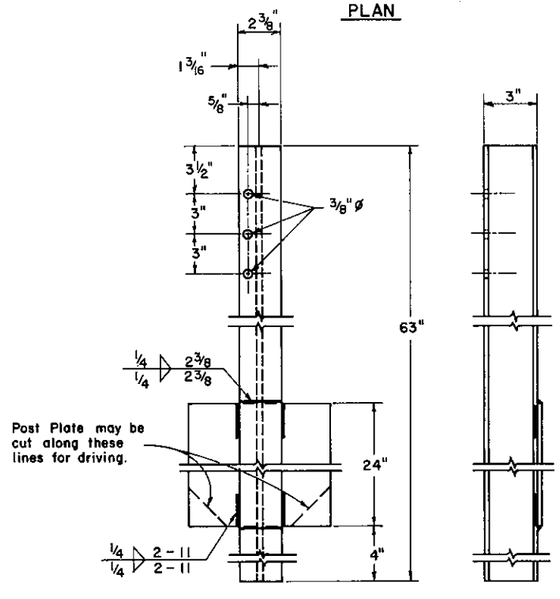
ELEVATION SIDE

3⅜" x 2¼" COLD FORMED CHANNEL POST

TYPE I-W GUARD RAIL POSTS



PLAN

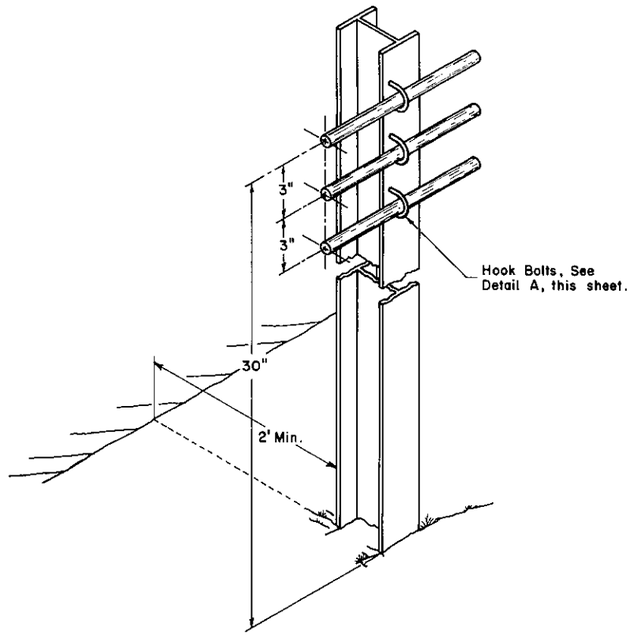


ELEVATION SIDE

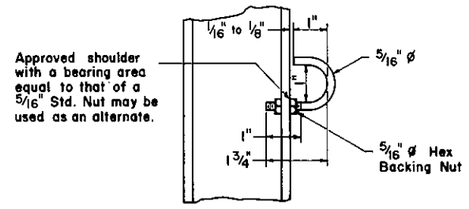
S3 x 5.7

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.



TYPICAL INSTALLATION



DETAIL A
⅝" HOOK BOLT

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

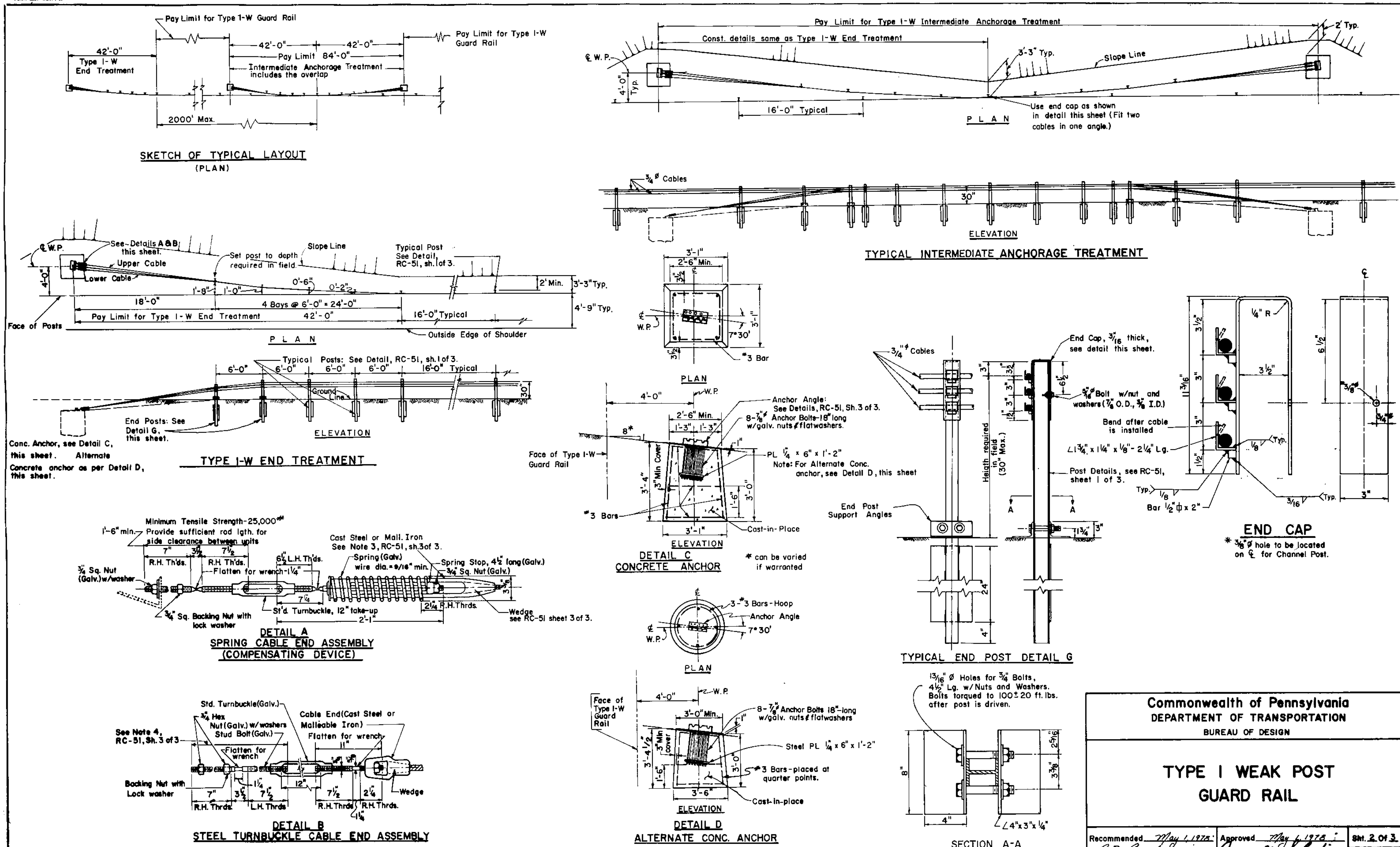
TYPE I WEAK POST GUARD RAIL

Recommended May 1, 1978
R.D. Kunkle
Director, Bureau of Design

Approved May 1, 1978
James M. Sheridan
Deputy Chief Hwy. Engr.

Sht. 1 Of 3

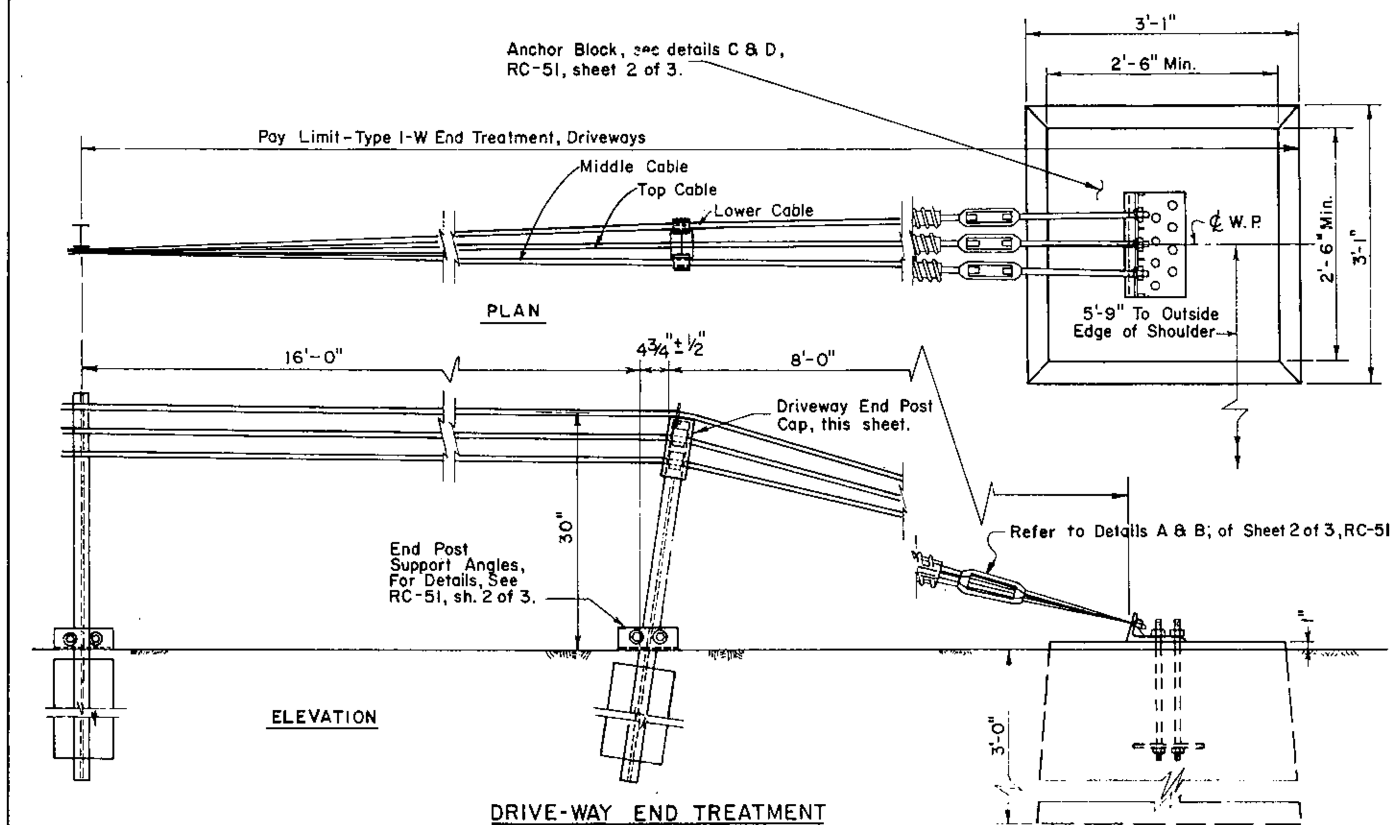
RC-51


SKETCH OF TYPICAL LAYOUT
(PLAN)
Pay Limit for Type 1-W Guard Rail
Pay Limit for Type 1-W Guard Rail
42'-0"
Type 1-W End Treatment
Pay Limit 84'-0"
Intermediate Anchorage Treatment includes the overlap
2000' Max.
Pay Limit for Type 1-W Intermediate Anchorage Treatment
Const. details same as Type 1-W End Treatment
Slope Line
16'-0" Typical
Use end cap as shown in detail this sheet (Fit two cables in one angle.)
PLAN
3/4" Ø Cables
ELEVATION
TYPICAL INTERMEDIATE ANCHORAGE TREATMENT
See Details A & B this sheet.
Upper Cable
Lower Cable
Set post to depth required in field.
Typical Post See Detail RC-51, sh. 1 of 3.
Face of Posts
Pay Limit for Type 1-W End Treatment 42'-0"
4 Bays @ 6'-0" = 24'-0"
16'-0" Typical
Outside Edge of Shoulder
PLAN
Typical Posts: See Detail, RC-51, sh. 1 of 3.
Ground Line
End Posts: See Detail G, this sheet.
Conc. Anchor, see Detail C, this sheet. Alternate Concrete anchor as per Detail D, this sheet.
ELEVATION
TYPE 1-W END TREATMENT
Minimum Tensile Strength-25,000#
Provide sufficient rod lgth. for side clearance between units
3/4" Sq. Nut (Galv.) w/washer
Flatten for wrench
Cast Steel or Mall. Iron See Note 3, RC-51, sh. 3 of 3.
Spring (Galv.) wire dia. = 9/16" min.
Spring Stop, 4 1/2" long (Galv.)
3/4" Sq. Nut (Galv.)
3/4" Sq. Backing Nut with lock washer
St'd. Turnbuckle, 12" take-up
Wedge see RC-51 sheet 3 of 3.
DETAIL A
SPRING CABLE END ASSEMBLY
(COMPENSATING DEVICE)
Std. Turnbuckle (Galv.)
See Note 4, RC-51, Sh. 3 of 3
3/4" Hex Nut (Galv.) w/washers
Stud Bolt (Galv.)
Cable End (Cast Steel or Malleable Iron)
Flatten for wrench
Backing Nut with Lock washer
Wedge
DETAIL B
STEEL TURNBUCKLE CABLE END ASSEMBLY
PLAN
#3 Bar
Anchor Angle: See Details, RC-51, Sh. 3 of 3.
8-7/8" Ø Anchor Bolts-18" long w/galv. nuts & flatwashers.
Face of Type 1-W Guard Rail
PL 1/4 x 6" x 1'-2"
Note: For Alternate Conc. anchor, see Detail D, this sheet
#3 Bars
Cast-in-Place
* can be varied if warranted
ELEVATION
DETAIL C
CONCRETE ANCHOR
3-#3 Bars-Hoop
Anchor Angle
PLAN
8-7/8" Anchor Bolts 18"-long w/galv. nuts & flatwashers
Steel PL 1/4 x 6" x 1'-2"
#3 Bars-placed at quarter points.
Cast-in-place
ELEVATION
DETAIL D
ALTERNATE CONC. ANCHOR
3/4" Ø Cables
End Cap, 3/16 thick, see detail this sheet.
5/8" Ø Bolt w/nut and washers (7/8 O.D., 5/8 I.D.)
Bend after cable is installed
Post Details, see RC-51, sheet 1 of 3.
End Post Support Angles
Heigth required in field (30" Max.)
TYPICAL END POST DETAIL G
END CAP
* 3/8" Ø hole to be located on ℄ for Channel Post.
13/16" Ø Holes for 3/4" Bolts, 4 1/2" Lg. w/Nuts and Washers. Bolts torqued to 100 ± 20 ft. lbs. after post is driven.
SECTION A-A

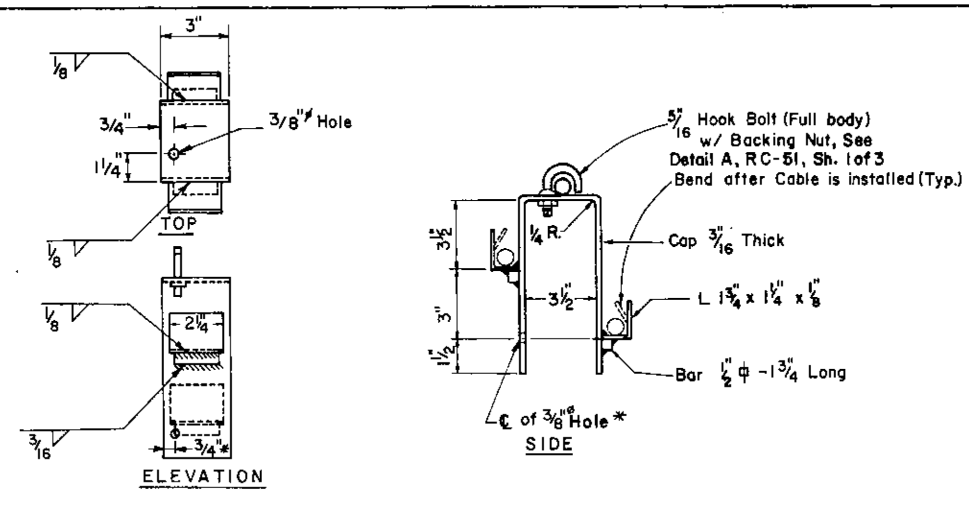
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

TYPE I WEAK POST GUARD RAIL

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

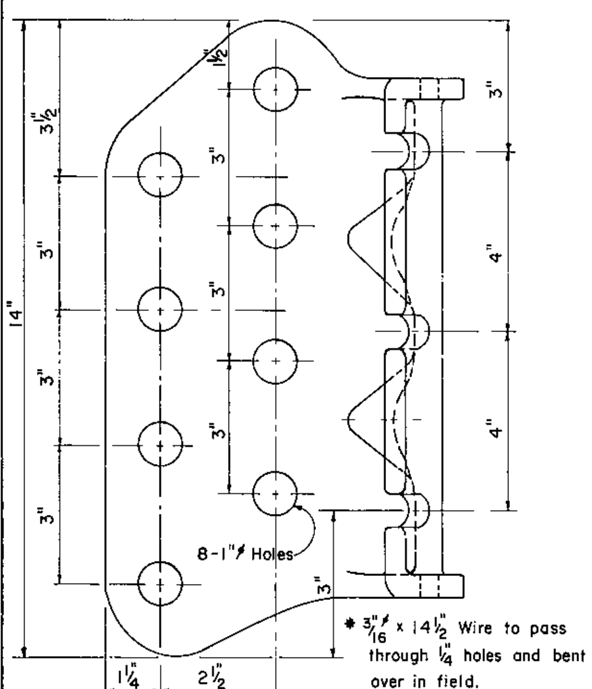


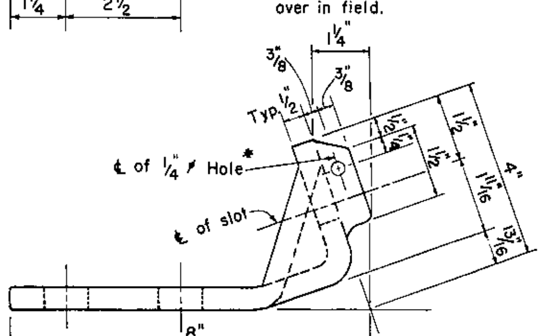
DRIVE-WAY END TREATMENT

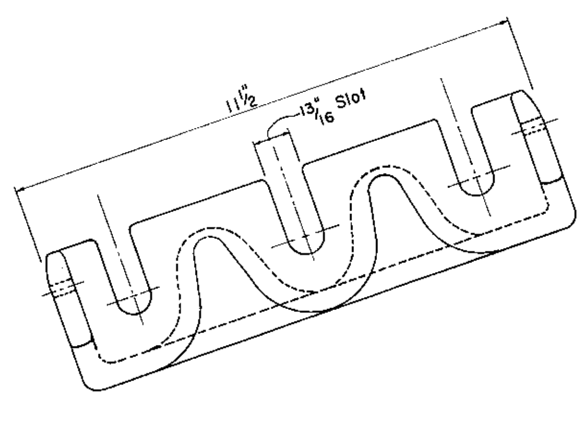


DRIVEWAY END POST CAP

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



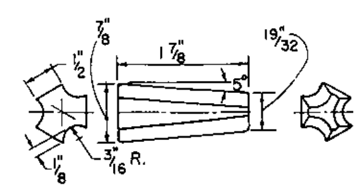




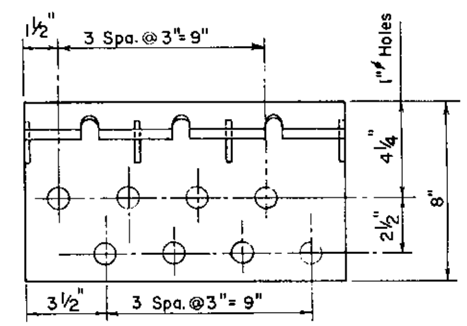
ALTERNATE CABLE ANCHOR ANGLE CASTING

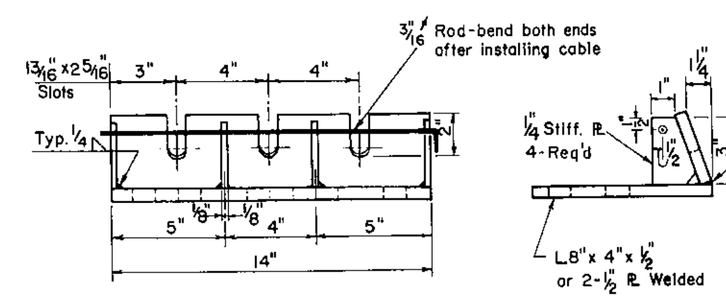
(Malleable Iron)

See Note 9.



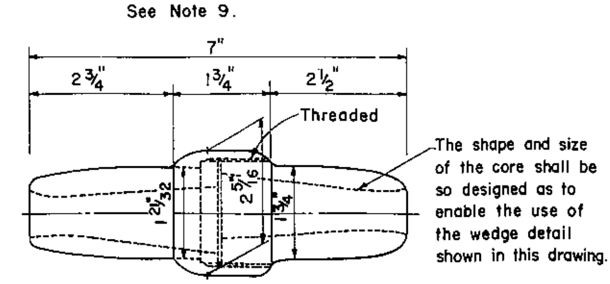
WEDGE DETAIL





CABLE ANCHOR ANGLE

See Note 9.



CABLE SPLICE

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.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

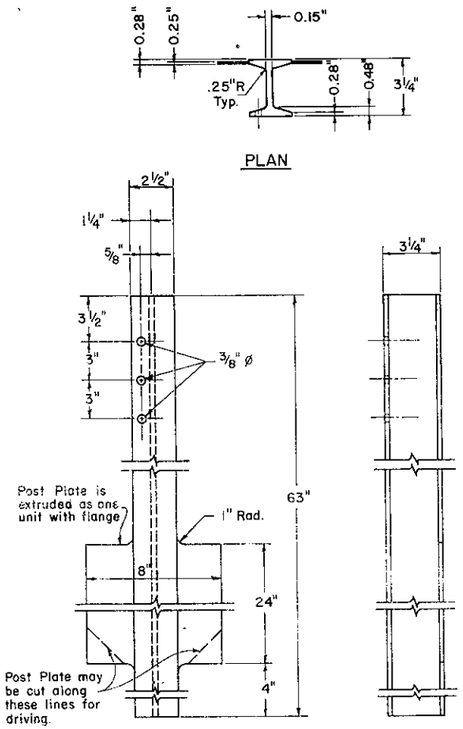
TYPE I WEAK POST GUARD RAIL

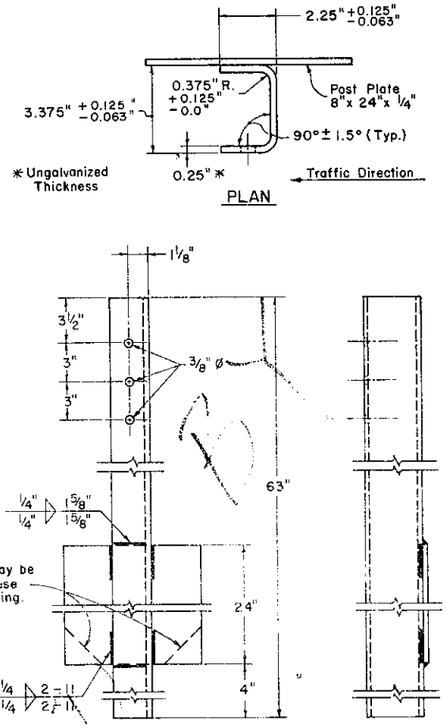
Recommended May 1, 1978 B.D. Rosuske
Director, Bureau of Design

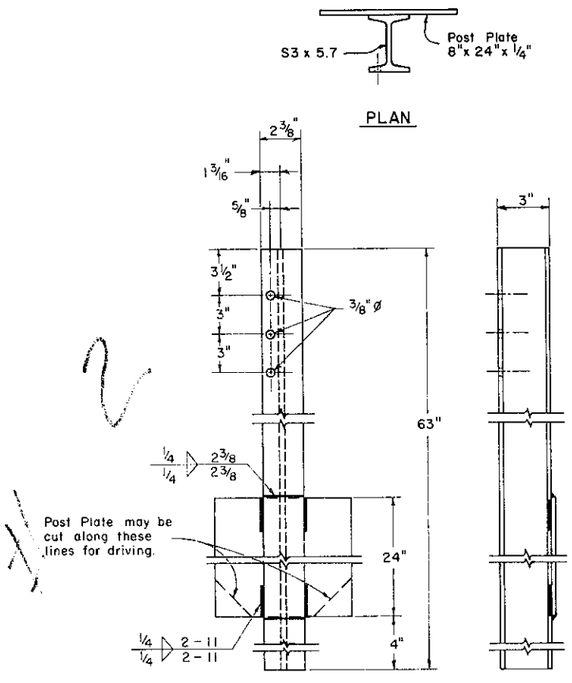
Approved May 1, 1978 [signature]
Deputy Chief Hwy. Engr.

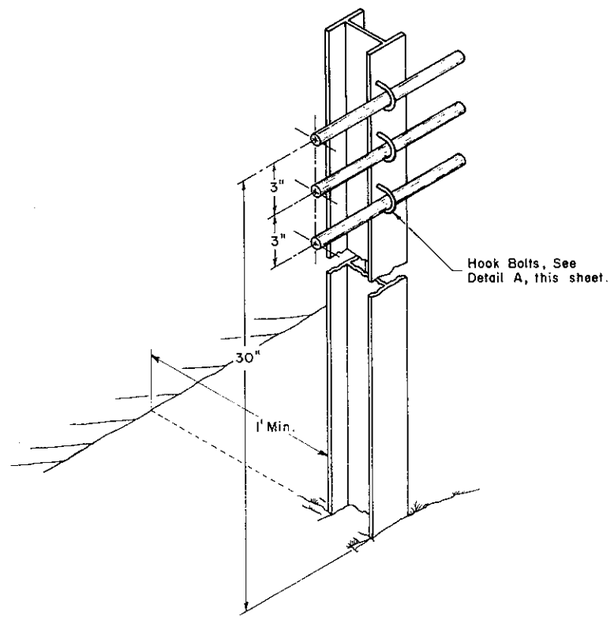
Sht. 3 of 3

RC-51







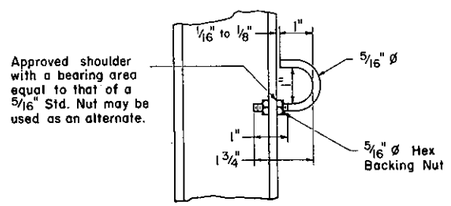


TYPICAL INSTALLATION

TYPE I-W GUARD RAIL POSTS

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.



DETAIL A
5/16" HOOK BOLT

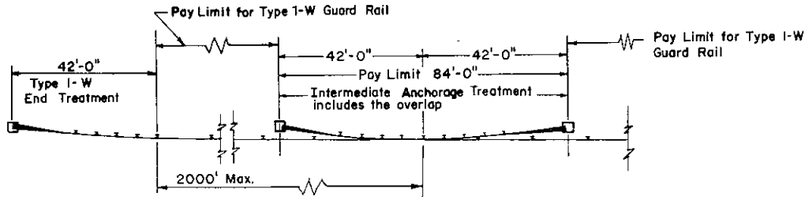
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

TYPE I WEAK POST GUARD RAIL

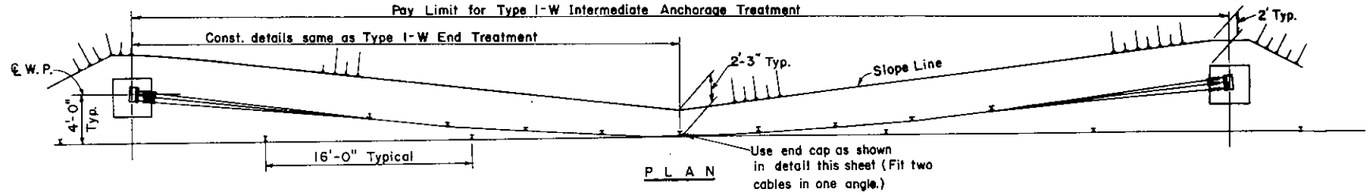
Recommended June 1, 1976	Approved June 1, 1976	Sht. 1 Of 3
B.D. Rowalie	Robert L. Moon	RC-51
Director, Bureau of Design	Deputy Chief Hwy. Engr.	

TRACED BY
FINAL BY

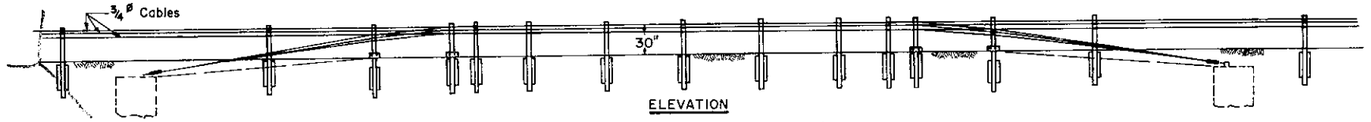
FORM 4237 REV. 7-66



SKETCH OF TYPICAL LAYOUT
(PLAN)

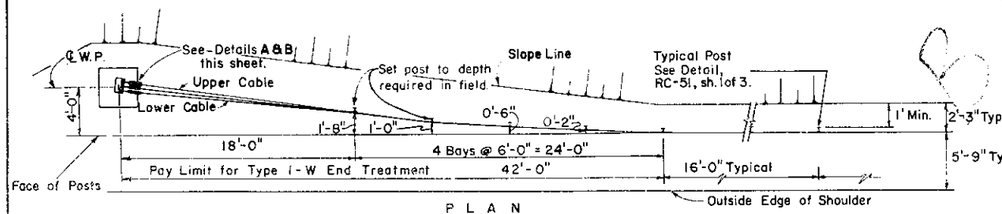


PLAN

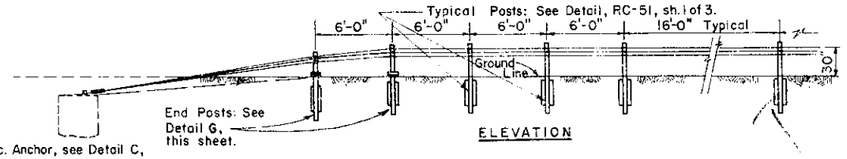


ELEVATION

TYPICAL INTERMEDIATE ANCHORAGE TREATMENT



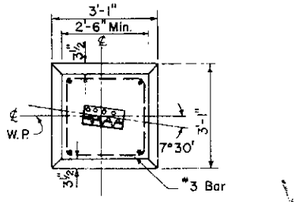
PLAN



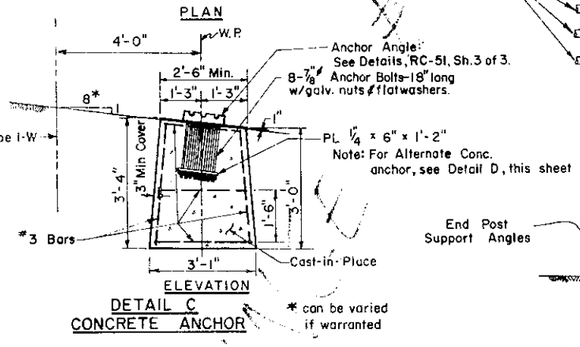
ELEVATION

Conc. Anchor, see Detail C, this sheet. Alternate
Concrete anchor as per Detail D, this sheet.

TYPE 1-W END TREATMENT



PLAN

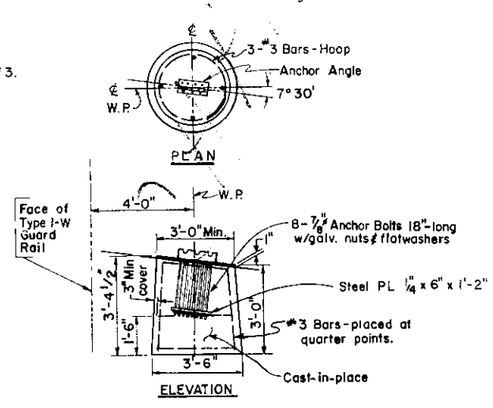


ELEVATION

DETAIL C
CONCRETE ANCHOR

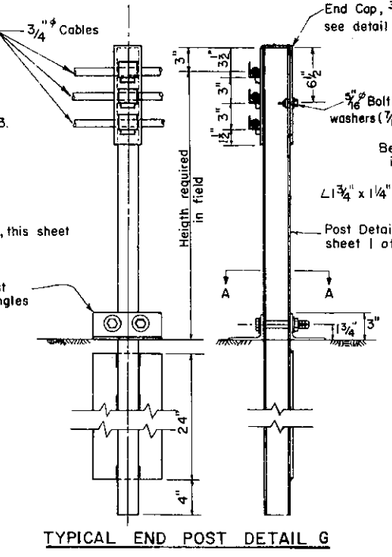
* can be varied if warranted

PLAN

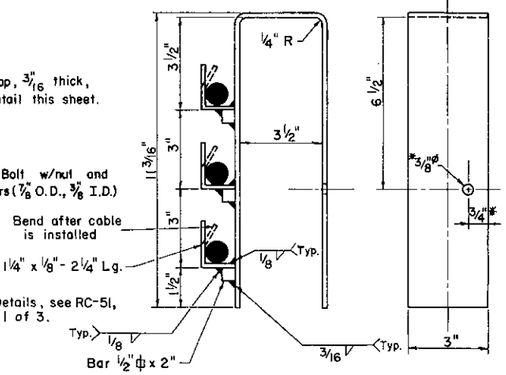


ELEVATION

DETAIL D
ALTERNATE CONC. ANCHOR

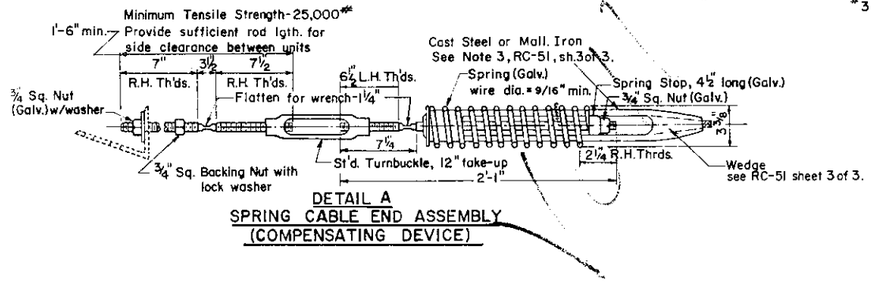


TYPICAL END POST DETAIL G

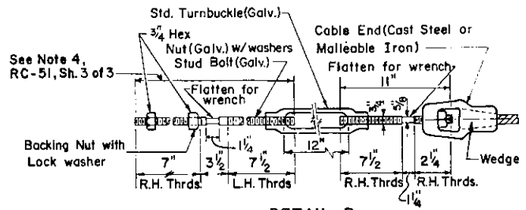


END CAP

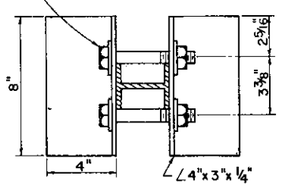
* 3/8" ϕ hole to be located on ℄ for Channel Post.



DETAIL A
SPRING CABLE END ASSEMBLY
(COMPENSATING DEVICE)



DETAIL B
STEEL TURNBUCKLE CABLE END ASSEMBLY



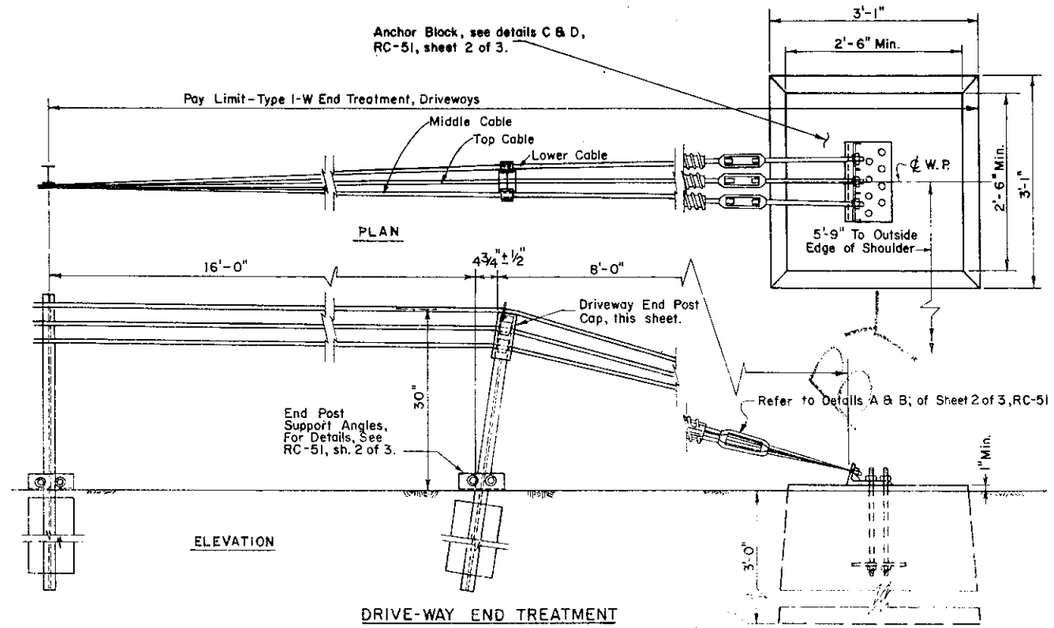
SECTION A-A

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

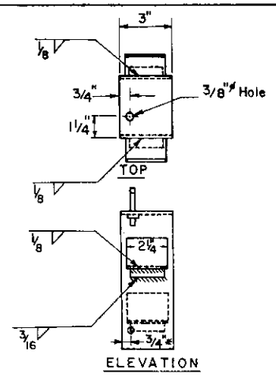
TYPE 1 WEAK POST GUARD RAIL

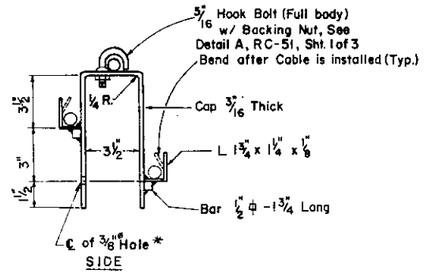
Recommended June 1, 1976	Approved June 1, 1976	Sht. 2 Of 3
B.O. Rossiter	Robert P. Moore	RC-51
Director, Bureau of Design	Deputy Chief Hwy. Engr.	

FORM 4297 REV. 7-88



DRIVE-WAY END TREATMENT





DRIVEWAY END POST CAP

* For Channel Post, 3/8"ø 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.

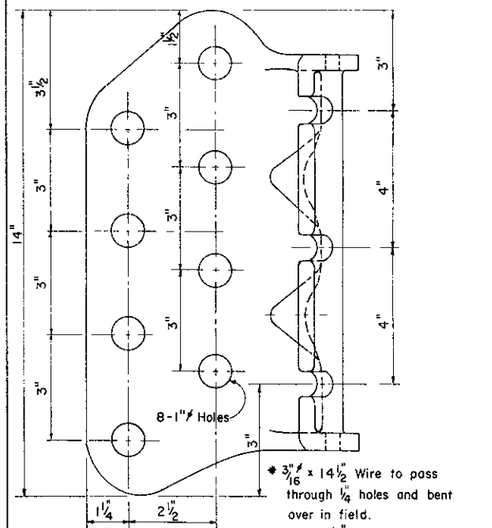
6. At all locations where the cable is connected to a cable socket with a wedge type connection, one wire of the wire rope shall be crimped over the base of the wedge to hold it firmly in place.

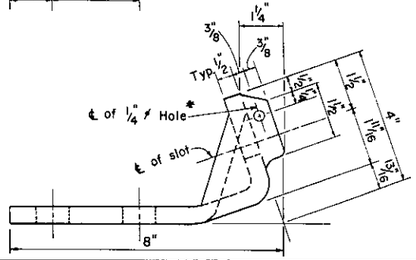
7. Compensating devices must have a spring rate of 450± 50 lbs. per inch and a total available "throw" of 6" min.

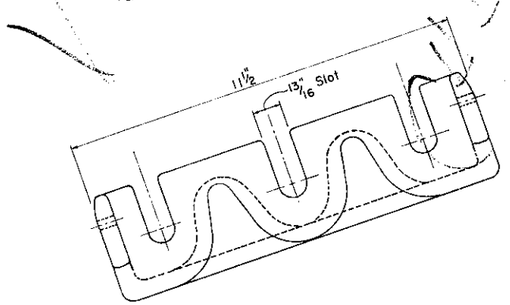
8. The cable tension shall be controlled by the following table:

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"	1½"	2"	2½"	3"	3½"	4"

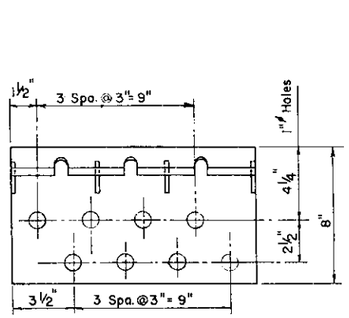
9. Alternate designs may be submitted for approval.
10. Installation of delineator assemblies shall be done under a separate pay item or contract. See Traffic Standard TC-7709, sheet 3 of 4.
11. Guard Rail over underground structures shall be constructed as shown on RC-53, sheet 1 of 2.

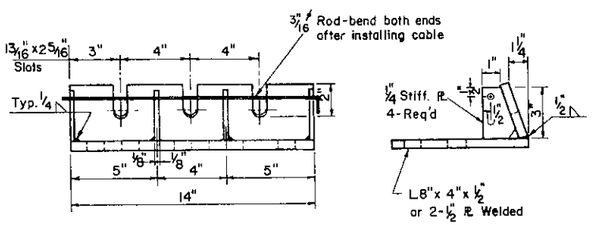




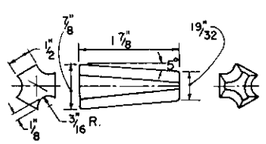


ALTERNATE CABLE ANCHOR ANGLE CASTING
(Malleable Iron)
See Note 9.

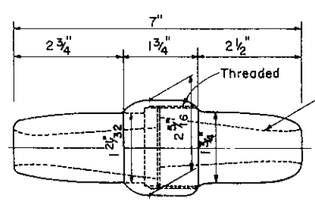




CABLE ANCHOR ANGLE
See Note 9.



WEDGE DETAIL



The shape and size of the core shall be so designed as to enable the use of the wedge detail shown in this drawing.

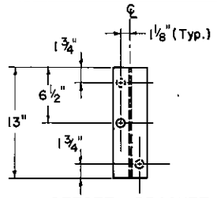
CABLE SPLICE

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

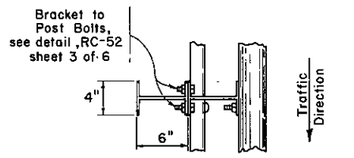
TYPE 1 WEAK POST GUARD RAIL

Recommended June 1, 1976	Approved June 1, 1976	Sht. 3 of 3
A.D. Rourke	Robert R. Mason	RC-51
Director, Bureau of Design	Deputy Chief Hwy. Engr.	

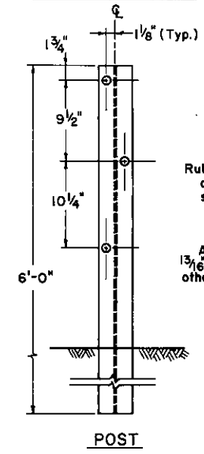
fix up these drawings they are labeled incorrectly



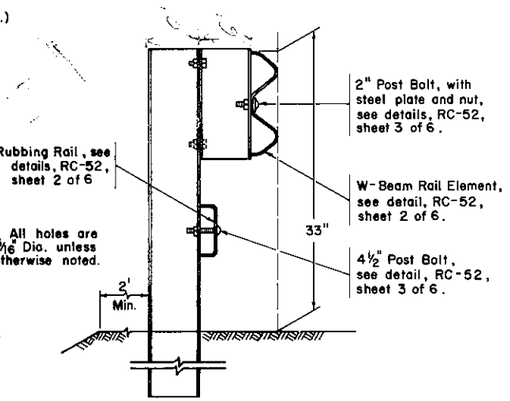
OFFSET BRACKET



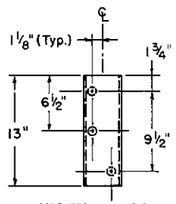
POST & OFFSET BRACKET



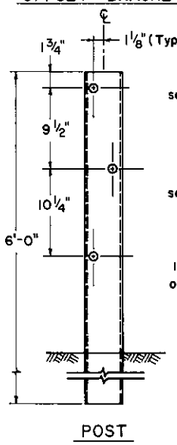
POST



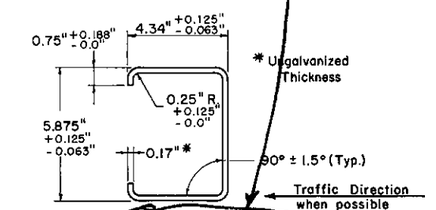
W6 x 9 POST DETAILS



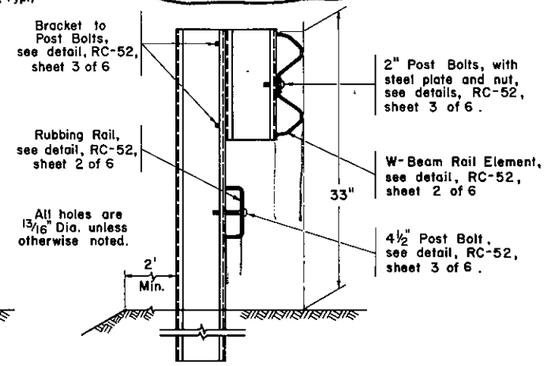
OFFSET BRACKET



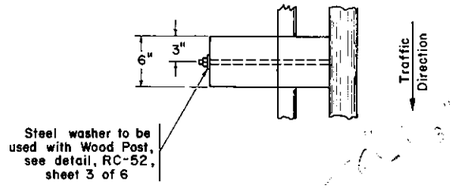
POST

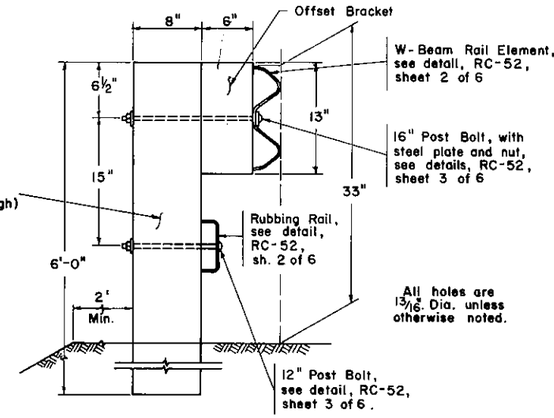


TYPICAL SECTION POST & OFFSET BRACKET



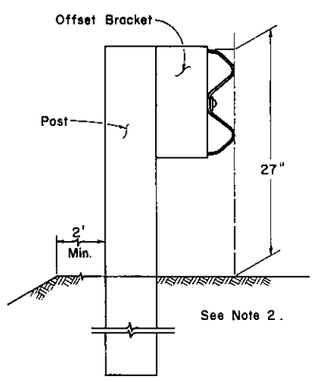
5⅞" COLD FORMED C-POST DETAILS



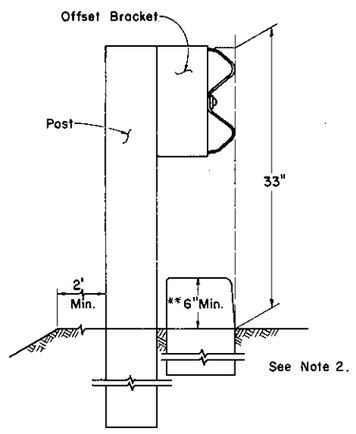


8"x 6" WOOD POST DETAILS

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

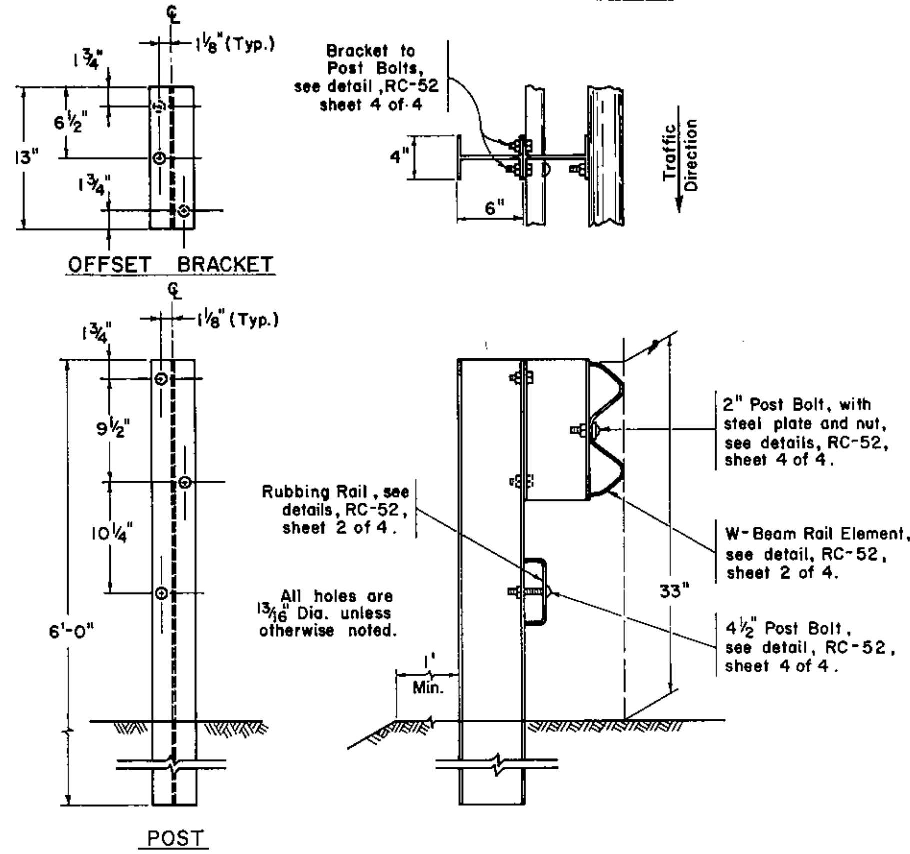
Recommended Sept. 1, 1978
B.D. Rowatt
Director, Bureau of Design

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

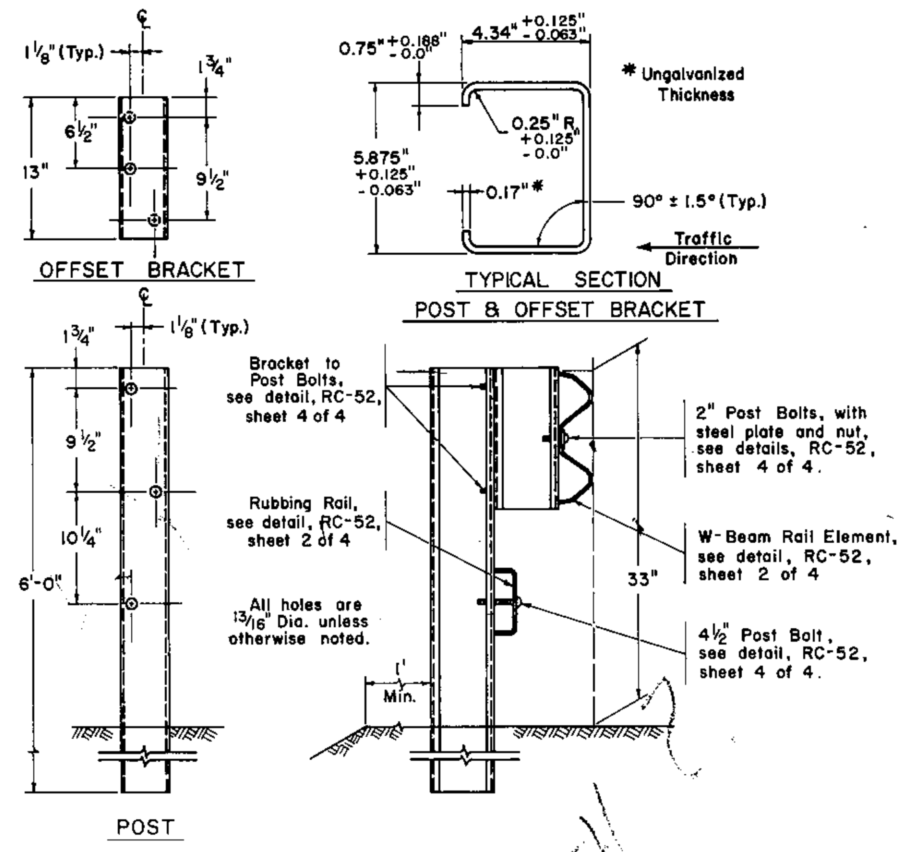
Sht. 1 Of 6

RC-52

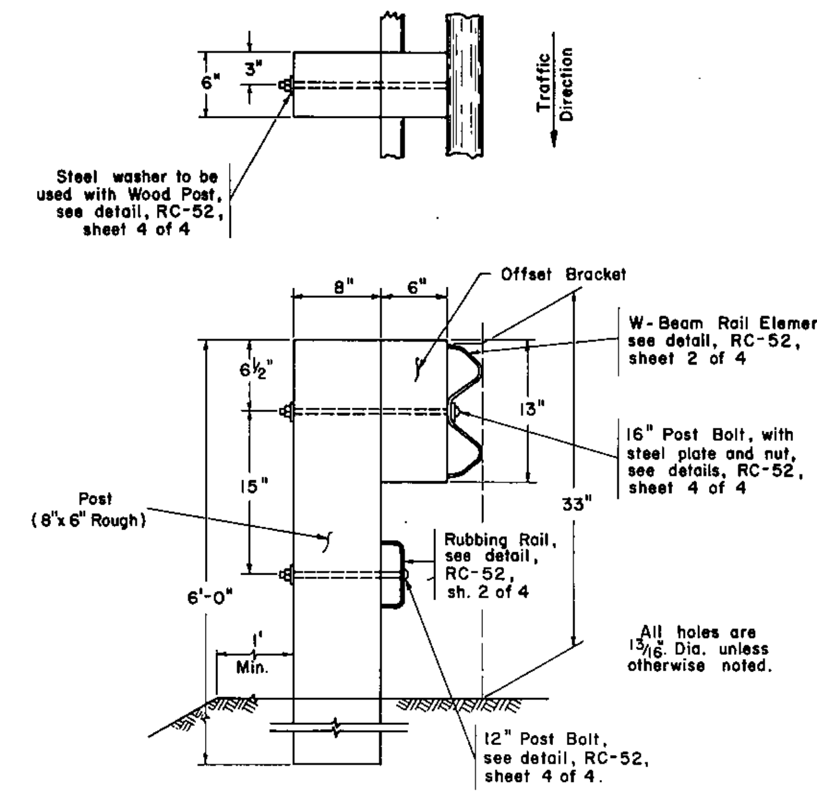
TRACED BY
FINAL BY



W6 x 8.5 POST DETAILS



5⅞" COLD FORMED C-POST DETAILS



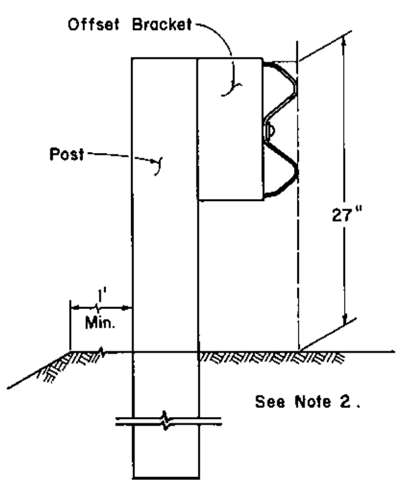
8"x 6" WOOD POST DETAILS

TYPE 2-S & 2-SC GUARD RAIL

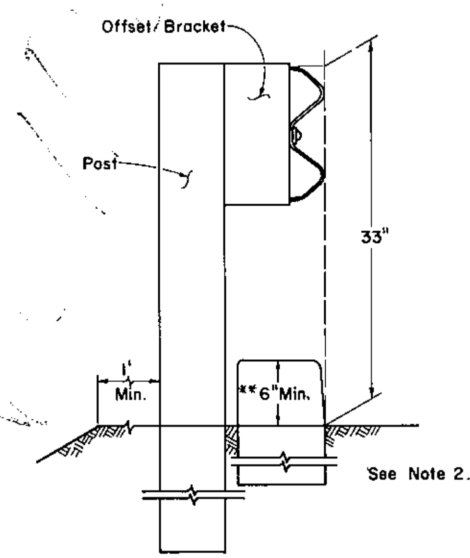
NOTES

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 8.5 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"



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



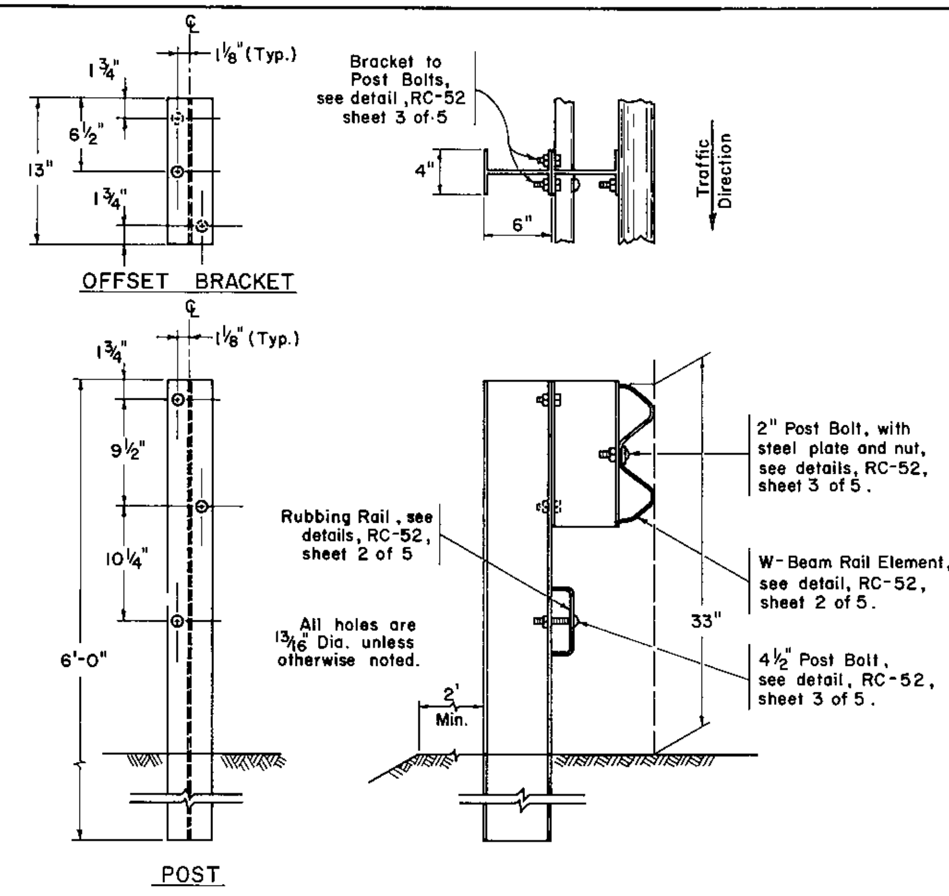
TYPE 2-S MODIFIED & 2-SC MODIFIED GUARD RAIL

** 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.

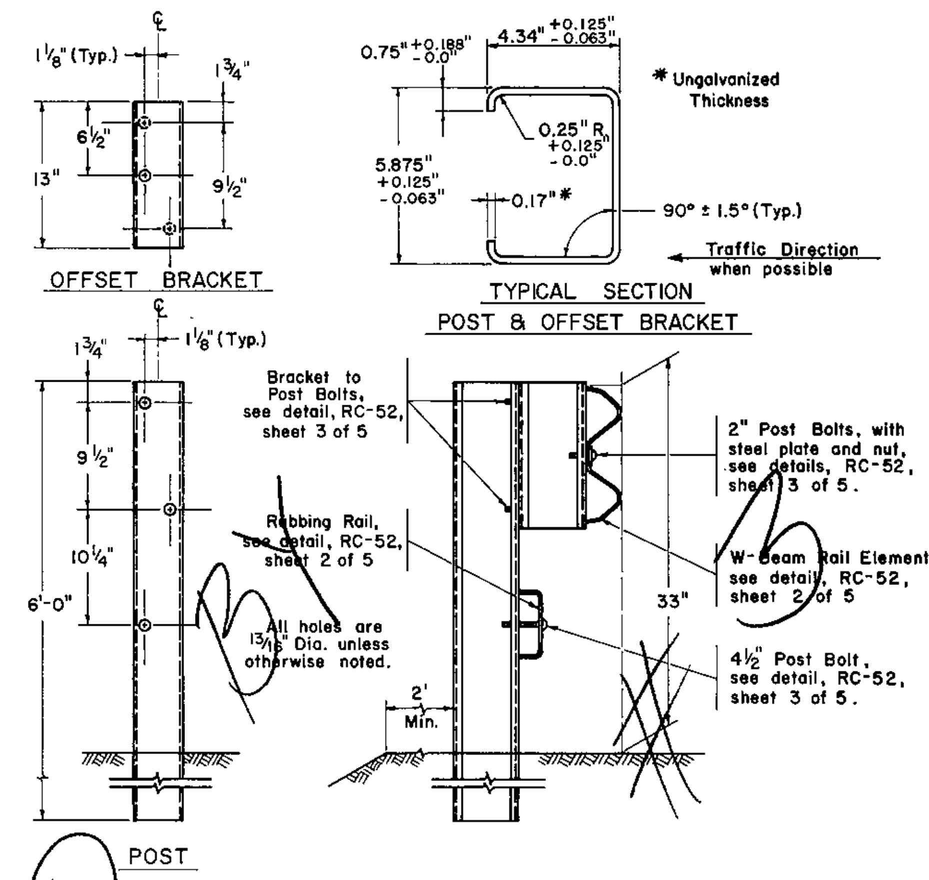
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

TYPE 2 STRONG POST GUARD RAIL

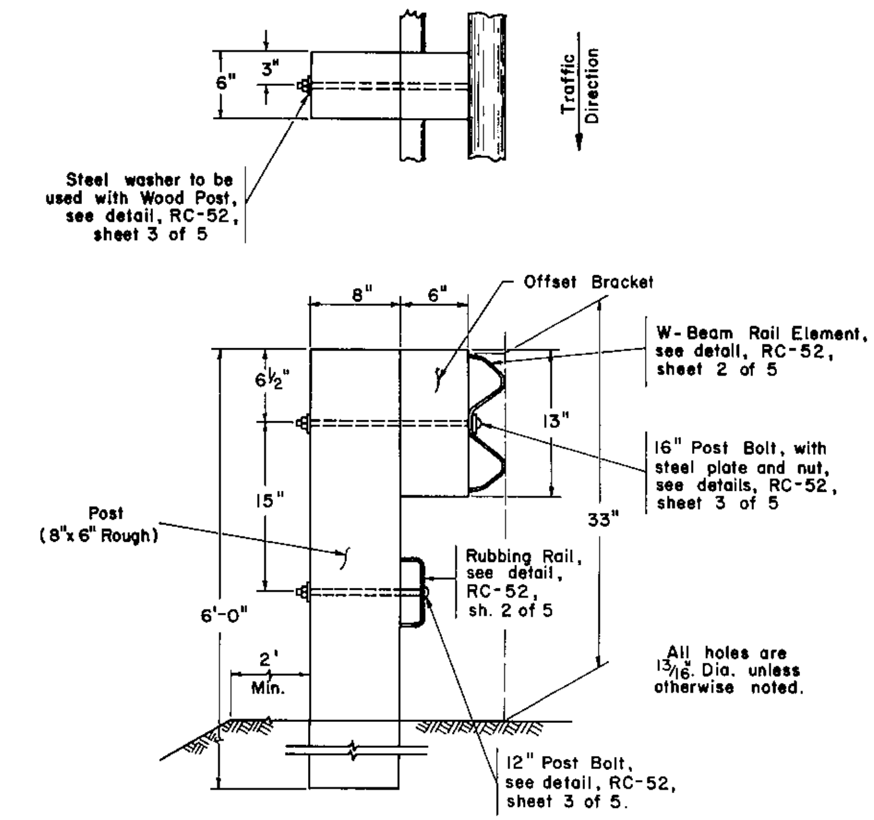
Recommended June 1, 1976	Approved June 1, 1976	Sht. 1 of 4
Director, Bureau of Design	Deputy Chief Hwy. Engr.	RC-52



W6 x 9 POST DETAILS



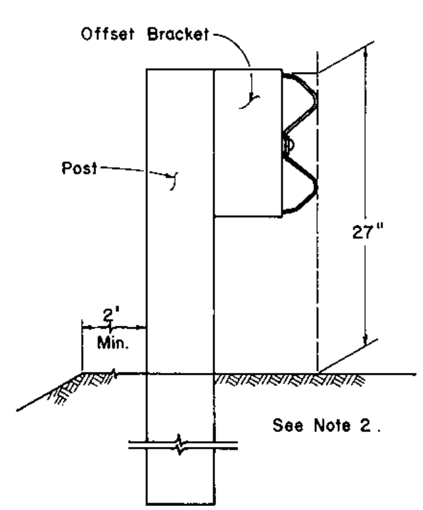
5⅞" COLD FORMED C-POST DETAILS



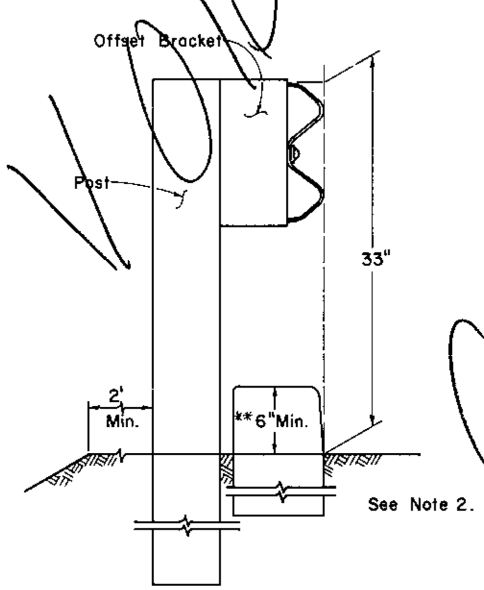
8"x 6" WOOD POST DETAILS

TYPE 2-S & 2-SC GUARD RAIL

VOIDED BY CHANGE



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.

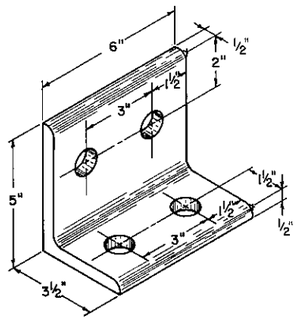
TYPE	POST SPACING
2-S	6'-3"
2-SC	3'-1½"
2-S Special	6'-3"
2-SC Special	3'-1½"
2-S Modified	6'-3"
2-SC Modified	3'-1½"

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

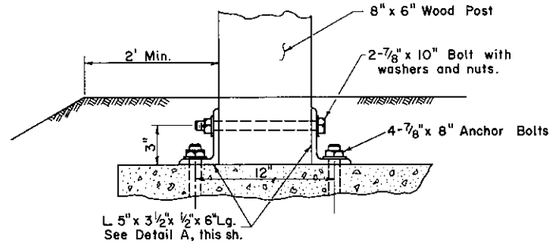
TYPE 2 STRONG POST GUARD RAIL

Recommended May 1, 1978	Approved May 1, 1978	Sht. 1 of 5
B.D. Rauschi, Director, Bureau of Design	James M. [illegible], Deputy Chief Hwy. Engr.	RC-52



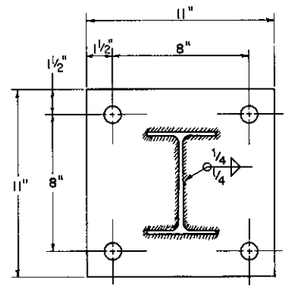
DETAIL A

All holes to be 1" diameter.



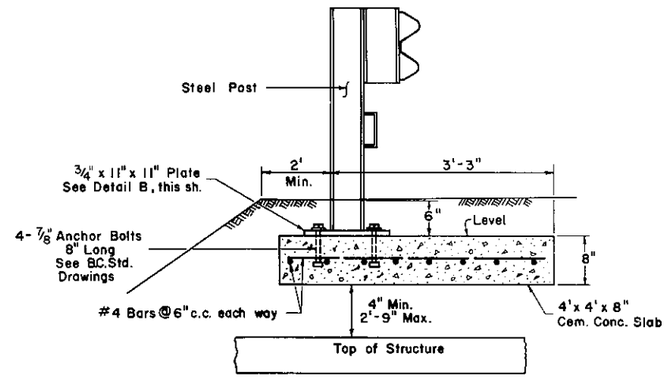
WOOD POSTS OVER UNDERGROUND STRUCTURES

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.



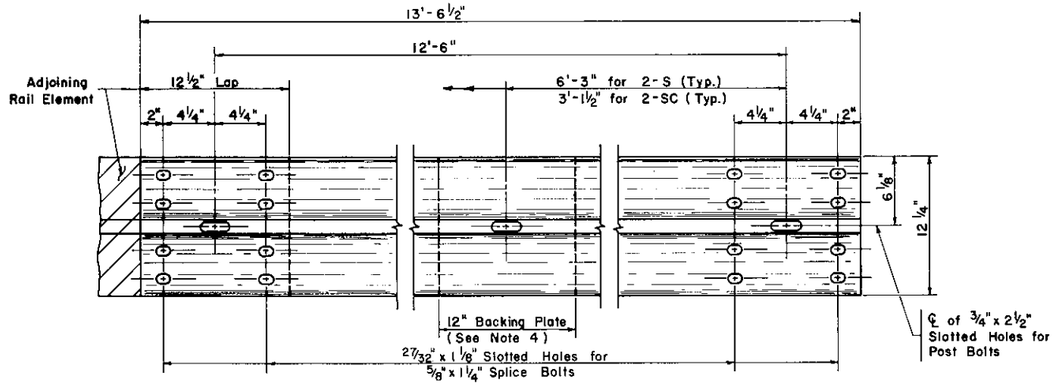
DETAIL B

Thickness is ¾"
All holes 1" Ø unless otherwise noted.
Use same base plate details for 5 ⅞" Cold Formed C-Post and W6 x 9 Post.

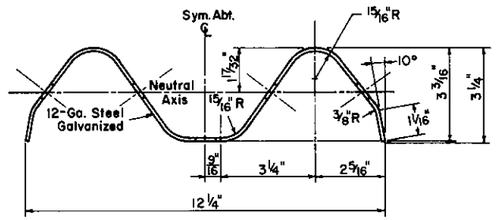


STEEL POSTS OVER UNDERGROUND STRUCTURES

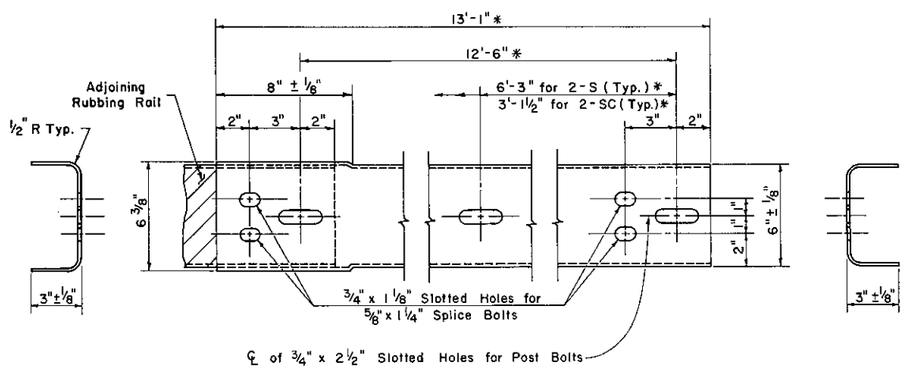
See Note 1, this sheet.



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

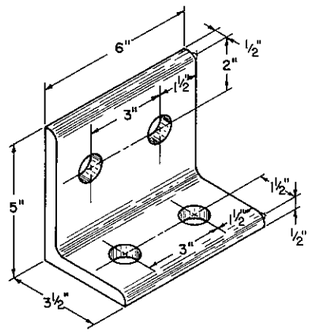
1. No separate payment will be made for installation of guard rail over underground structures. Concrete, reinforcement bars, and hardware shall be considered incidental to the guard rail pay item.
2. For rubbing rails installed on small radii, dimensions noted for hole spacing should be adjusted to 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

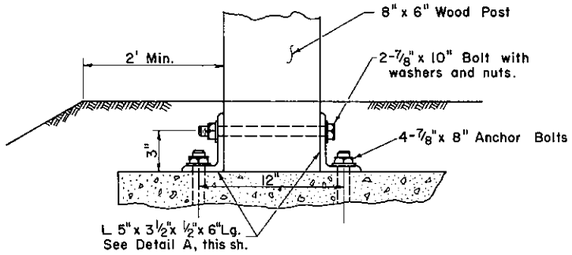
Recommended Sept 1, 1978	Approved Sept 1, 1978	Sht. 2 Of 6
B.D. Rourke	James M. Sebastian	RC-52
Director, Bureau of Design	Deputy Chief Hwy. Engr.	

TRACED BY
FINAL BY



DETAIL A

All holes to be 1" diameter.

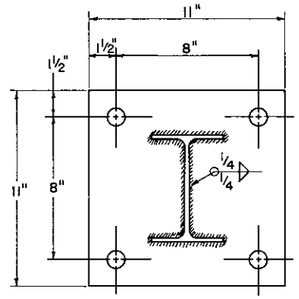


WOOD POSTS OVER UNDERGROUND STRUCTURES

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.

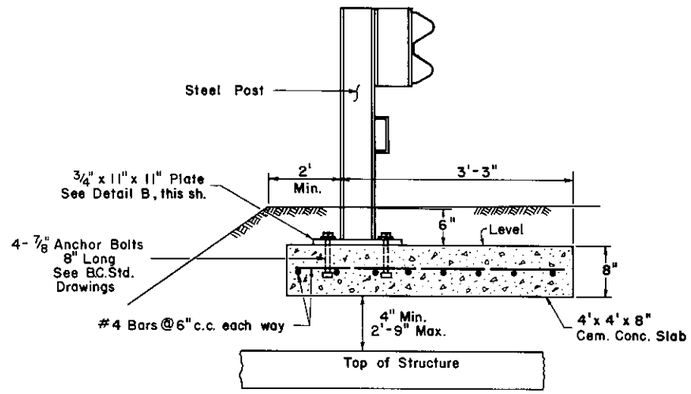


DETAIL B

Thickness is ¾"

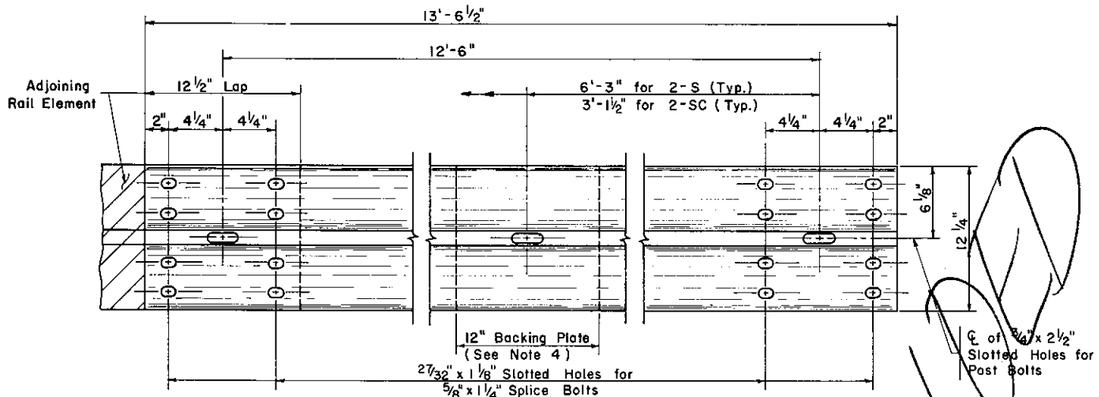
All holes 1" Ø unless otherwise noted.

Use same base plate details for 5 ⅞" Cold Formed C-Post and W6 x 9 Post.

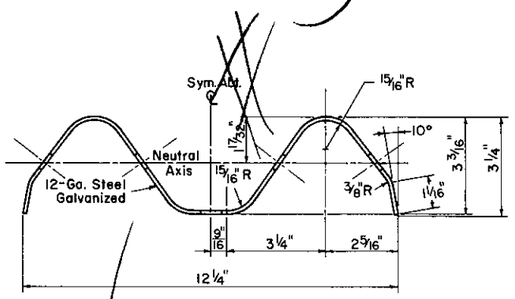


STEEL POSTS OVER UNDERGROUND STRUCTURES

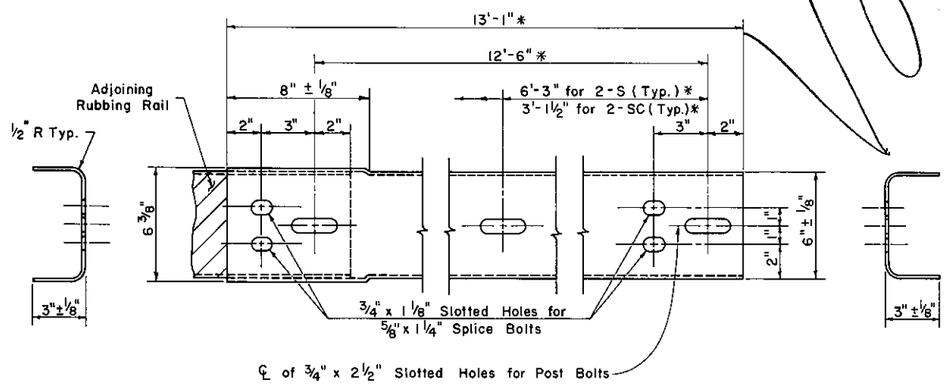
See Note 1, this sheet.



W-BEAM RAIL ELEMENT



SECTION THRU W-BEAM RAIL ELEMENT



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

* See Note 2

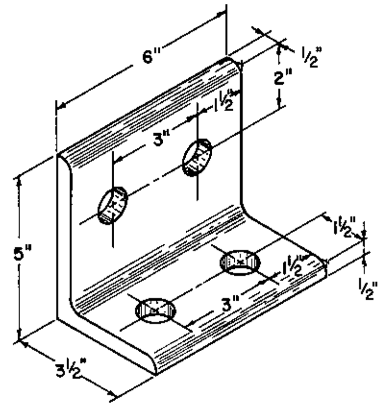
NOTES

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

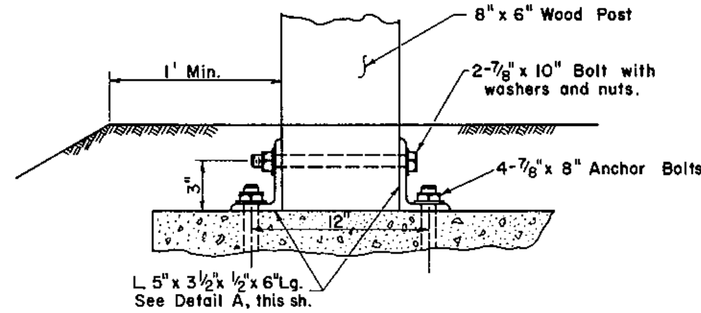
TYPE 2 STRONG POST GUARD RAIL

Recommended May 1, 1978	Approved May 1, 1978	Sht. 2 Of 5
B D Rountree	James M. Johnson	RC-52
Director, Bureau of Design	Deputy Chief Hwy. Engr.	



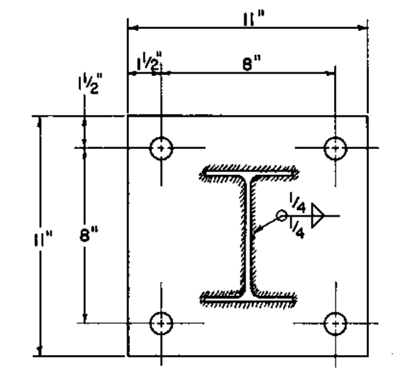
DETAIL A

All holes to be 1" diameter.



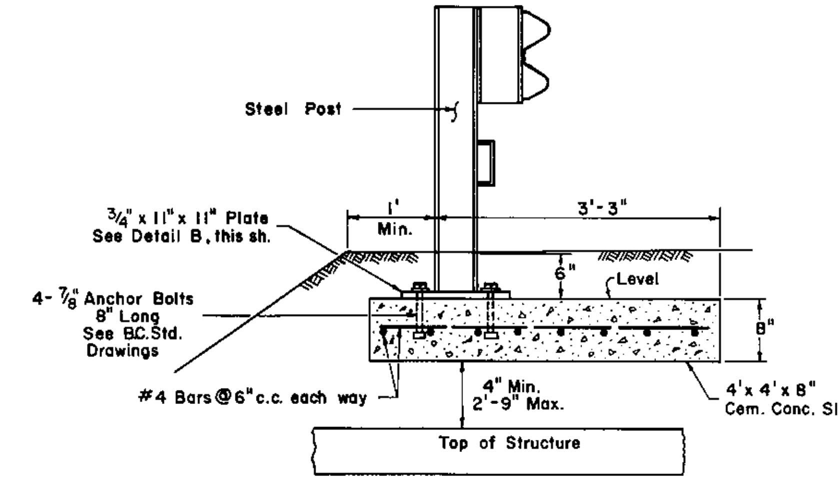
WOOD POSTS OVER UNDERGROUND STRUCTURES

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.



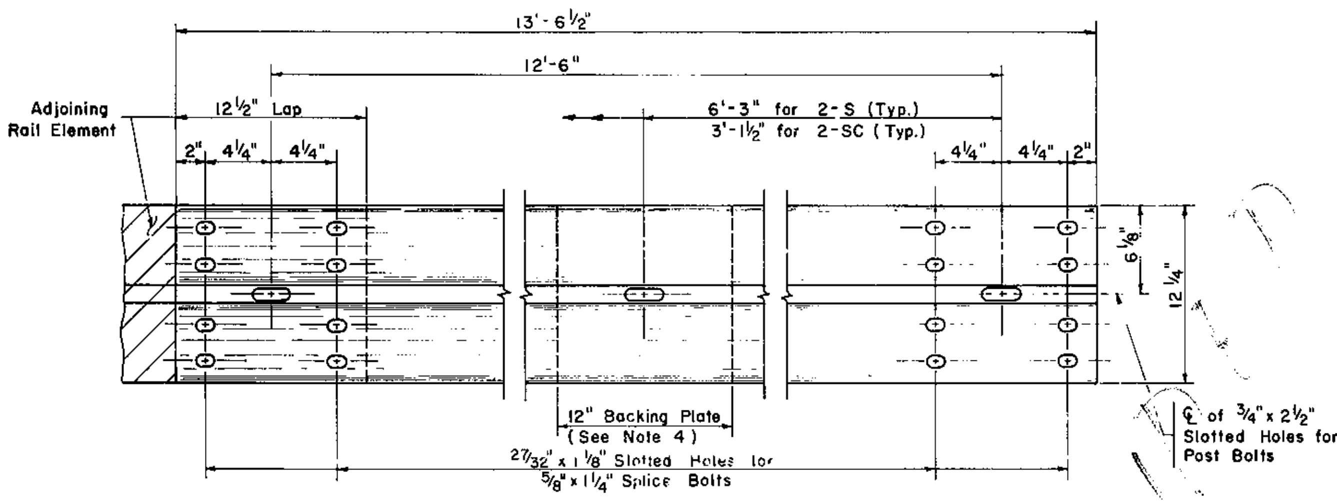
DETAIL B

Thickness is 3/4"
All holes 1" Ø unless otherwise noted.
Use same base plate details for 5 7/8" Cold Formed C-Post and W6 x 8.5 Post.

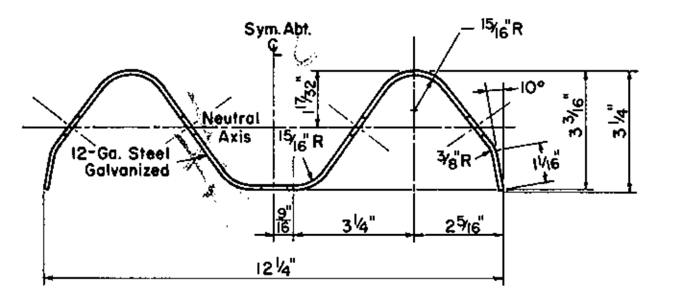


STEEL POSTS OVER UNDERGROUND STRUCTURES

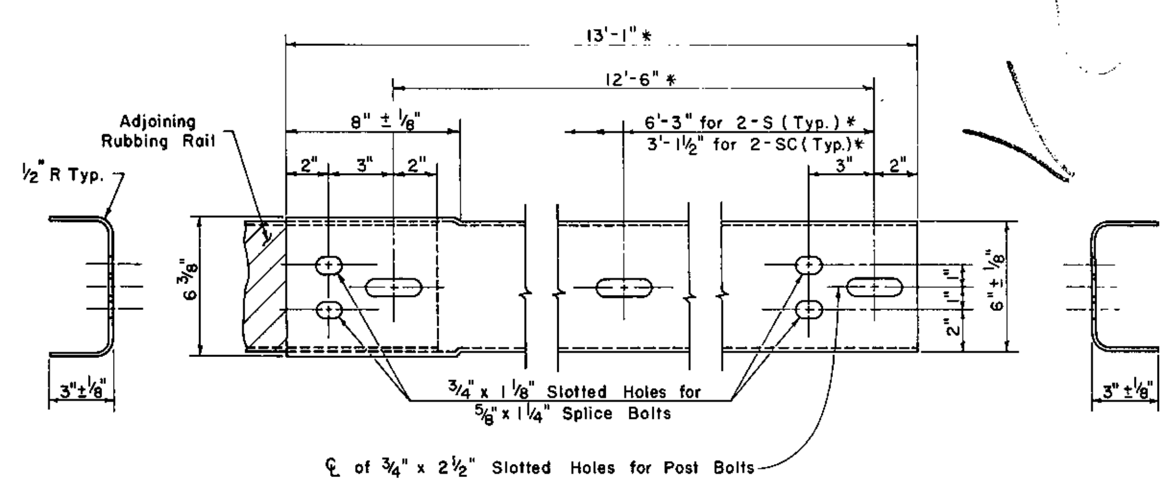
See Note 1, this sheet.



W-BEAM RAIL ELEMENT



SECTION THRU W-BEAM RAIL ELEMENT



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

* See Note 2

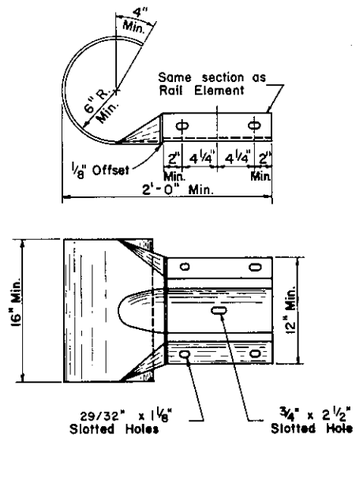
NOTES

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.

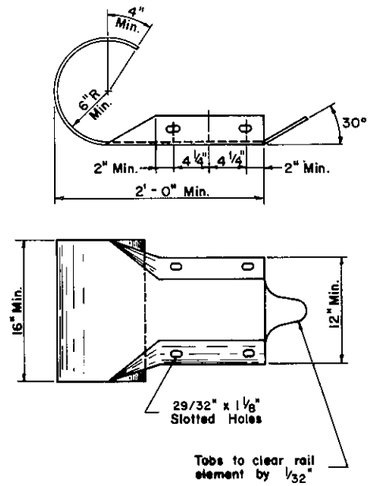
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

TYPE 2 STRONG POST GUARD RAIL

Recommended June 1, 1976	Approved June 1, 1976	Sht. 2 Of 4
B.D. Rowski — Director, Bureau of Design	Deputy Chief Hwy. Engr.	RC-52

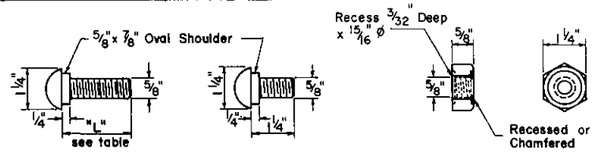


TERMINAL TO BE PLACED ON BACK OF RAIL ELEMENT



TERMINAL TO BE PLACED ON FACE OF RAIL ELEMENT

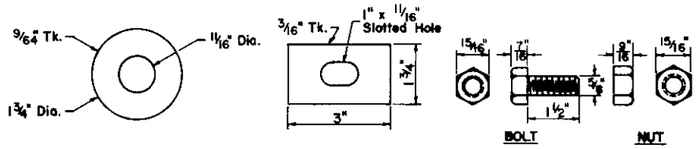
ALTERNATE TERMINAL SECTIONS (SINGLE)



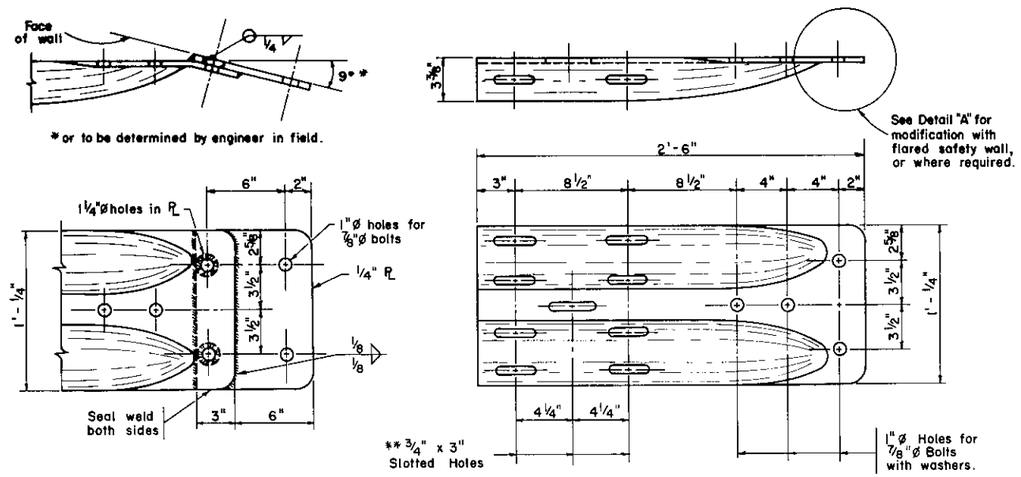
POST BOLT SPLICE BOLT NUT

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.

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

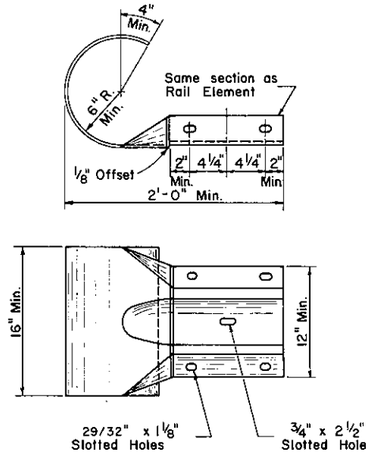
TYPE 2 STRONG POST GUARD RAIL

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

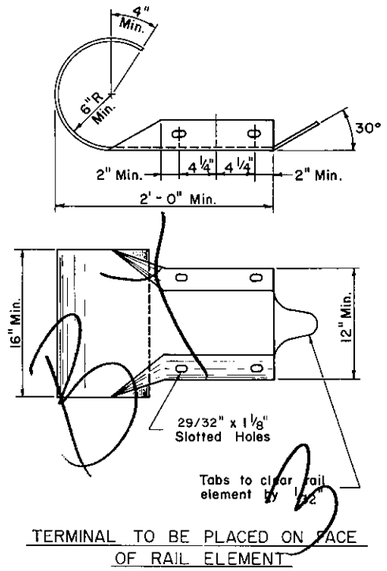
Approved Sept 5, 1978
James M. Sebastian
Deputy Chief Hwy. Engr.

Sht. 3 Of 6
RC-52

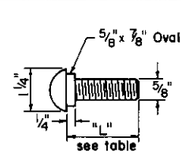
TRACED BY
FINAL BY



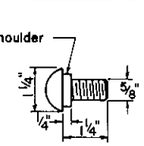
TERMINAL TO BE PLACED ON BACK OF RAIL ELEMENT



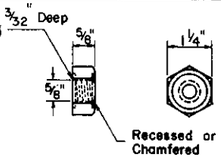
TERMINAL TO BE PLACED ON FACE OF RAIL ELEMENT



POST BOLT



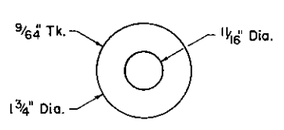
SPLICE BOLT



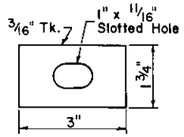
NUT

TABLE OF POST BOLT LENGTHS - L

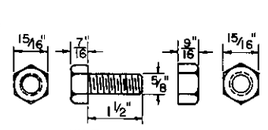
Post	Rubbing Rail	W-Beam
W6 x 9 & 5 7/8" C Post	4 1/2" Post Bolt	2" Post Bolt
Wood Post	12" Post Bolt	16" Post Bolt



STEEL WASHER

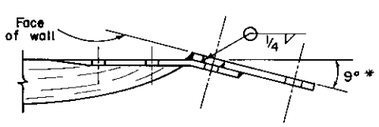


STEEL PLATE

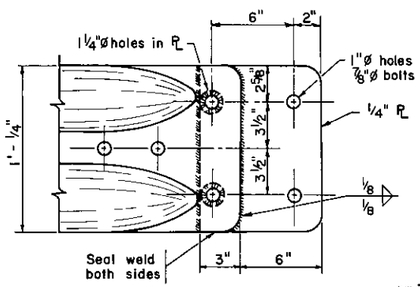


BRACKET TO POST

ALTERNATE TERMINAL SECTIONS (SINGLE)

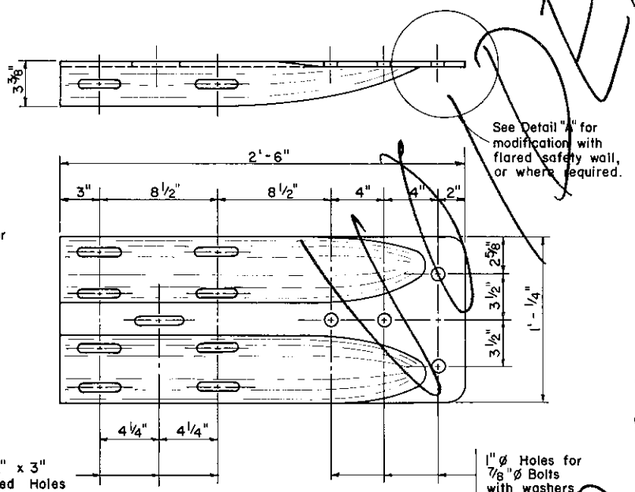


*or to be determined by engineer in field.



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.

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.

CHANGE

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

TYPE 2 STRONG POST GUARD RAIL

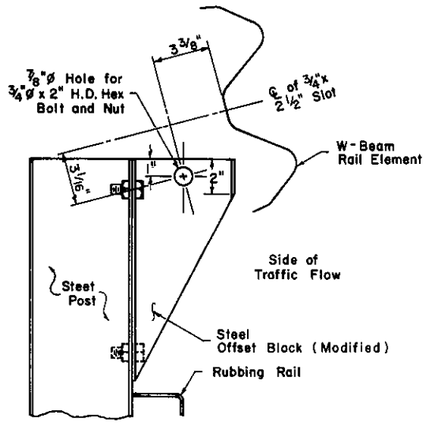
Recommended May 4, 1978
B.D. Rosado
Director, Bureau of Design

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

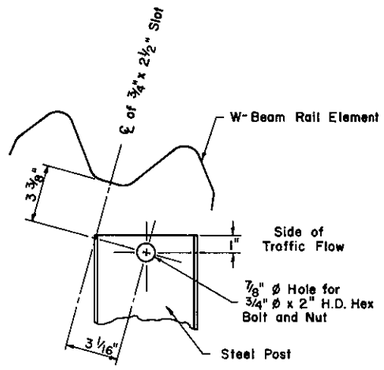
Sht. 3 Of 5

RC-52

TRACED BY
FINAL BY

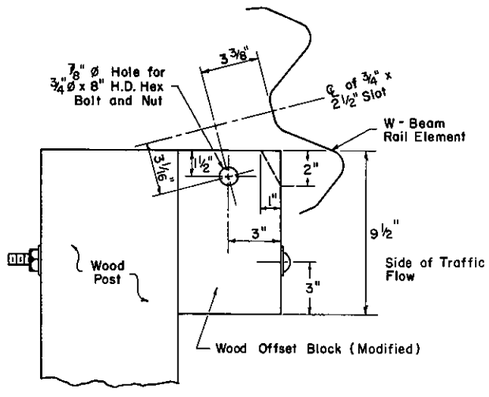


15° POSITION

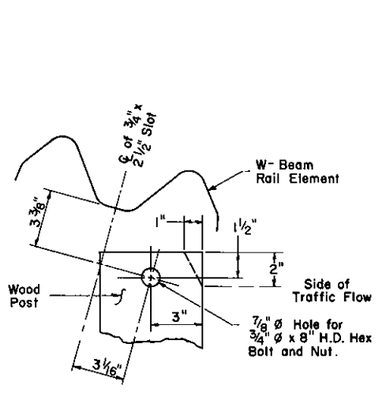


TYPICAL FOR
30° THRU 75° POSITIONS

STEEL POSTS



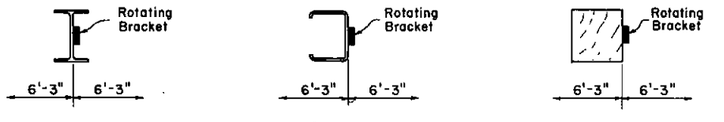
15° POSITION



TYPICAL FOR
30° THRU 75° POSITIONS

WOOD POSTS

ROTATING BRACKET REQUIREMENTS

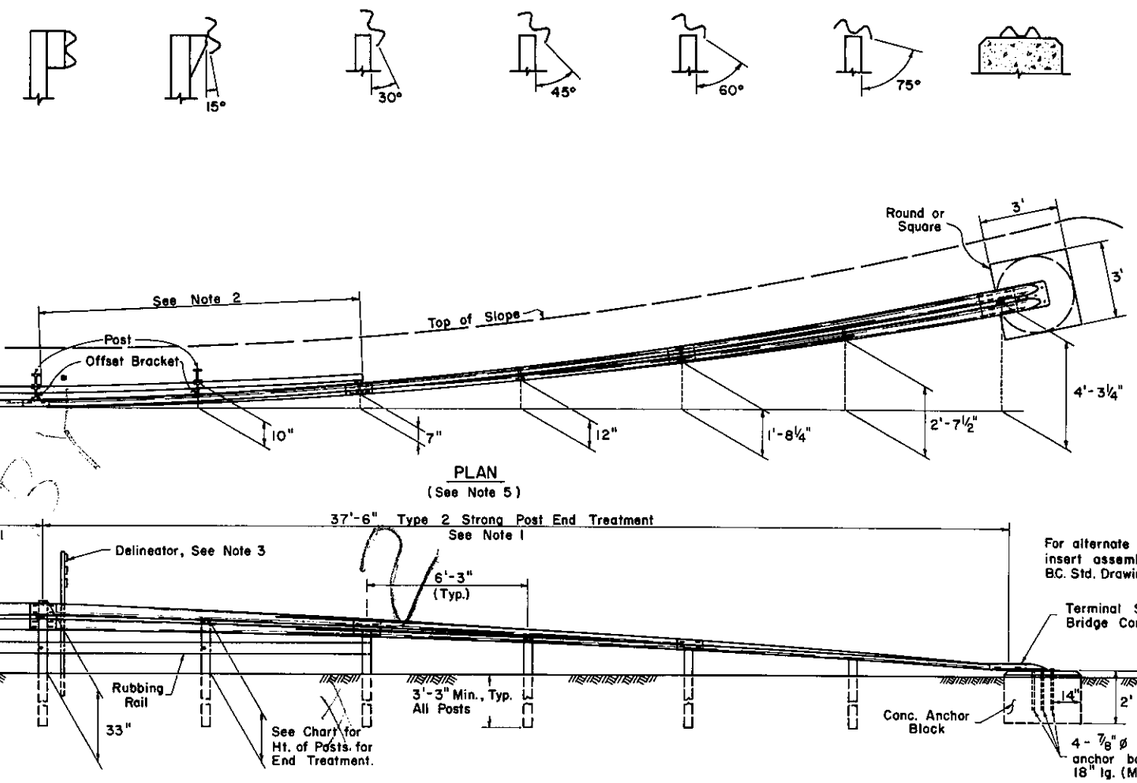


W6 x 8.5 POST

5⅞" C-POST

8" x 6" WOOD POST

POSITIONING OF ROTATING BRACKET ON POSTS OF THE END TREATMENT



PLAN
(See Note 5)

ELEVATION

TYPICAL 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.

	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"

For alternate Type A insert assembly see BC. Std. Drawings.

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, sheet 3 of 4.
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

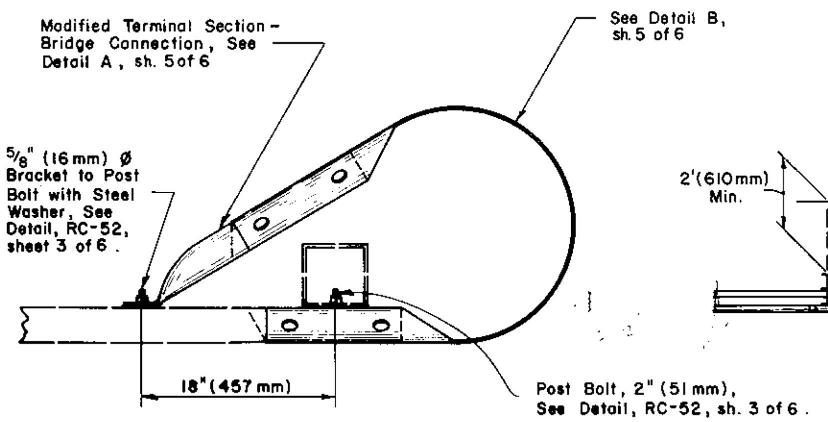
TYPE 2 STRONG POST GUARD RAIL

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

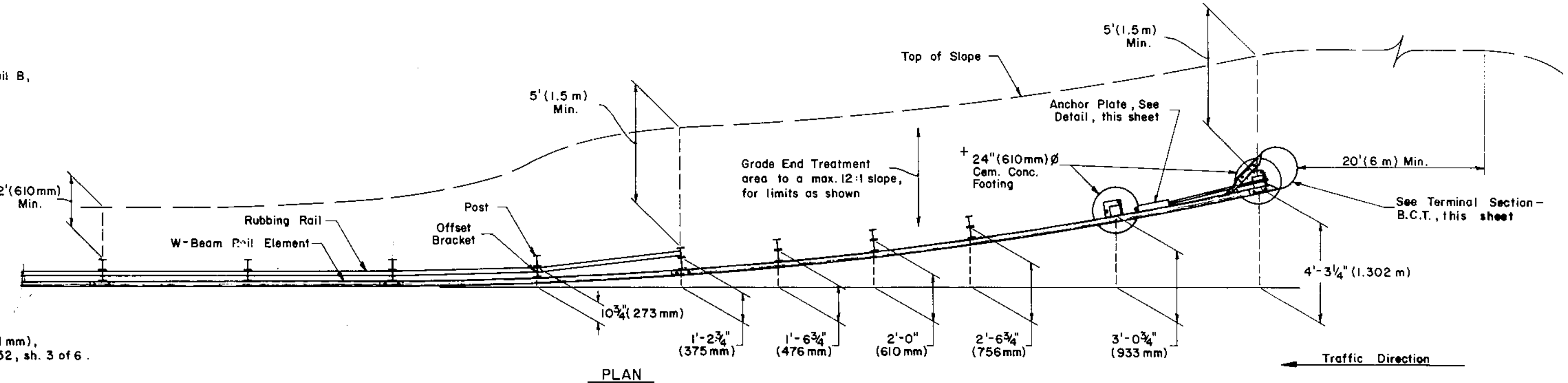
Approved June 1, 1976
Robert R. Meaver
Deputy Chief Hwy. Engr.

Sht. 3 Of 4

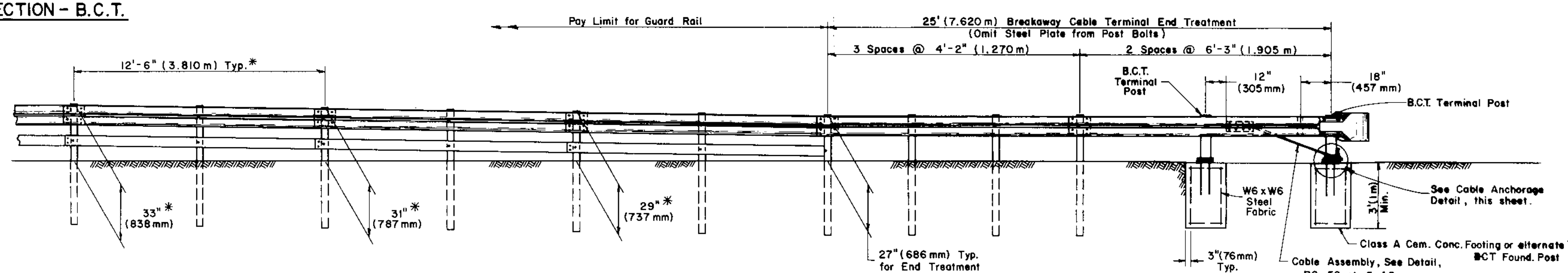
RC-52



TERMINAL SECTION - B.C.T.



PLAN



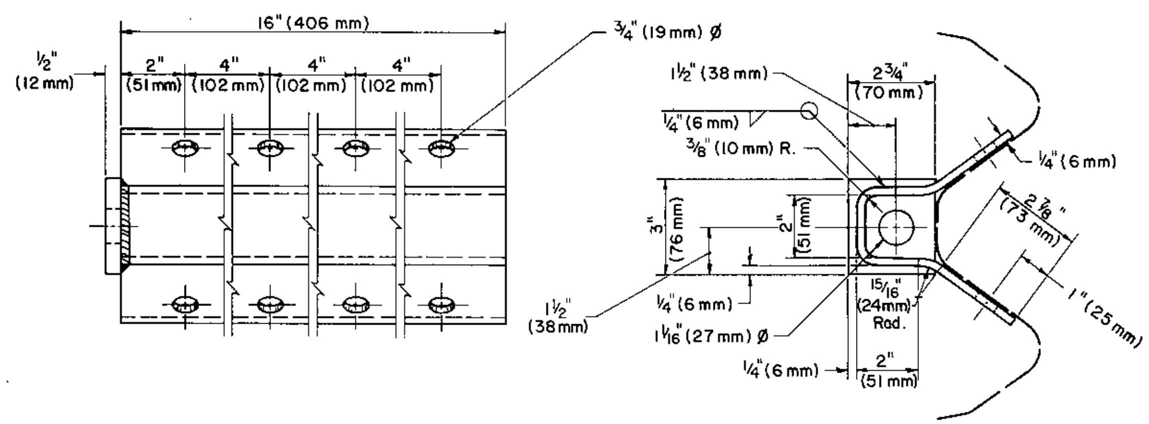
* See Note 1, this sheet.

ELEVATION

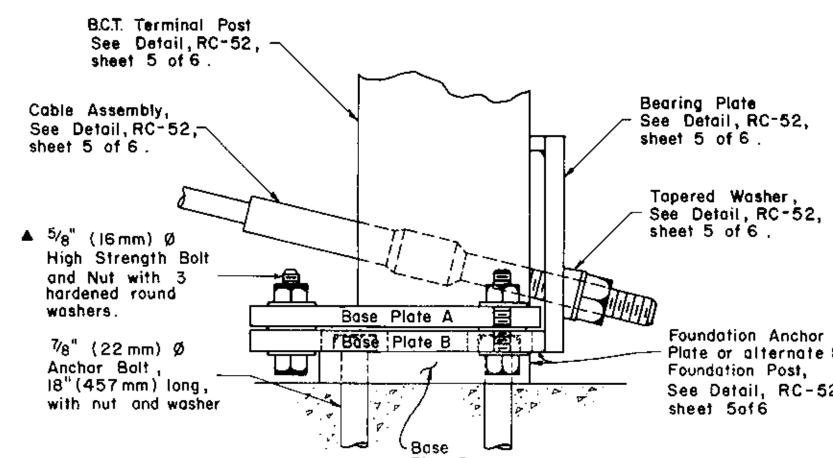
BREAKAWAY CABLE TERMINAL END TREATMENT

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).



ANCHOR PLATE



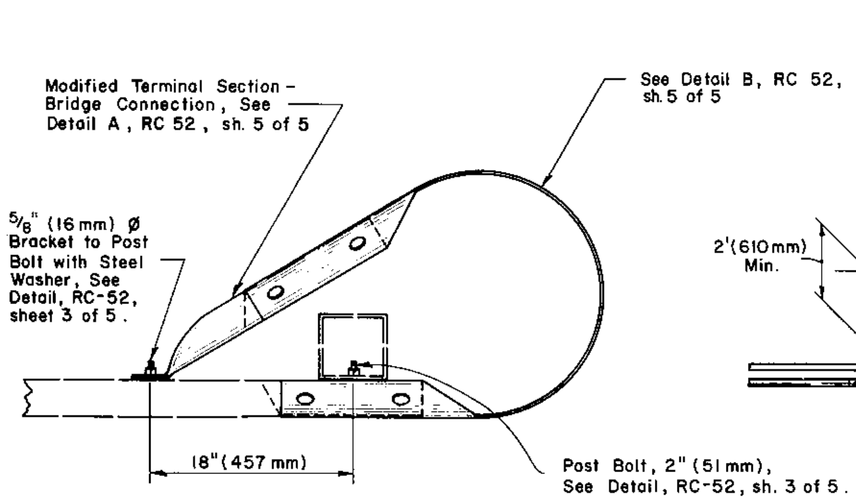
▲ See Note 3, this sheet.

CABLE ANCHORAGE DETAIL

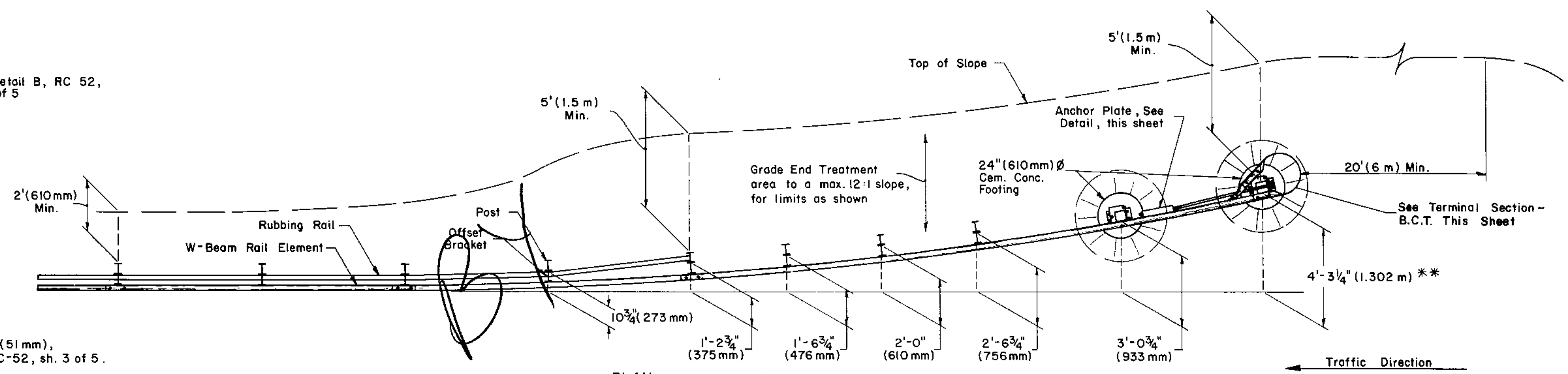
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

TYPE 2 STRONG POST GUARD RAIL
BREAKAWAY CABLE TERMINAL END TREATMENT

Recommended Sept. 1, 1978	Approved Sept. 1, 1978	Sht. 4 Of 6
B.D. Kosnskie — Director, Bureau of Design	James M. Sebastian — Deputy Chief Hwy. Engr.	RC-52

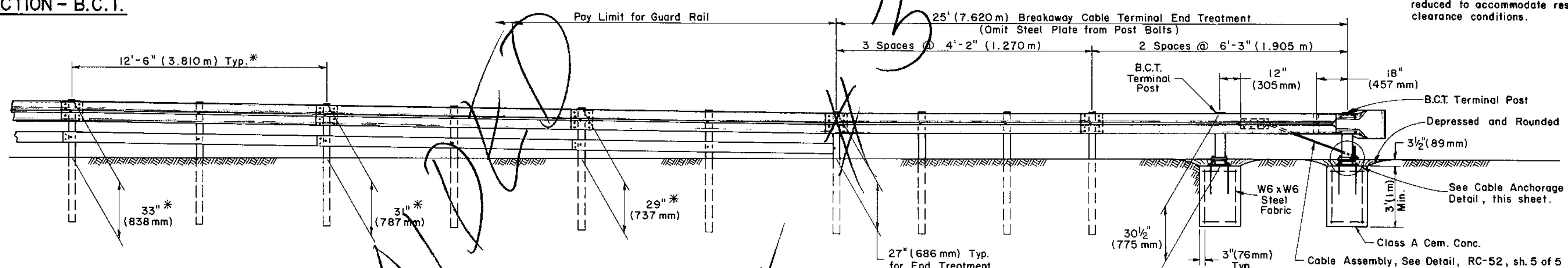


TERMINAL SECTION - B.C.T.



PLAN

** The offset dimension may be reduced to accommodate restricted clearance conditions.



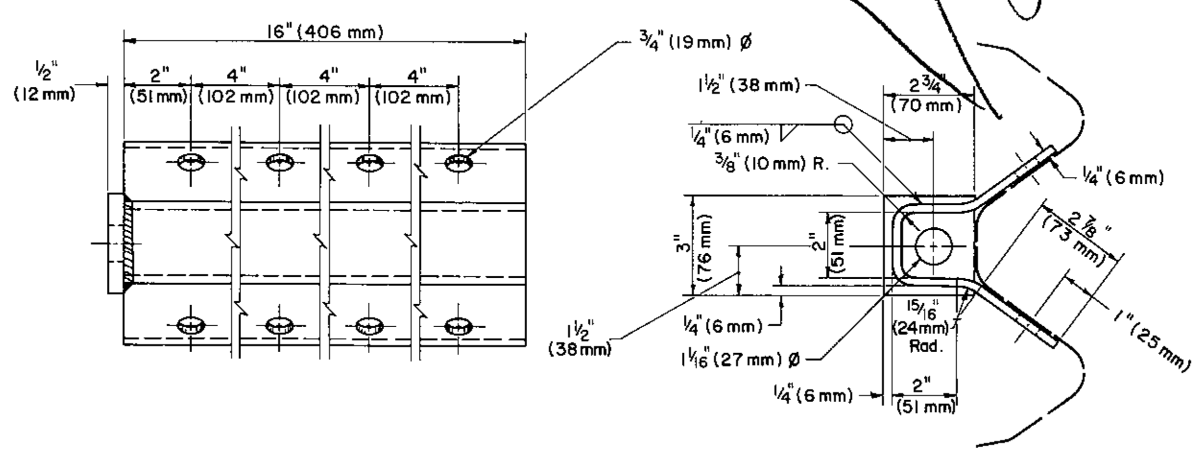
* See Note 1, this sheet.

ELEVATION

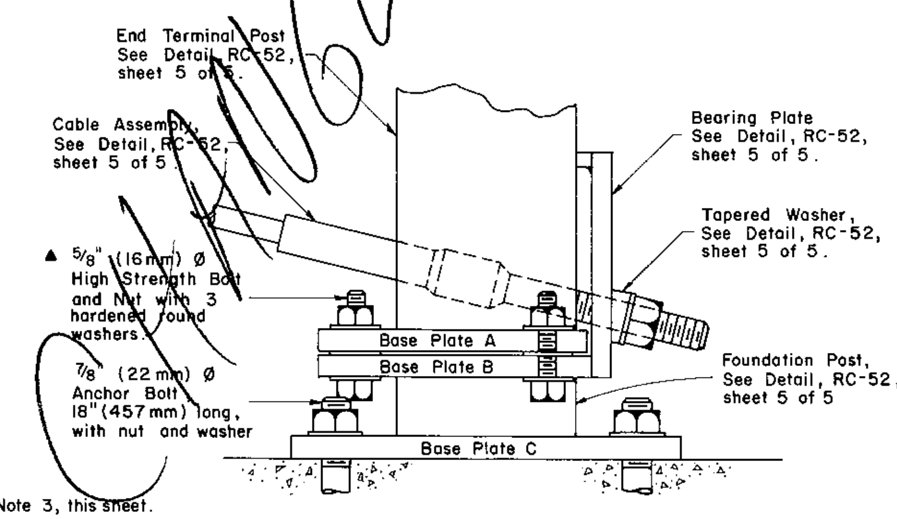
BREAKAWAY CABLE TERMINAL END TREATMENT

NOTES

1. Breakaway Cable Terminal 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. 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).



ANCHOR PLATE



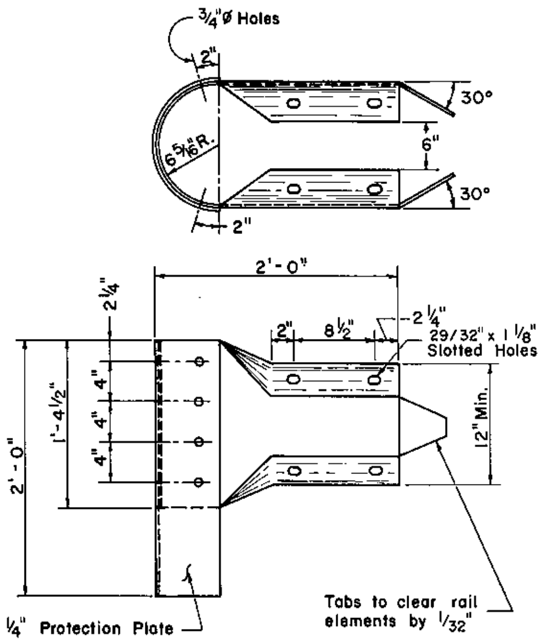
▲ See Note 3, this sheet.

CABLE ANCHORAGE DETAIL

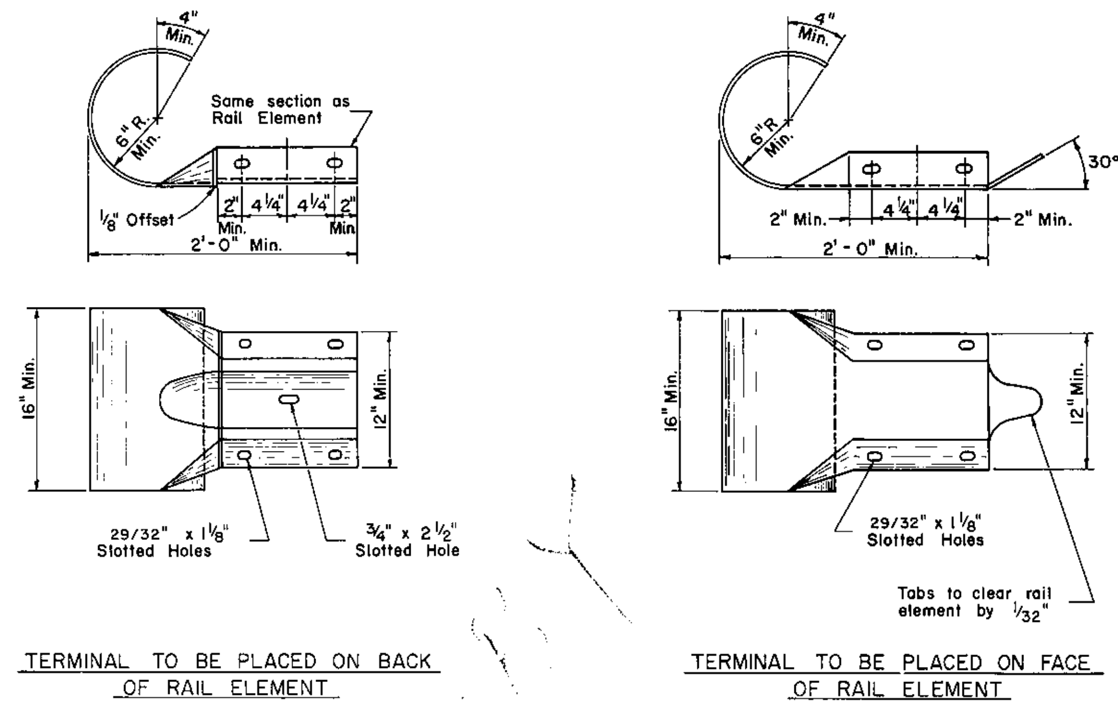
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

TYPE 2 STRONG POST GUARD RAIL

Recommended May 1, 1978	Approved May 1, 1978	Sht. 4 Of 5
B.D. [signature] Director, Bureau of Design	[signature] Deputy Chief Hwy. Engr.	RC-52



TERMINAL SECTION (DOUBLE)



ALTERNATE TERMINAL SECTIONS (SINGLE)

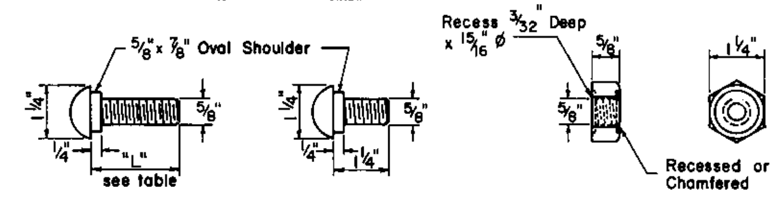
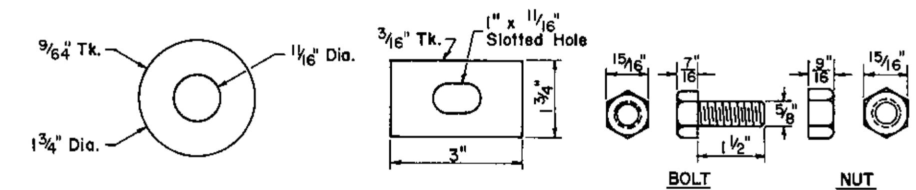
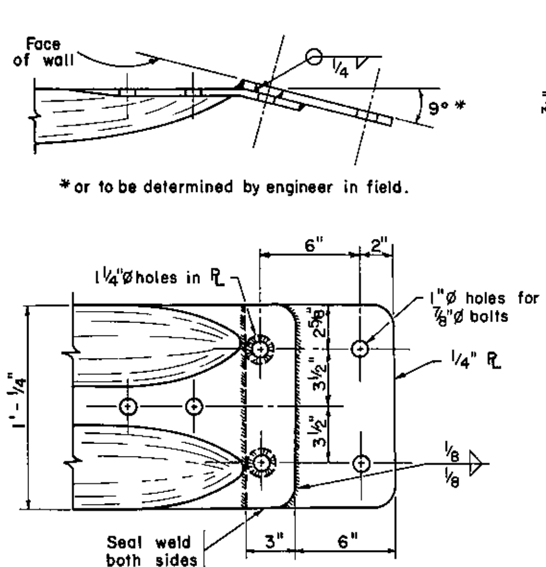


TABLE OF POST BOLT LENGTHS - L

Post	Rubbing Rail	W-Beam
W6 x 8.5 & 5 7/8" C Post	4 1/2" Post Bolt	2" Post Bolt
Wood Post	12" Post Bolt	16" Post Bolt

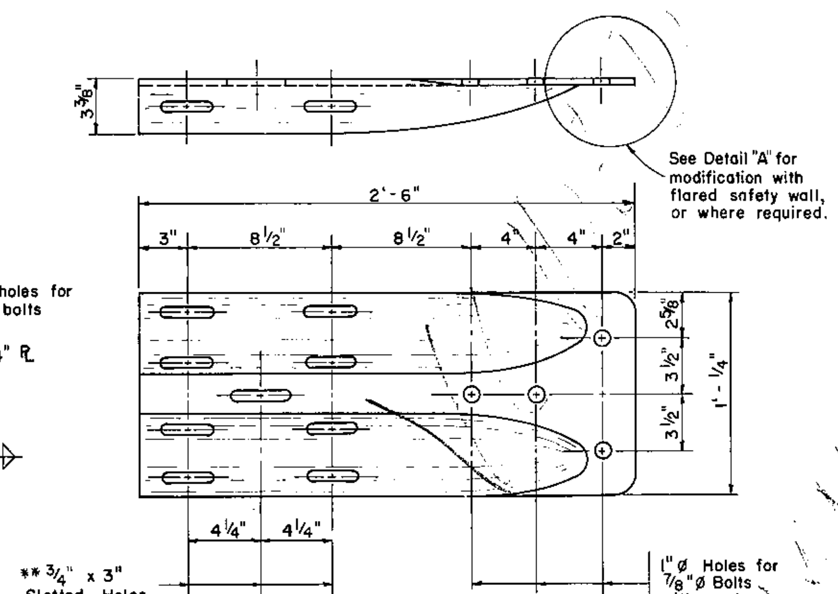




*or to be determined by engineer in field.

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.

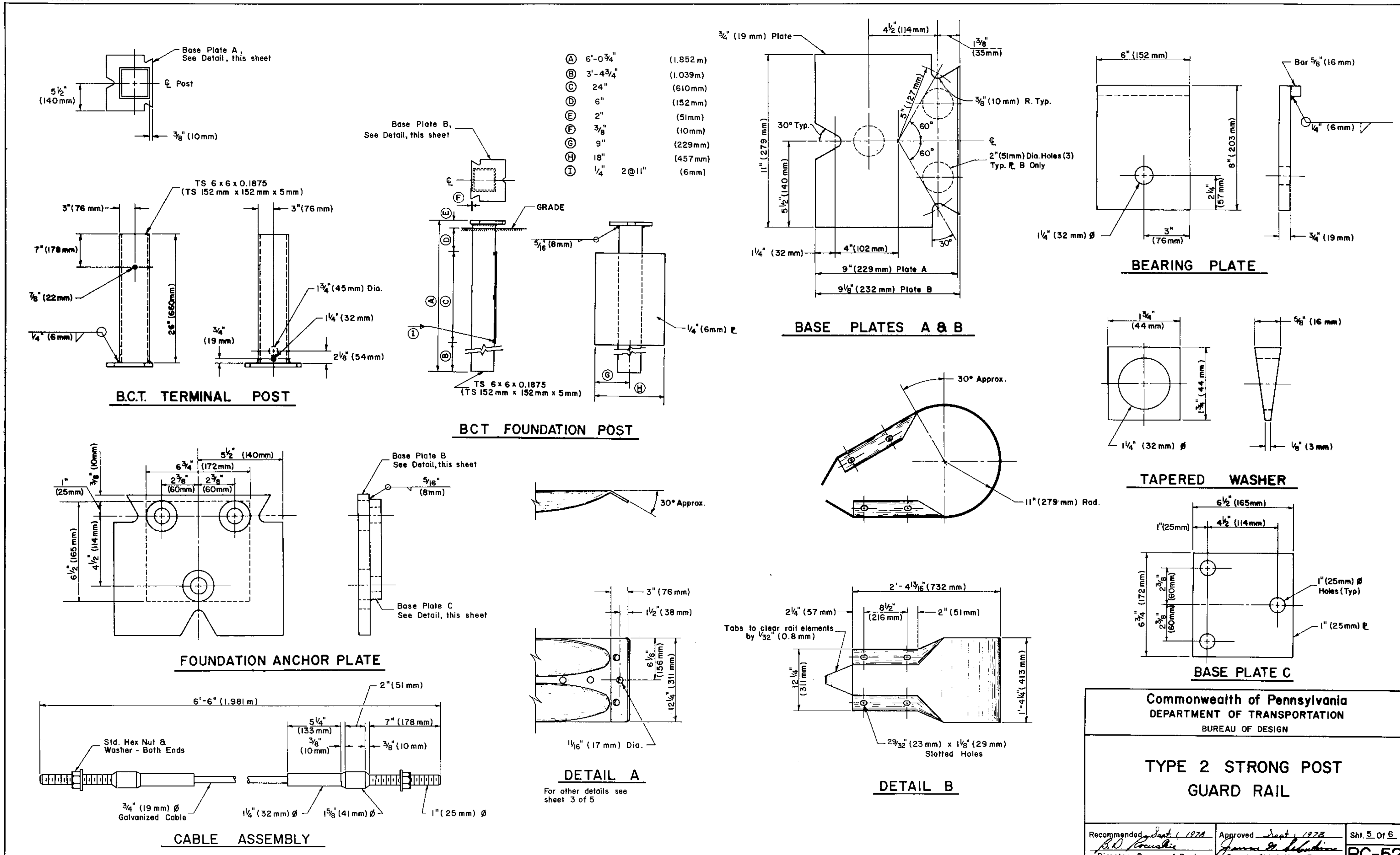
NOTES

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 June 1, 1976 B.D. Rawlins Director, Bureau of Design	Approved June 1, 1976 Robert R. Moore Deputy Chief Hwy. Engr.	Sht. 4 Of 4 RC-52

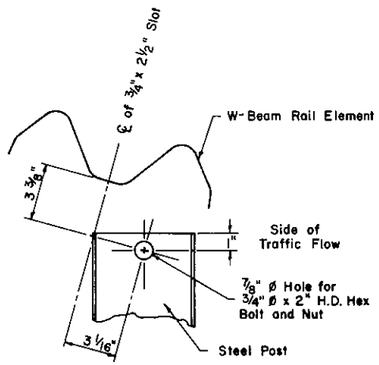


Base Plate A, See Detail, this sheet
℄ Post
5½" (140 mm)
⅜" (10 mm)
TS 6 x 6 x 0.1875 (TS 152 mm x 152 mm x 5 mm)
3" (76 mm)
7" (178 mm)
⅞" (22 mm)
26" (660 mm)
¼" (6 mm)
1¾" (45 mm) Dia.
1¼" (32 mm)
¾" (19 mm)
2⅛" (54 mm)
B.C.T. TERMINAL POST
Base Plate B, See Detail, this sheet
GRADE
5/16" (8 mm)
¼" (6 mm) ℗
TS 6 x 6 x 0.1875 (TS 152 mm x 152 mm x 5 mm)
BCT FOUNDATION POST
Ⓐ 6'-0¾" (1.852 m)
Ⓑ 3'-4¾" (1.039 m)
Ⓒ 24" (610 mm)
Ⓓ 6" (152 mm)
Ⓔ 2" (51 mm)
Ⓕ ⅜" (10 mm)
Ⓖ 9" (229 mm)
Ⓗ 18" (457 mm)
Ⓘ ¼" 2@11" (6 mm)
¾" (19 mm) Plate
4½" (114 mm)
1⅜" (35 mm)
5" (127 mm)
⅜" (10 mm) R. Typ.
30° Typ.
60°
2" (51 mm) Dia. Holes (3) Typ. ℗ B Only
11" (279 mm)
5½" (140 mm)
1¼" (32 mm)
4" (102 mm)
9" (229 mm) Plate A
9⅛" (232 mm) Plate B
BASE PLATES A & B
6" (152 mm)
Bar ⅝" (16 mm)
¼" (6 mm)
8" (203 mm)
2¼" (57 mm)
3" (76 mm)
1¼" (32 mm) Ø
¾" (19 mm)
BEARING PLATE
1¾" (44 mm)
⅝" (16 mm)
1¼" (32 mm) Ø
⅛" (3 mm)
TAPERED WASHER
30° Approx.
11" (279 mm) Rad.
5½" (140 mm)
6¾" (172 mm)
2⅜" (60 mm)
1" (25 mm)
⅜" (10 mm)
6½" (165 mm)
4½" (114 mm)
Base Plate B See Detail, this sheet
5/16" (8 mm)
Base Plate C See Detail, this sheet
FOUNDATION ANCHOR PLATE
30° Approx.
3" (76 mm)
1½" (38 mm)
6⅛" (156 mm)
12¼" (311 mm)
11/16" (17 mm) Dia.
DETAIL A
For other details see sheet 3 of 5
2'-4 13/16" (732 mm)
2¼" (57 mm)
8½" (216 mm)
2" (51 mm)
Tabs to clear rail elements by 1/32" (0.8 mm)
1'-4¼" (413 mm)
29/32" (23 mm) x 1⅛" (29 mm) Slotted Holes
DETAIL B
6½" (165 mm)
4½" (114 mm)
1" (25 mm) Ø Holes (Typ)
6¾ (172 mm)
2⅜ (60 mm)
1" (25 mm) ℗
BASE PLATE C
6'-6" (1.981 m)
2" (51 mm)
5¼" (133 mm)
7" (178 mm)
⅜" (10 mm)
Std. Hex Nut & Washer - Both Ends
¾" (19 mm) Ø Galvanized Cable
1¼" (32 mm) Ø
1⅝" (41 mm) Ø
1" (25 mm) Ø
CABLE ASSEMBLY

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

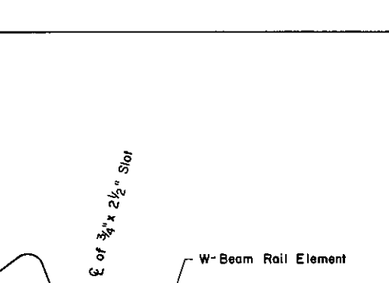
TYPE 2 STRONG POST GUARD RAIL

Recommended Sept. 1, 1978	Approved Sept. 1, 1978	Sht. 5 Of 6
B.D. Rocuskie — Director, Bureau of Design	James M. Sebastian — Deputy Chief Hwy. Engr.	RC-52



TYPICAL FOR
15° THRU 75° POSITIONS

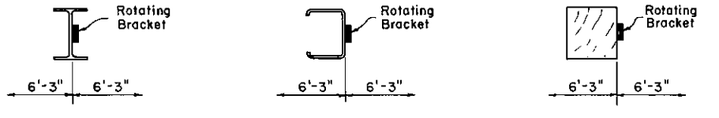
STEEL POSTS



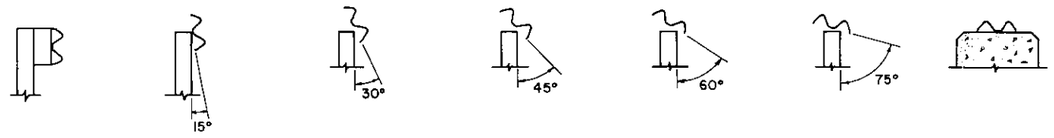
TYPICAL FOR
15° THRU 75° POSITIONS

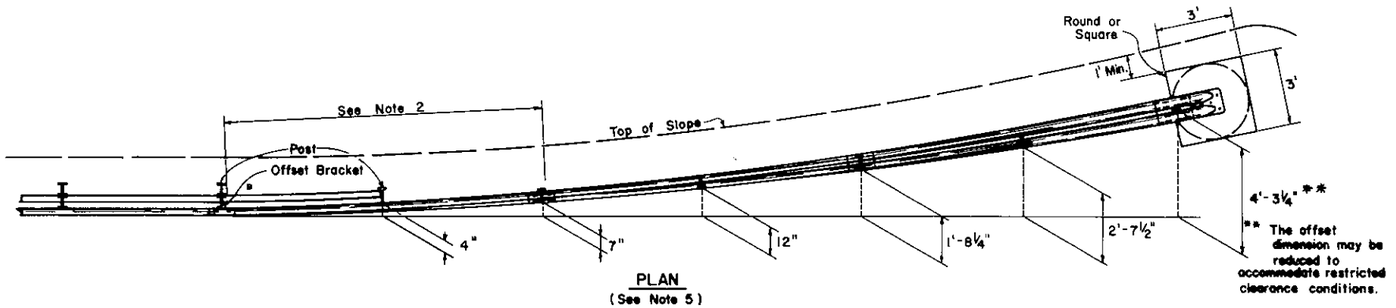
WOOD POSTS

ROTATING BRACKET REQUIREMENTS



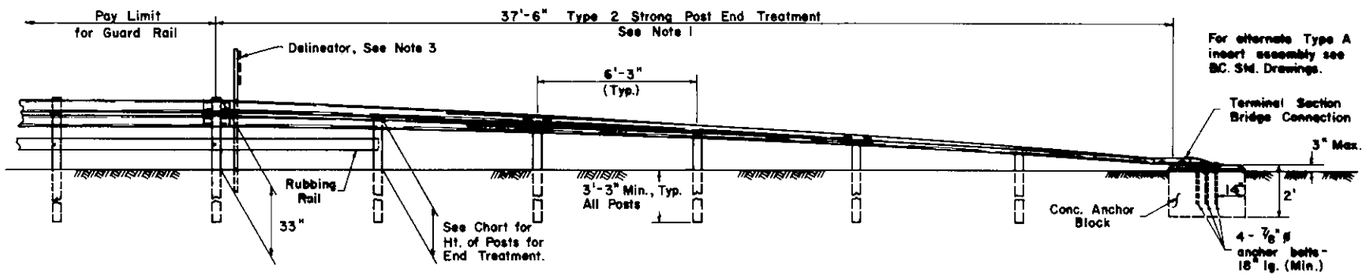
POSITIONING OF ROTATING BRACKET ON POSTS OF THE END TREATMENT





PLAN
(See Note 5)

** The offset dimension may be reduced to accommodate restricted clearance conditions.



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"

For alternate Type A insert assembly see BC. Std. Drawings.

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, sheet 3 of 4.
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

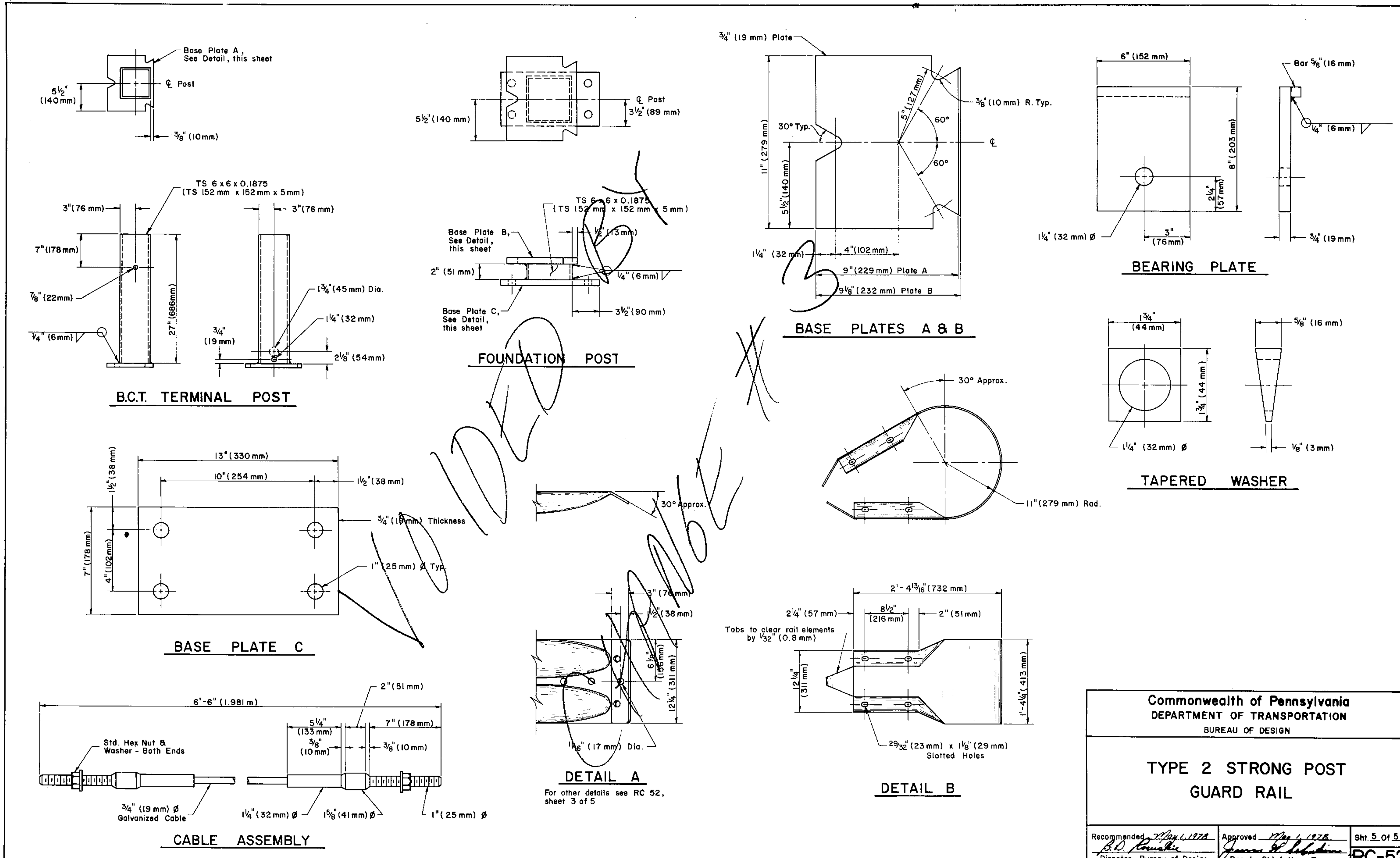
TYPE 2 STRONG POST END TREATMENT

Recommended Sept 1, 1978
B D Rowshie
Director, Bureau of Design

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

Sht. 6 Of 6

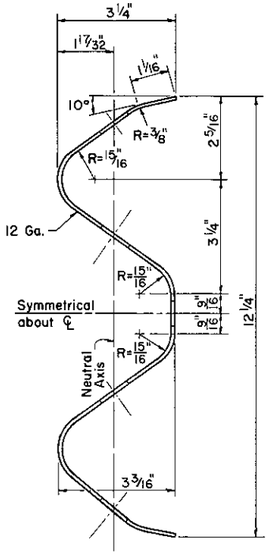
RC-52



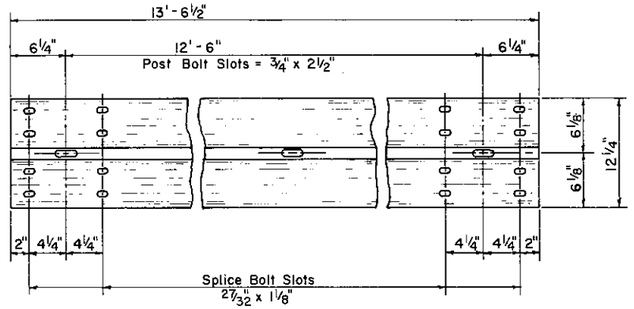
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

TYPE 2 STRONG POST GUARD RAIL

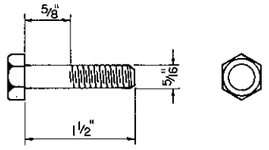
Recommended May 1, 1978	Approved May 1, 1978	Sht. 5 of 5
B.D. Rowske (signature) Director, Bureau of Design	(signature) Deputy Chief Hwy. Engr.	RC-52



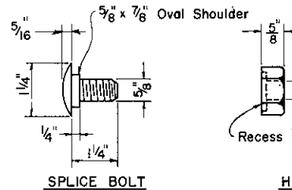
DETAIL D
RAIL ELEMENT



DETAIL E
TYPICAL RAIL SECTION

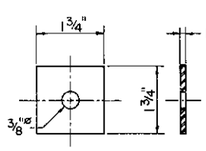


DETAIL G
5/16" DIA. HEX. BOLT

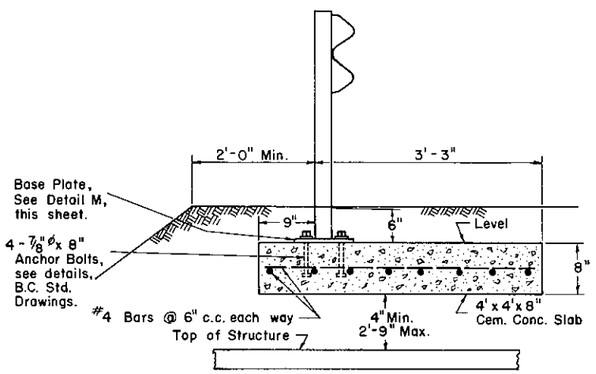


SPLICE BOLT HEX NUT

DETAIL F
BEAM SPLICE HARDWARE

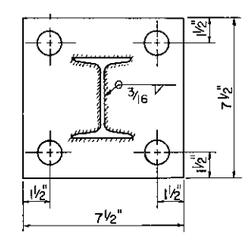


DETAIL I
SQUARE WASHER



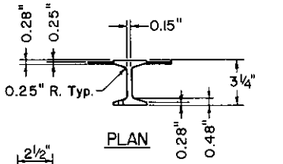
GUARD RAIL OVER UNDERGROUND STRUCTURES

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.

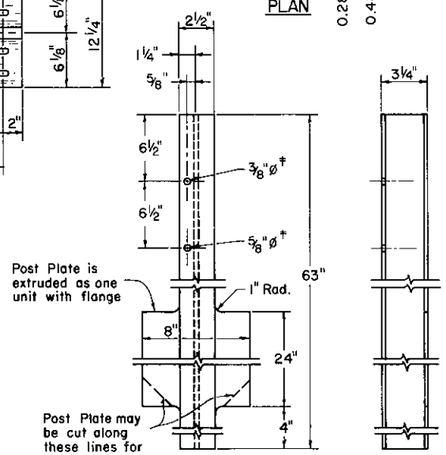


BASE PLATE DETAIL M

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.

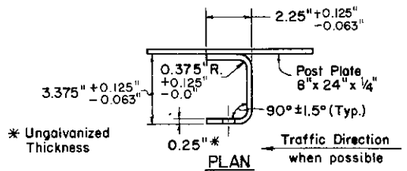


PLAN

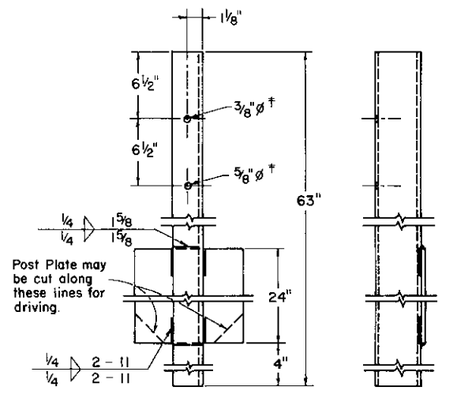


ELEVATION SIDE

ALUMINUM ALLOY POST

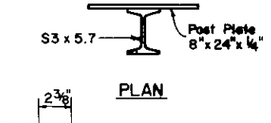


PLAN

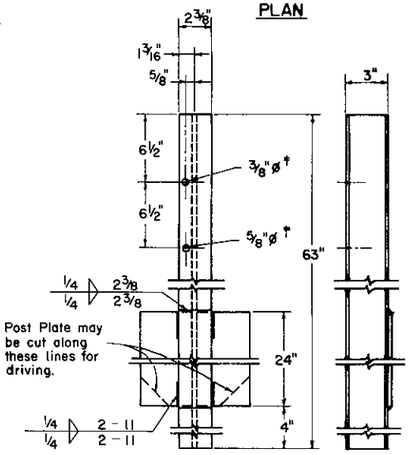


ELEVATION SIDE

3⅜" x 2¼" COLD FORMED CHANNEL POST



PLAN



ELEVATION SIDE

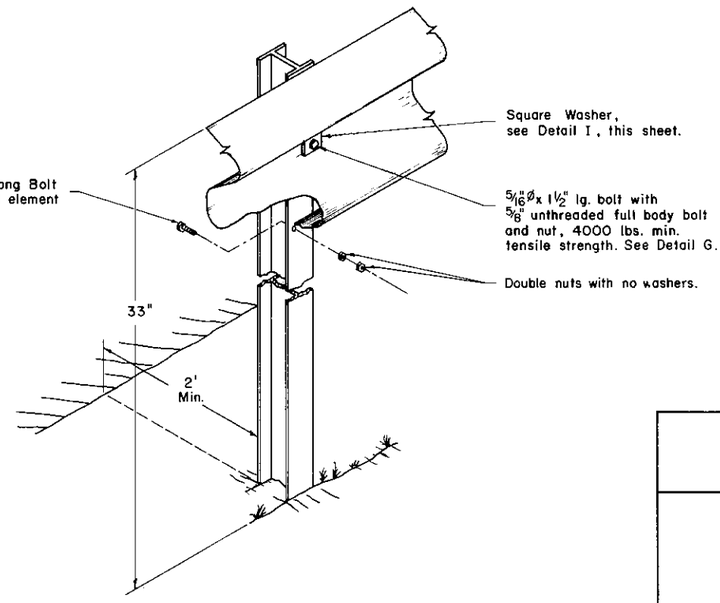
S3 x 5.7

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.



TYPICAL INSTALLATION

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

TYPE 2 WEAK POST GUARD RAIL

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

Approved May 1, 1978
James M. Shrodin
Deputy Chief Hwy. Engr.

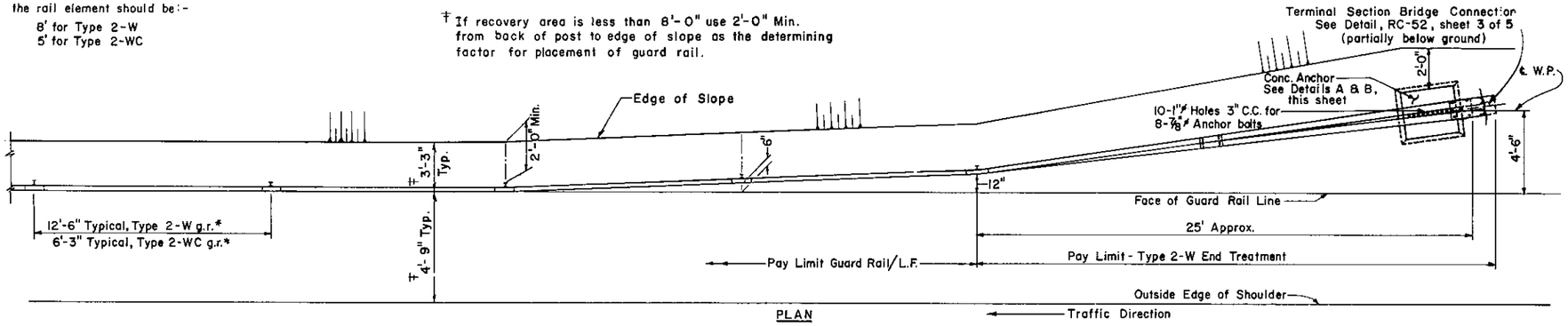
Sht. 1 Of 2

RC-53

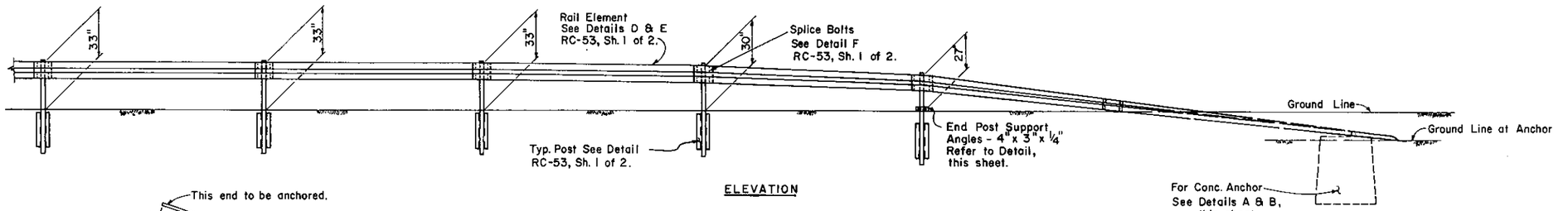
FORM 4237 REV. 7-69

* 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.

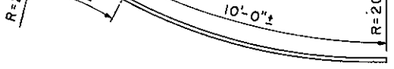


PLAN



ELEVATION

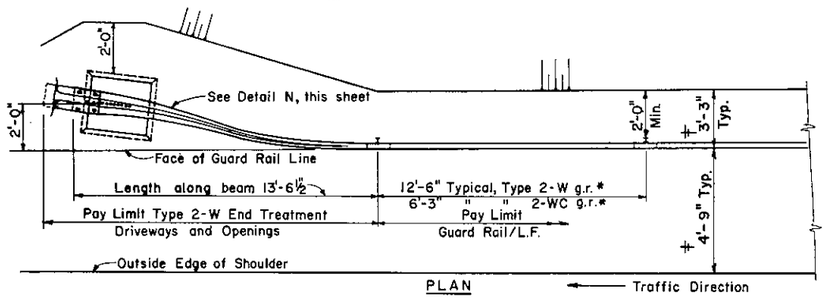
TYPE 2-W END TREATMENT



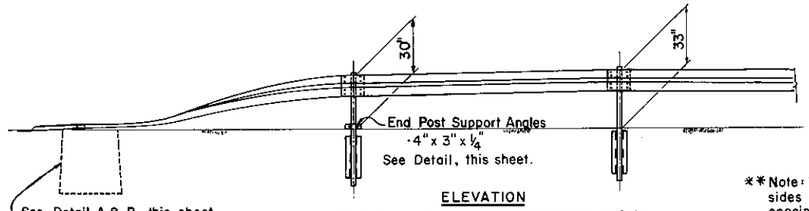
Shop bending required to make the End Treatment at Driveways & Openings.

DETAIL N

SHOP CURVED RAIL



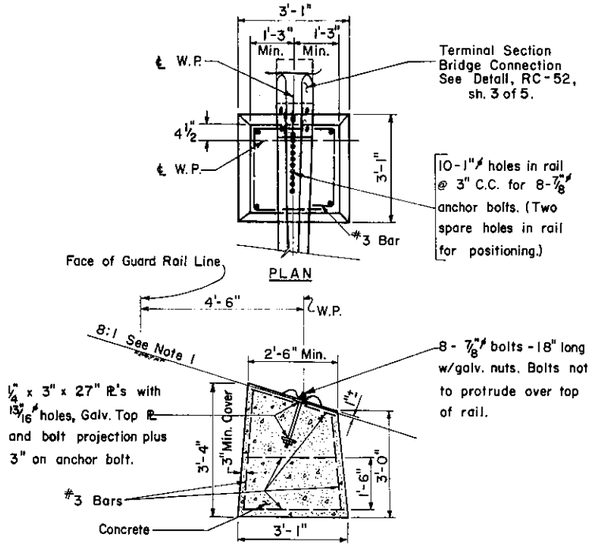
PLAN ← Traffic Direction



ELEVATION

TYPE 2-W END TREATMENT** DRIVEWAYS & OPENINGS

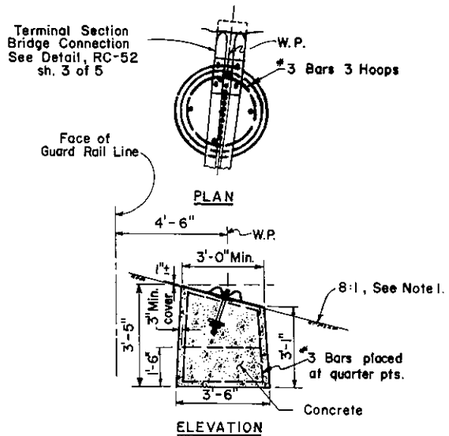
**Note: To be used on both sides of driveways and openings.



PLAN

ELEVATION

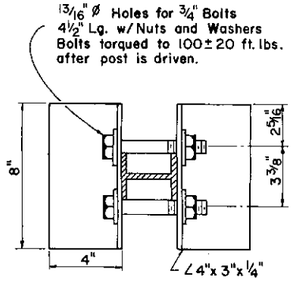
DETAIL A CONCRETE ANCHOR



PLAN

ELEVATION

DETAIL B ALTERNATE CONC. ANCHOR



END POST SUPPORT ANGLES

NOTES

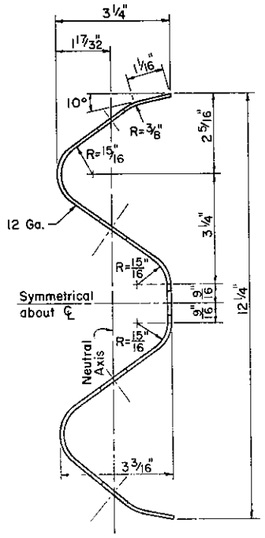
1. Slope can be varied if warranted.
2. Installation of delineator assemblies shall be done under a separate pay item or contract. See Traffic Standard TC-7709, sheet 3 of 4.
3. Type 2-W End Treatment must be used at approach and trailing ends of Type 2-W Guard Rail.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

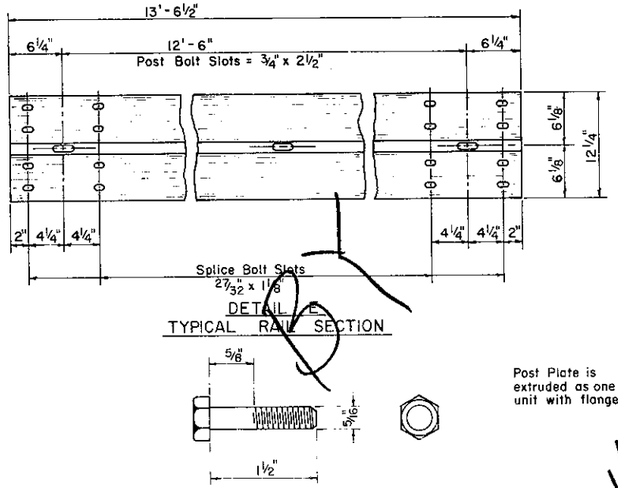
TYPE 2 WEAK POST GUARD RAIL

Recommended May 4, 1978	Approved May 4, 1978	Sht. 2 Of 2
B.D. Rowalt	James R. Sebastian	RC-53
Director, Bureau of Design	Deputy Chief Hwy. Engr.	

TRACED BY
CHKD BY

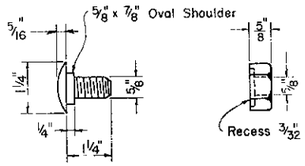


DETAIL D
RAIL ELEMENT

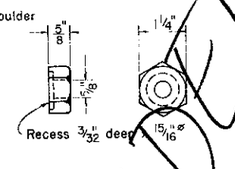


DETAIL E
TYPICAL RAIL SECTION

DETAIL G
⅝" DIA. HEX. BOLT

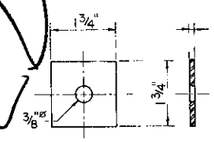


SPLICE BOLT

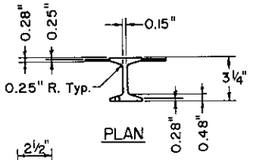


HEX NUT

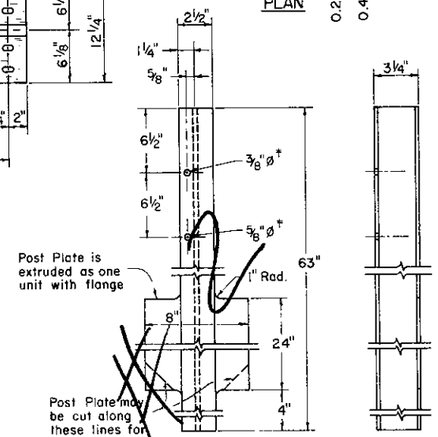
DETAIL F
BEAM SPLICE HARDWARE



DETAIL I
SQUARE WASHER

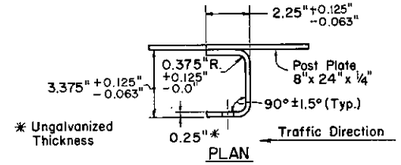


PLAN

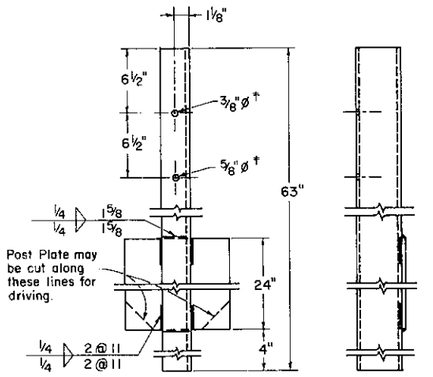


ELEVATION SIDE

ALUMINUM ALLOY POST

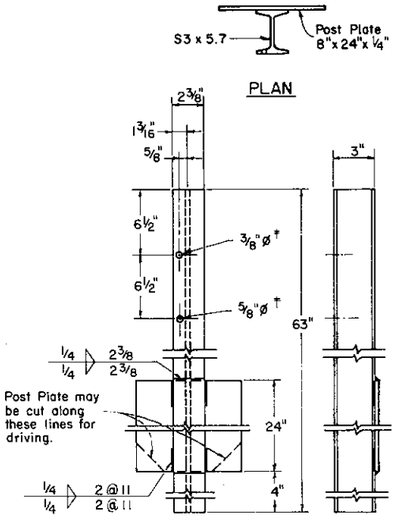


PLAN



ELEVATION SIDE

3⅜" x 2¼" COLD FORMED CHANNEL POST



ELEVATION SIDE

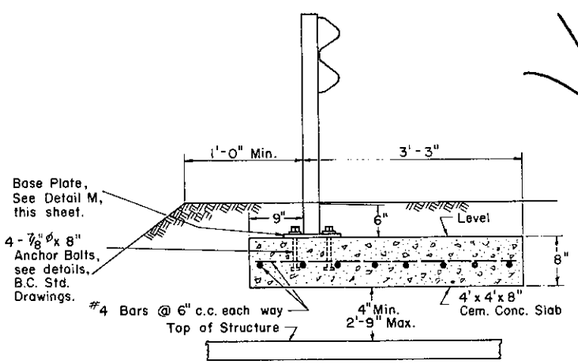
S3 x 5.7

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.

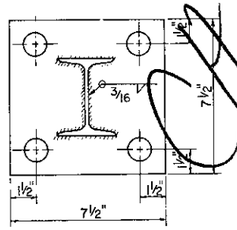
Notes

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.



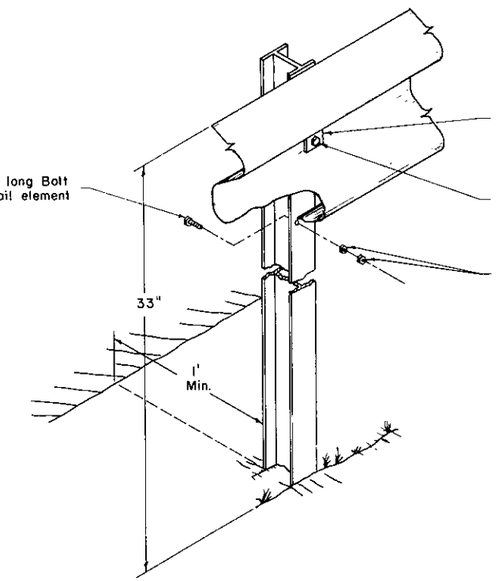
GUARD RAIL OVER UNDERGROUND STRUCTURES

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

VOID CHANGE

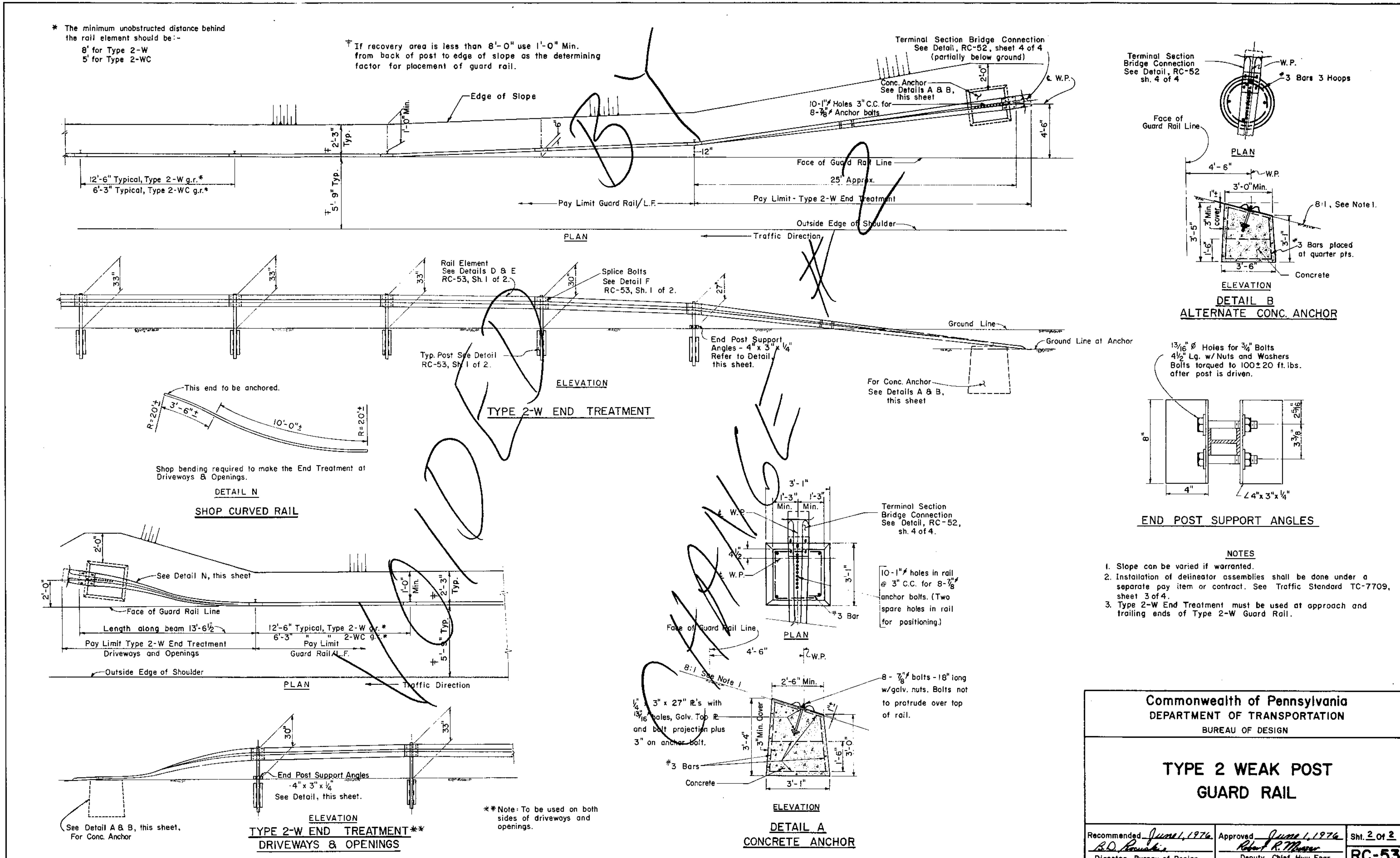
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

TYPE 2 WEAK POST GUARD RAIL

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

Approved June 1, 1976
Robert R. Musser
Deputy Chief Hwy. Engr.

Sht. 1 Of 2
RC-53



* 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 1'-0" Min. from back of post to edge of slope as the determining factor for placement of guard rail.
Edge of Slope
Terminal Section Bridge Connection See Detail, RC-52, sheet 4 of 4 (partially below ground)
Conc. Anchor See Details A & B, this sheet
10-1" Holes 3" C.C. for 8-7/8" Anchor bolts
W.P.
2'-0"
1'-0" Min.
2'-3" Typ.
4'-6"
12"
Face of Guard Rail Line
12'-6" Typical, Type 2-W g.r.*
6'-3" Typical, Type 2-WC g.r.*
5'-9" Typ.
25' Approx.
Pay Limit Guard Rail/L.F.
Pay Limit - Type 2-W End Treatment
Outside Edge of Shoulder
PLAN
Traffic Direction
Rail Element See Details D & E RC-53, Sh. 1 of 2.
Splice Bolts See Detail F RC-53, Sh. 1 of 2.
33"
30"
27"
Ground Line
Ground Line at Anchor
Typ. Post See Detail RC-53, Sh. 1 of 2.
End Post Support Angles - 4" x 3" x 1/4" Refer to Detail, this sheet.
For Conc. Anchor See Details A & B, this sheet
ELEVATION
TYPE 2-W END TREATMENT
This end to be anchored.
R=20'±
3'-6"±
10'-0"±
Shop bending required to make the End Treatment at Driveways & Openings.
DETAIL N
SHOP CURVED RAIL
See Detail N, this sheet
Face of Guard Rail Line
Length along beam 13'-6½"
12'-6" Typical, Type 2-W g.r.*
6'-3" " " 2-WC g.r.*
Pay Limit Type 2-W End Treatment Driveways and Openings
Pay Limit Guard Rail/L.F.
Outside Edge of Shoulder
PLAN
Traffic Direction
End Post Support Angles 4" x 3" x 1/4" See Detail, this sheet.
See Detail A & B, this sheet, For Conc. Anchor
ELEVATION
TYPE 2-W END TREATMENT** DRIVEWAYS & OPENINGS
**Note: To be used on both sides of driveways and openings.
3'-1"
1'-3" Min.
1'-3" Min.
W.P.
Terminal Section Bridge Connection See Detail, RC-52, sh. 4 of 4.
10-1" holes in rail @ 3" C.C. for 8-7/8" anchor bolts. (Two spare holes in rail for positioning.)
#3 Bar
Face of Guard Rail Line
4'-6"
PLAN
8:1 See Note 1
2'-6" Min.
1/4" x 3" x 27" Pl's with 13/16" holes, Galv. Top Pl and bolt projection plus 3" on anchor bolt.
8 - 7/8" bolts - 18" long w/galv. nuts. Bolts not to protrude over top of rail.
3" Min. Cover
3'-4"
1'-6"
3'-0"
#3 Bars
Concrete
3'-1"
ELEVATION
DETAIL A
CONCRETE ANCHOR
Terminal Section Bridge Connection See Detail, RC-52 sh. 4 of 4
W.P.
#3 Bars 3 Hoops
Face of Guard Rail Line
PLAN
4'-6"
3'-0" Min.
8:1, See Note 1.
3" Min. cover
3'-5"
1'-6"
3'-1"
#3 Bars placed at quarter pts.
3'-6"
Concrete
ELEVATION
DETAIL B
ALTERNATE CONC. ANCHOR
13/16" Holes for 3/4" Bolts 4½" Lg. w/ Nuts and Washers Bolts torqued to 100±20 ft. lbs. after post is driven.
8"
4"
2-5/16"
3-3/8"
∠4"x3"x1/4"
END POST SUPPORT ANGLES

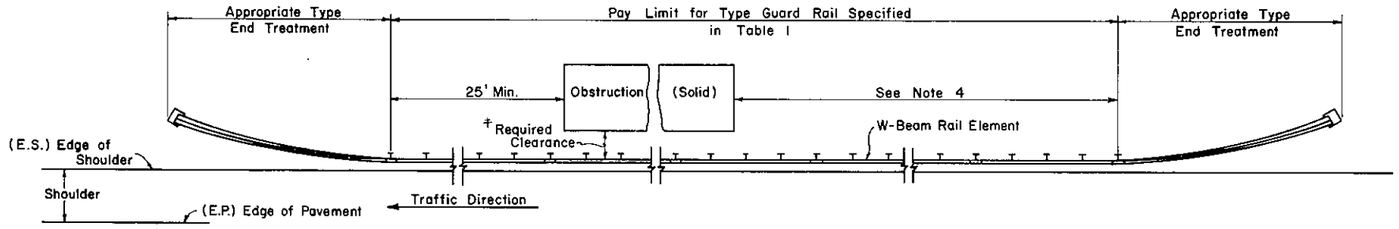
NOTES

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.

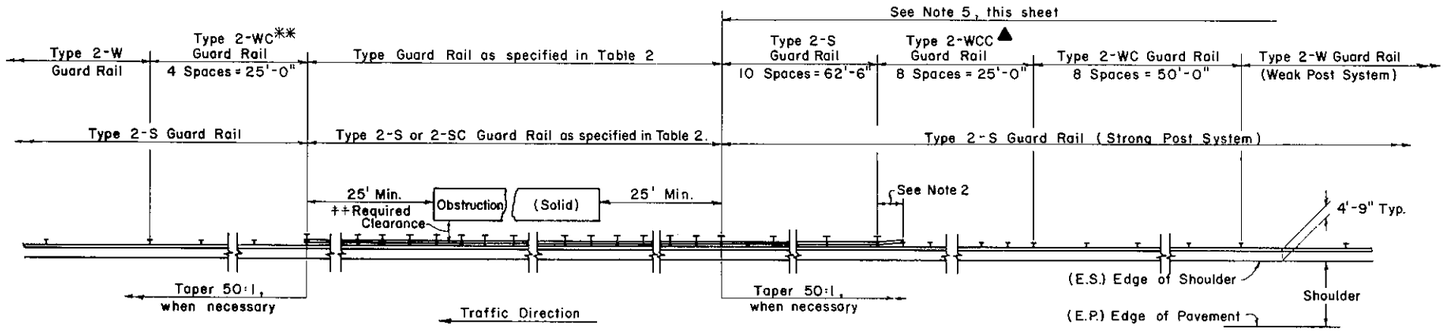
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

TYPE 2 WEAK POST GUARD RAIL

Recommended June 1, 1976	Approved June 1, 1976	Sht. 2 of 2
Director, Bureau of Design	Deputy Chief Hwy. Engr.	RC-53



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.

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.

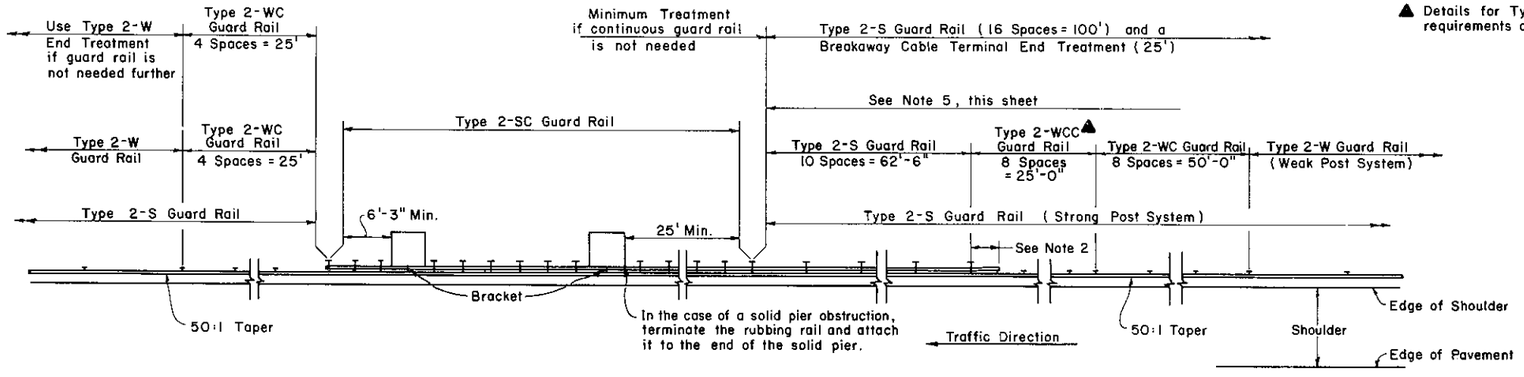
NOTES

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 then 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.

Revise as to Chapter and DM-2

** 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 ◓



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

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

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

GUARD RAIL AND MEDIAN BARRIER PLACEMENT

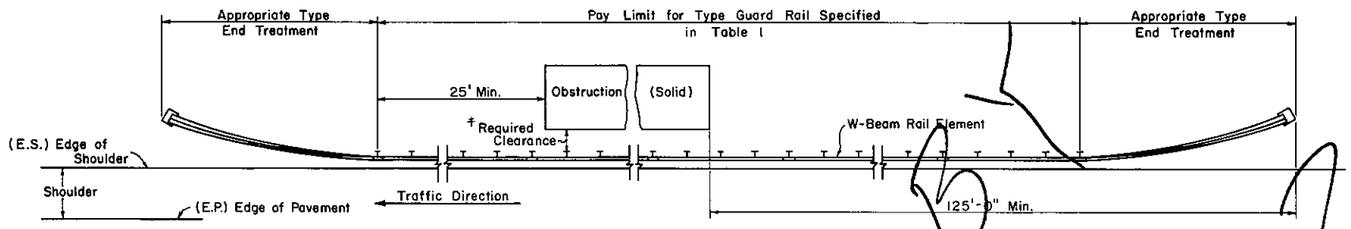
Recommended 7 May 4, 1978
B.D. Rowshi
Director, Bureau of Design

Approved May 4, 1978
Deputy Chief Hwy. Engineer

Sht. 1 Of 3

RC-54

TRACED BY
FINAL BY

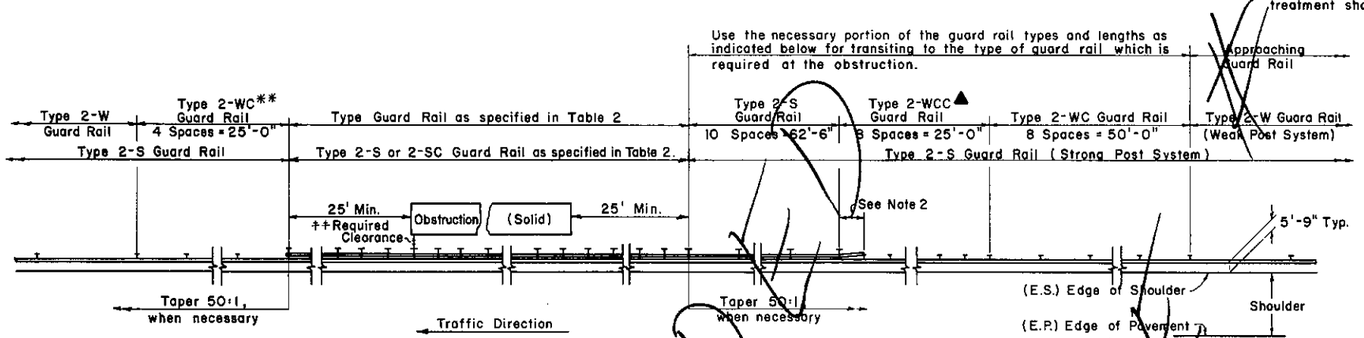


TREATMENT WHEN EDGE OF SHOULDER TO FACE OF OBSTRUCTION IS 3' OR GREATER WHERE CONTINUOUS GUARD RAIL IS NOT USED ◓

◓ 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.

TABLE I

Dist. to Obst. from Edge of Shld.	Type of Guard Rail	‡ Required Clearance (Dist. to Obst. from Back of Post)
3' up to 6'	2-SC	1'-9"
6'-1" up to 8'	2-S	3'
8'-1" up to 12'	2-WC	5'
12'-1" & Greater	2-W	8'



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

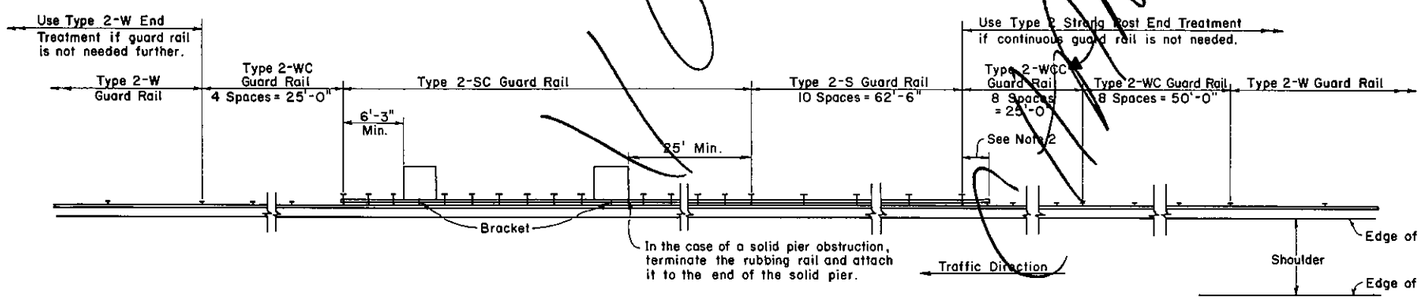
TREATMENT WHEN EDGE OF SHOULDER TO FACE OF OBSTRUCTION IS 3' OR GREATER WHERE CONTINUOUS GUARD RAIL IS USED ◓

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 Post)
Weak Post	3' up to 6'	2-SC	1'-9"
	6'-1" up to 7'	2-WCC	3'-9"
	7'-1" up to 14'	2-WC	5'
	14'-1" & Greater	2-W	8'
Strong Post	3' up to 6'	2-SC	1'-9"
	6'-1" & Greater	2-S	3'

① Maintain the alignment of the approaching guard rail, when it allows greater clearance (dist. from obstacle to back of post) 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"



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

NOTES

1. The treatments shown are for four lane divided highways. The appoach 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.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

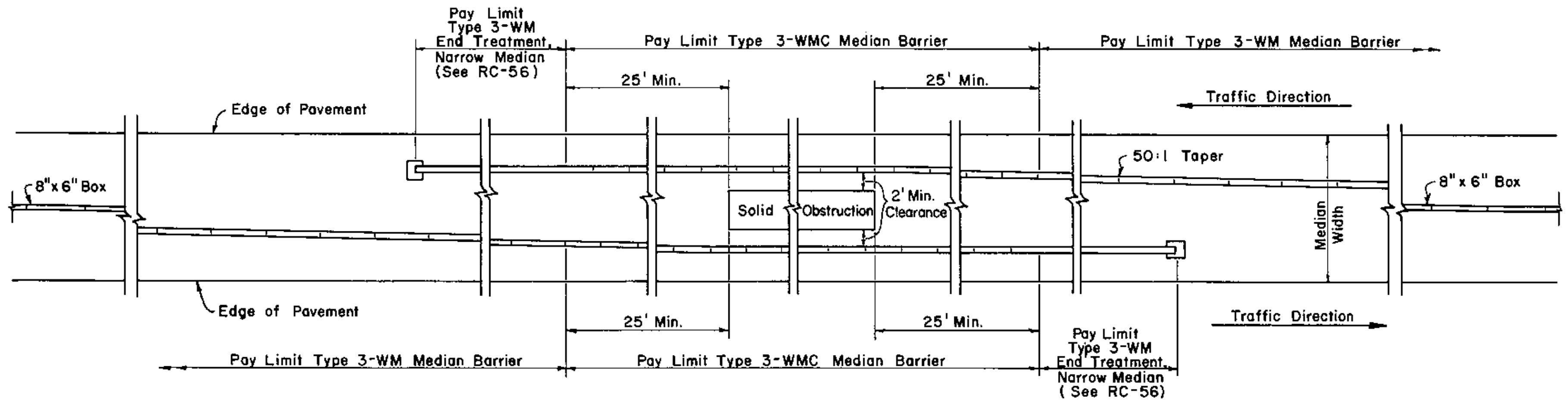
GUARD RAIL AND MEDIAN BARRIER PLACEMENT

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

Approved June 1, 1976
Robert R. Mauser
Deputy Chief Hwy. Engineer

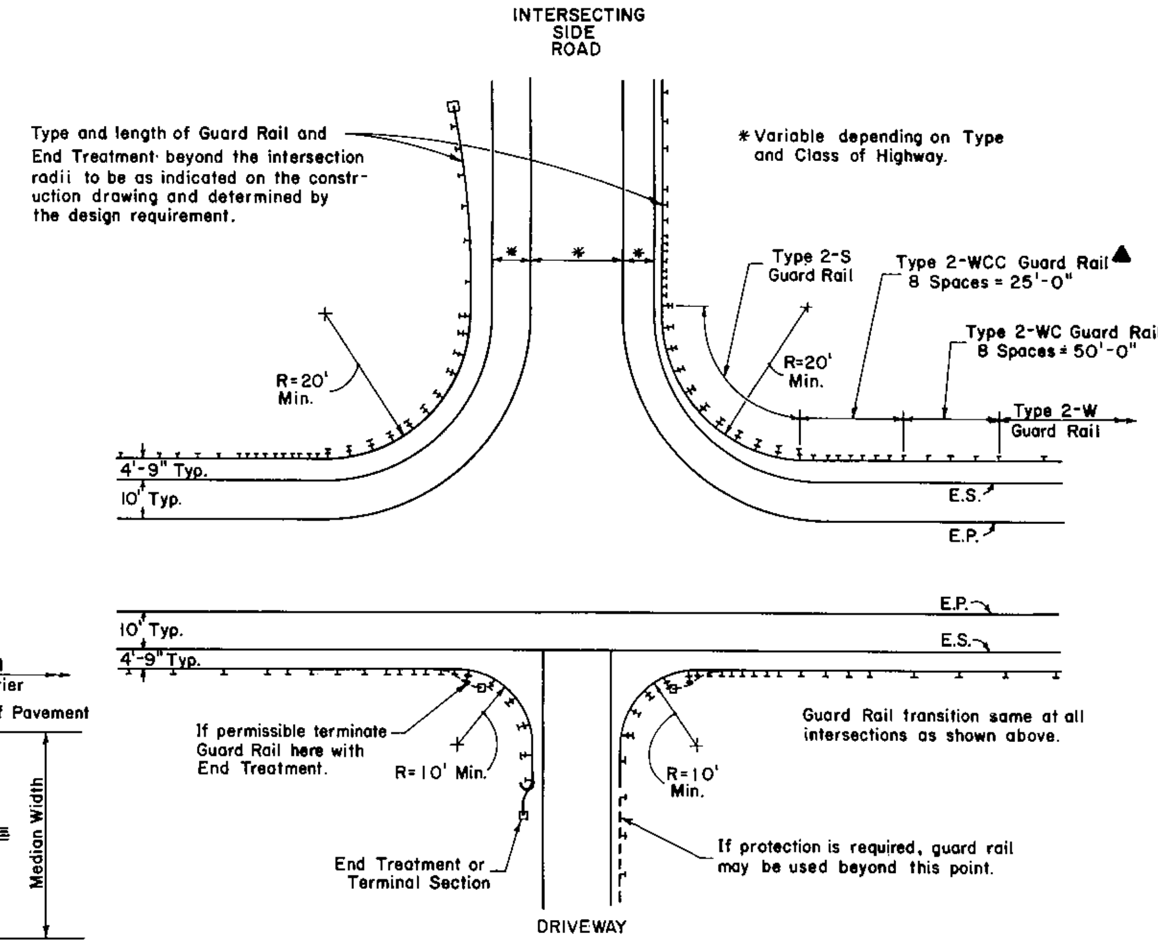
Sht. 1 Of 3
RC-54

TRACED BY
FINAL BY

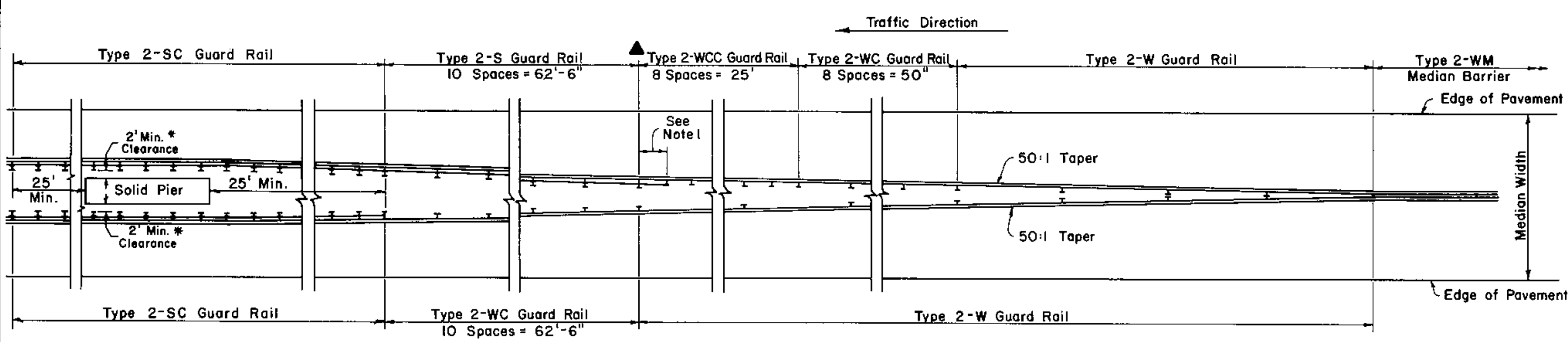


TREATMENT AT OBSTRUCTION FOR MEDIAN WIDTHS UP TO 16' WHERE CONTINUOUS BARRIER IS USED

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



TREATMENT AT INTERSECTIONS



* See Notes 3 & 4

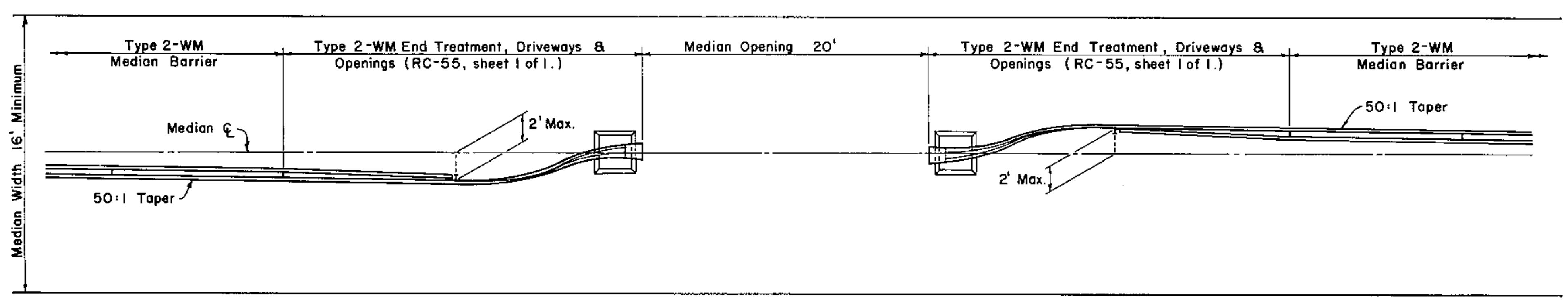
Traffic Direction

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.

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.

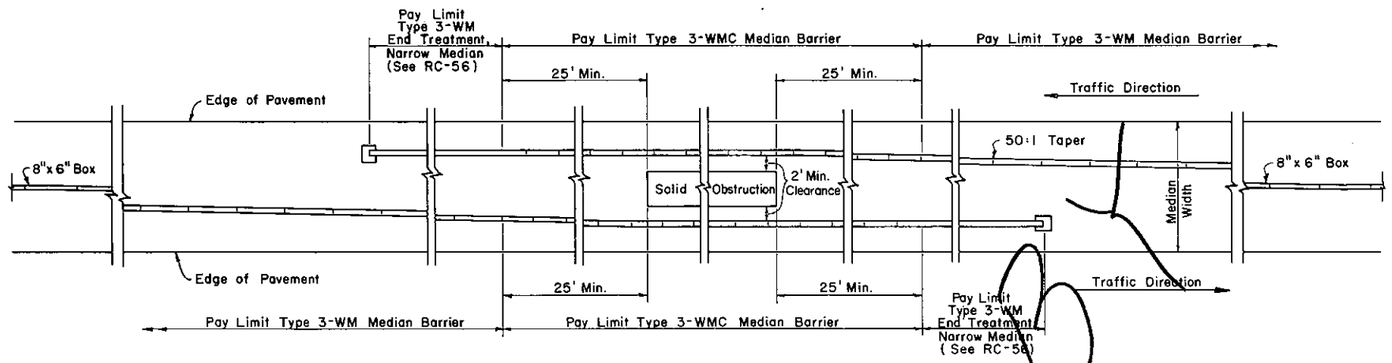


TREATMENT FOR TYPE 2-WM MEDIAN BARRIER CROSS-OVER

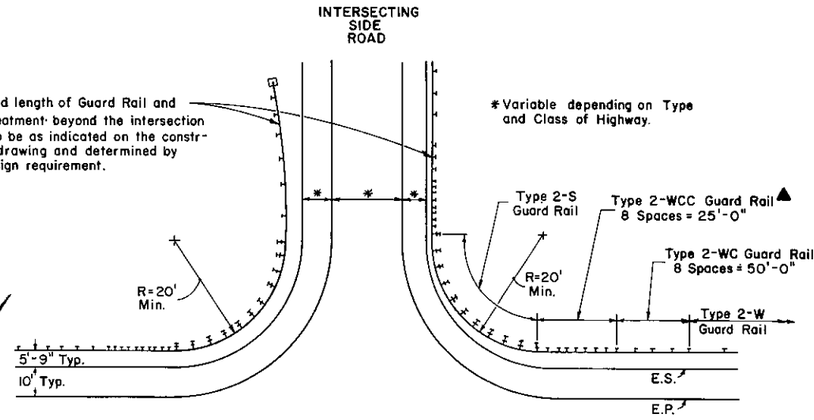
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

GUARD RAIL AND MEDIAN BARRIER PLACEMENT

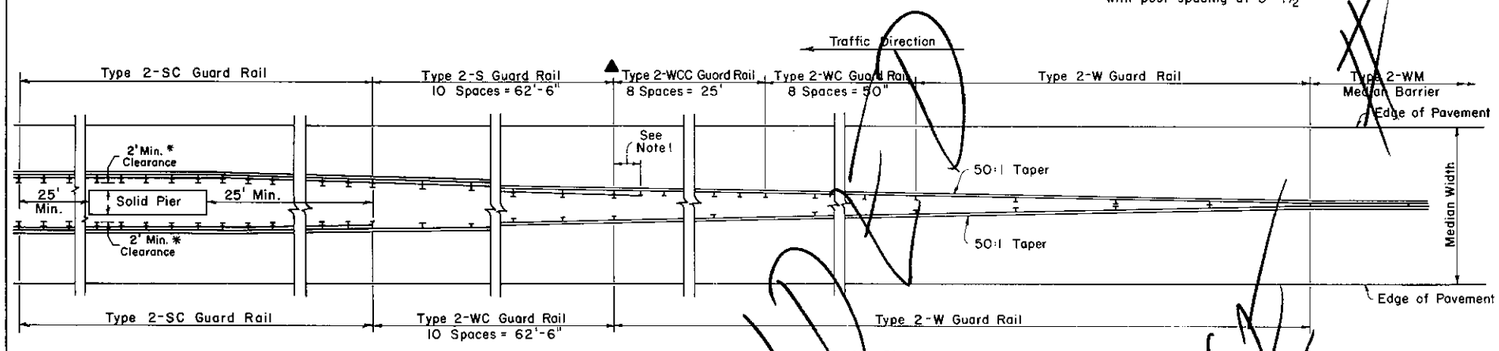
Recommended May 1, 1978	Approved May 1, 1978	Sht. 2 Of 3
B.D. [signature] Director, Bureau of Design	[signature] Deputy Chief Hwy. Engr.	RC-54



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



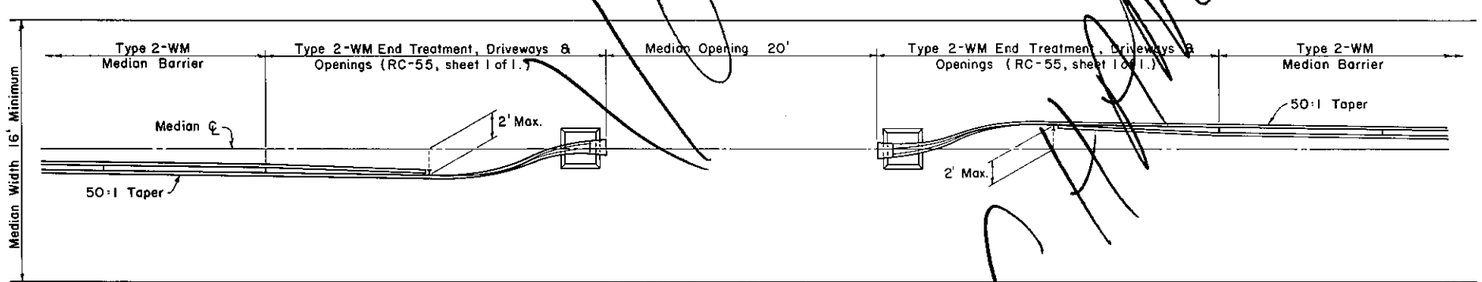
▲ Details for Type 2-WCC Guard Rail shall conform to the requirements of Type 2-W with post spacing at 3'-1½"



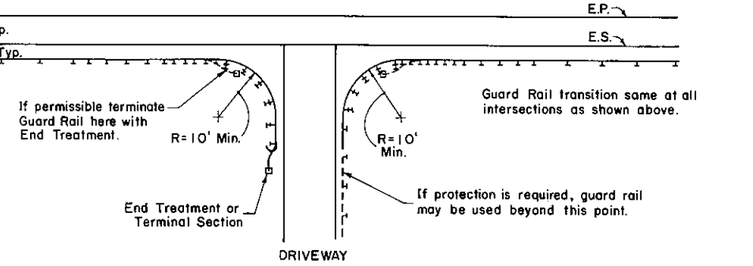
* See Notes 3 & 4

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'-1 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.

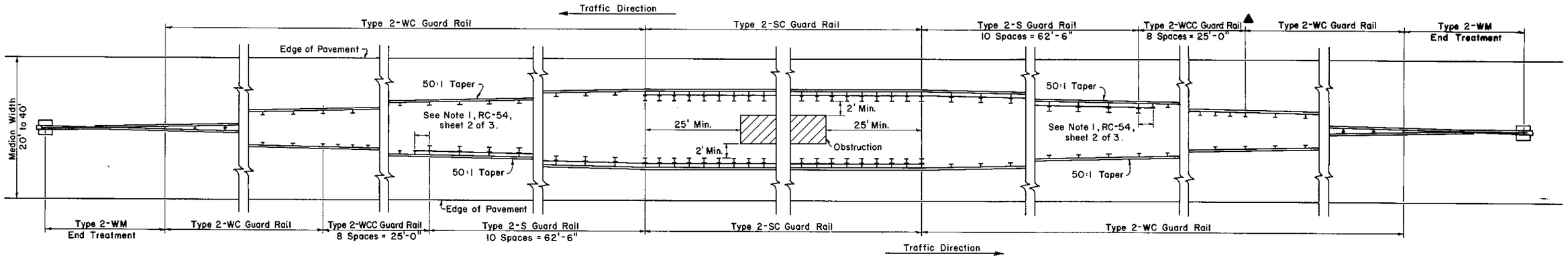
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

GUARD RAIL AND MEDIAN BARRIER PLACEMENT

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

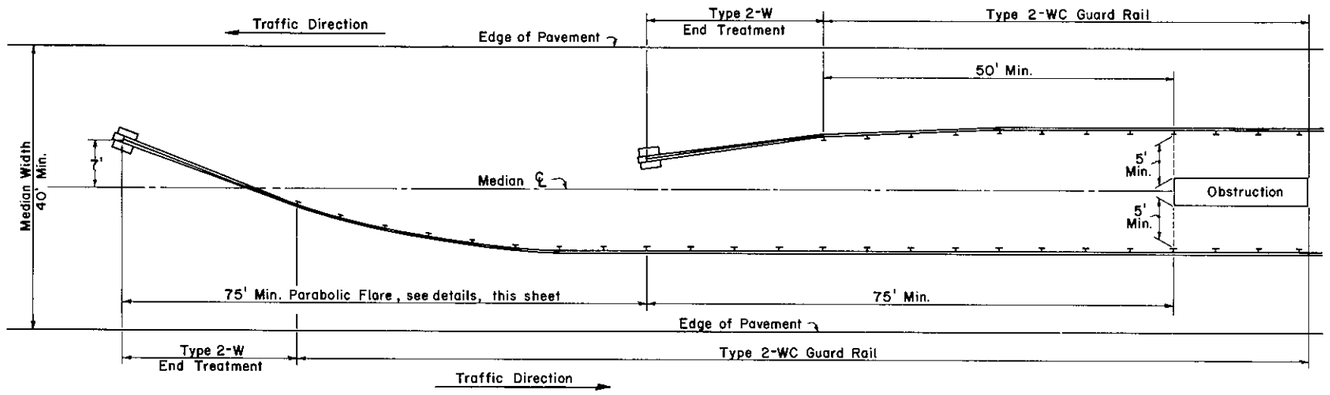
Approved June 1, 1976
Deputy Chief Hwy. Engr.

Sht. 2 of 3
RC-54

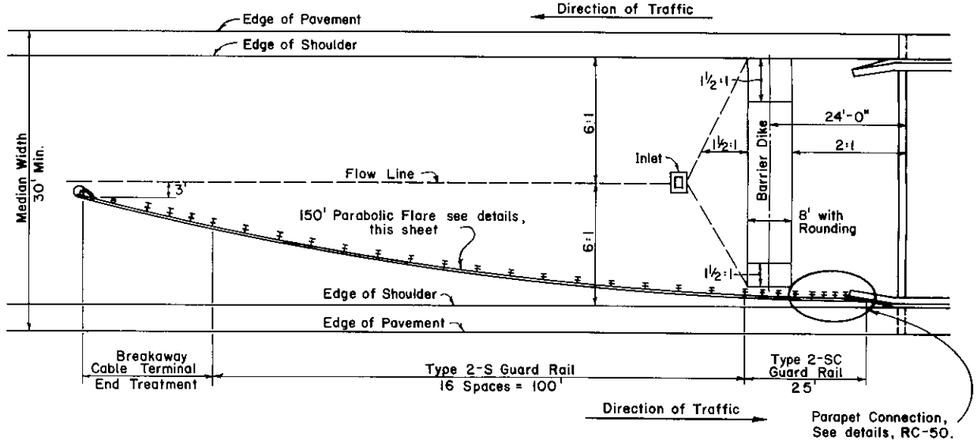


TREATMENT AT OBSTRUCTIONS FOR MEDIAN WIDTHS OF 20' TO 40' WHERE CONTINUOUS BARRIER IS NOT USED

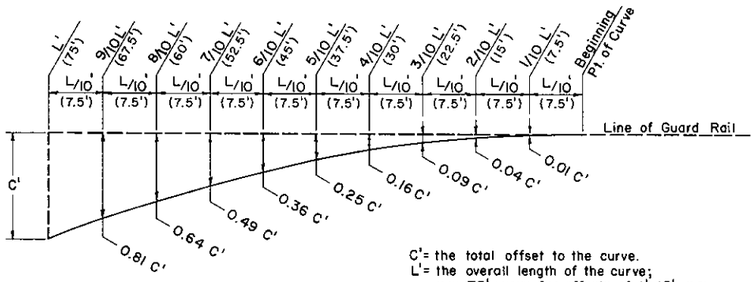
▲ Details for Type 2-WCC Guard Rail shall conform to the requirements of Type 2-W with post spacing at 3'-1½"



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

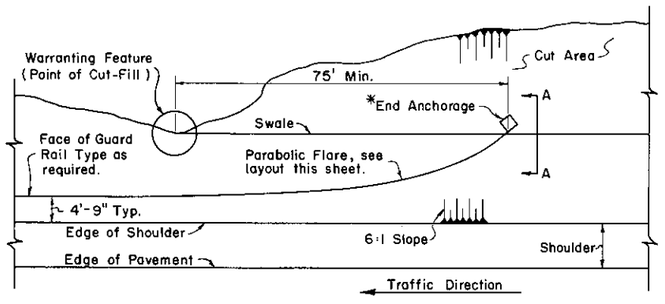


MEDIAN TREATMENT AT DUAL STRUCTURES

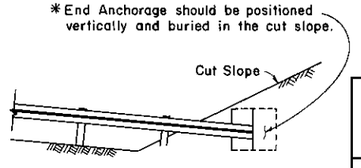


C'= the total offset to the curve.
L'= the overall length of the curve; use 75' curve for offsets of 1'-15' max., for larger offsets, use 150' length curve. (Distances for a 75' curve are shown in parentheses.)

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

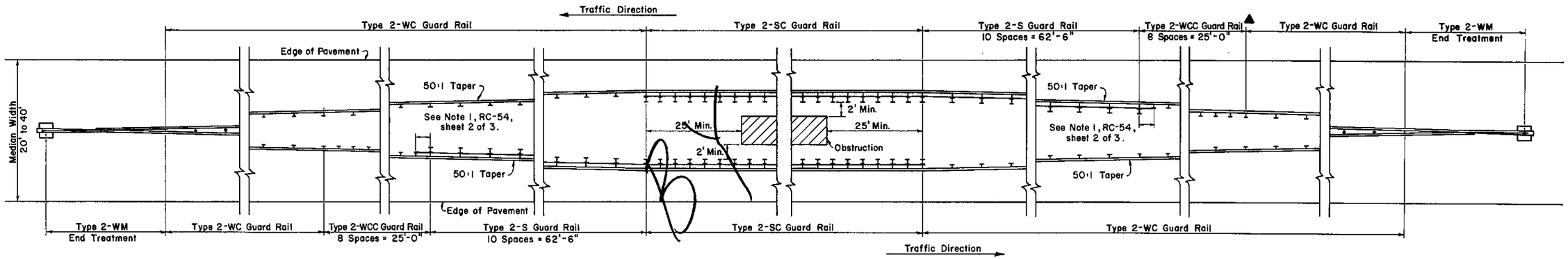
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

GUARD RAIL AND MEDIAN BARRIER PLACEMENT

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

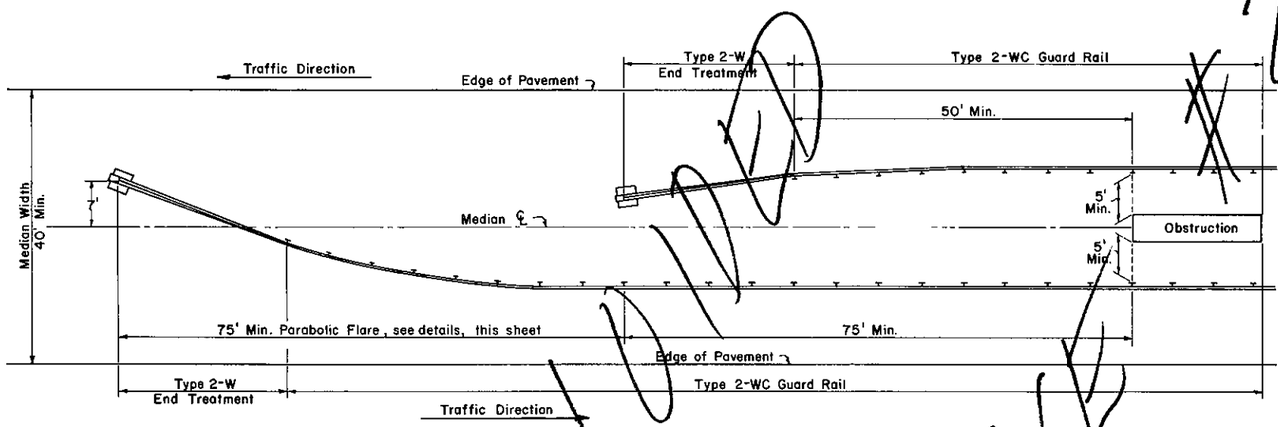
Approved May 1, 1978
James M. Shrader
Deputy Chief Hwy. Engr.

Sht. 3 Of 3
RC-54

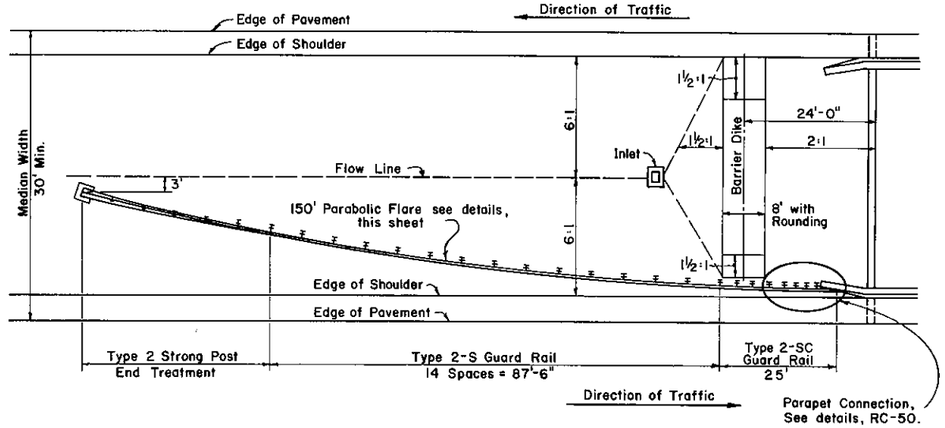


TREATMENT AT OBSTRUCTIONS FOR MEDIAN WIDTHS OF 20' TO 40' WHERE CONTINUOUS BARRIER IS NOT USED

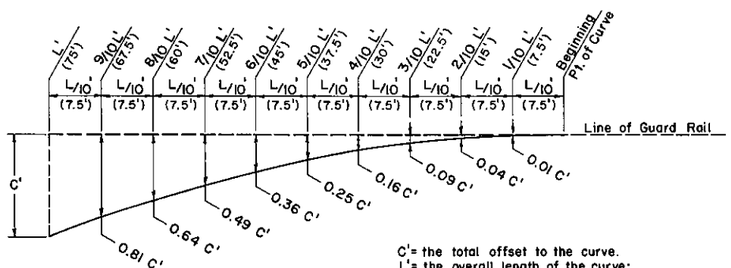
▲ Details for Type 2-WCC Guard Rail shall conform to the requirements of Type 2-W with post spacing at 3'-1½"



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

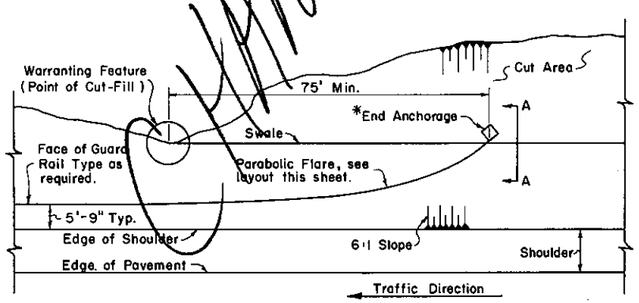


MEDIAN TREATMENT AT DUAL STRUCTURES

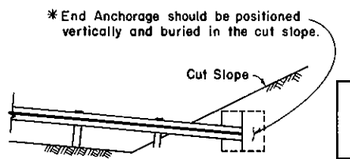


C'= the total offset to the curve.
L'= the overall length of the curve; use 75' curve for offsets of 1'-15' max., for larger offsets, use 150' length curve. (Distances for a 75' curve are shown in parentheses.)

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

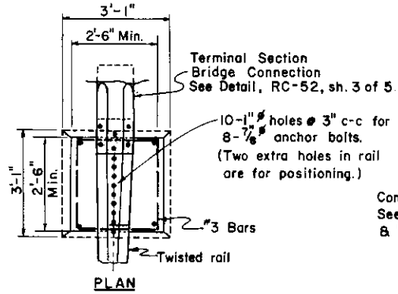
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

GUARD RAIL AND MEDIAN BARRIER PLACEMENT

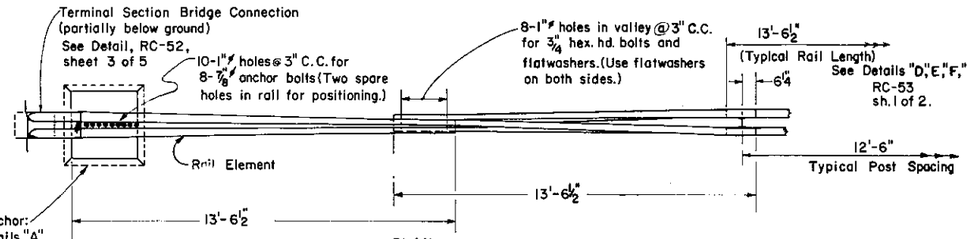
Recommended June 1, 1976
B.D. Rankin
Director, Bureau of Design

Approved June 1, 1976
Robert P. Moore
Deputy Chief Hwy. Engr.

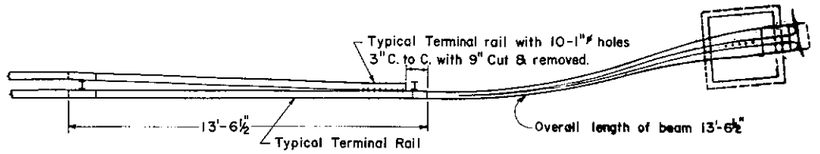
Sht. 3 Of 3
RC-54



PLAN



PLAN



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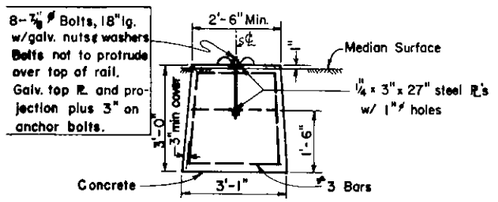
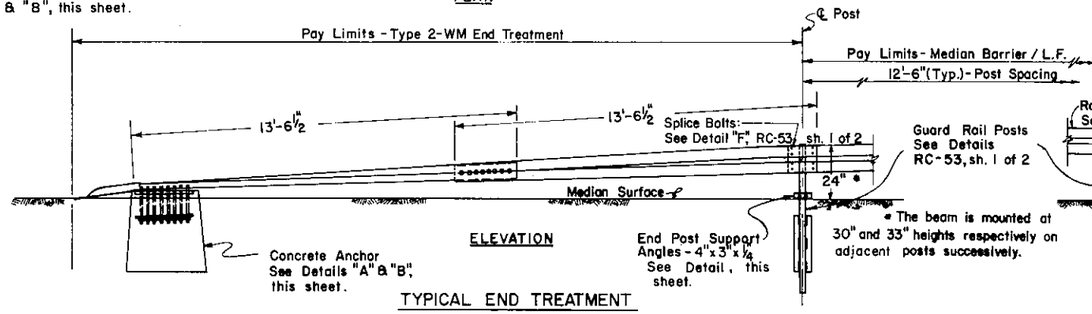


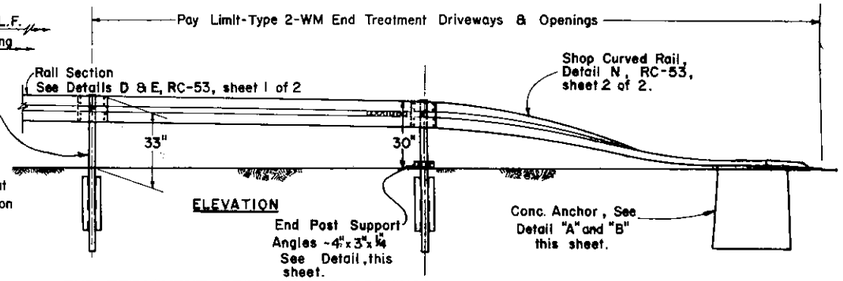
ELEVATION

DETAIL "A"
CONCRETE ANCHOR



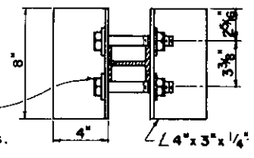
ELEVATION

TYPICAL END TREATMENT

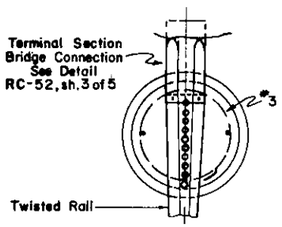


ELEVATION

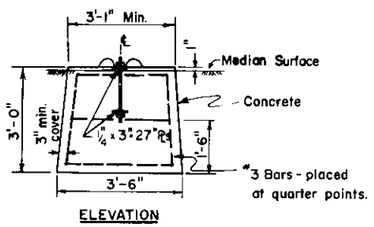
END TREATMENT DRIVEWAYS & OPENINGS



END POST SUPPORT ANGLES

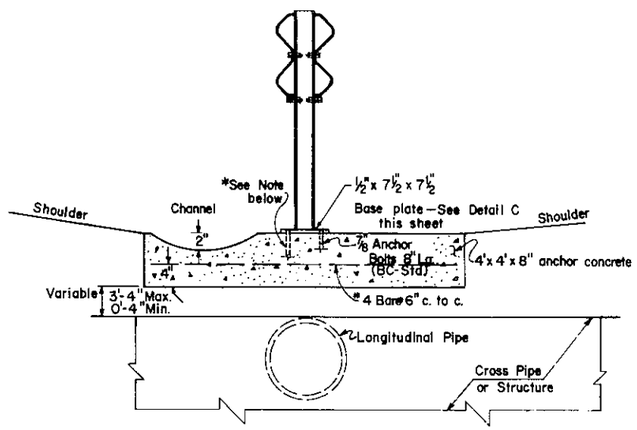


PLAN



ELEVATION

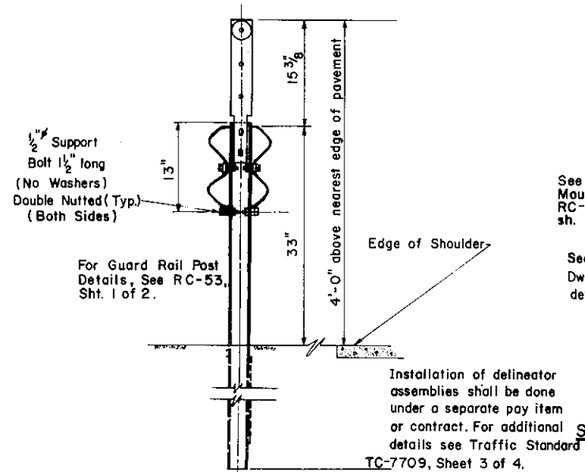
DETAIL "B"
ALTERNATE CONC. ANCHOR



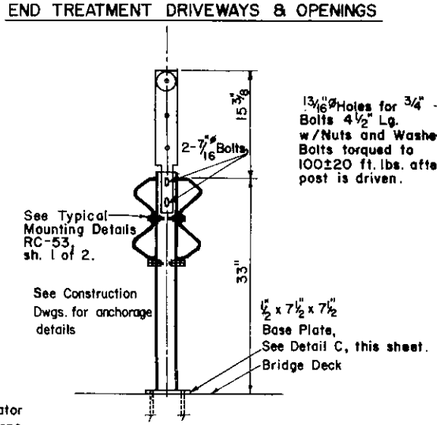
TYPICAL INSTALLATION WHEN CROSSING UNDERGROUND STRUCTURE

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

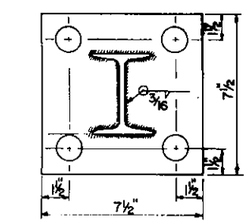
* For anchorage to existing bridge decks and divisors, see Bridge Construction Drawings.



TYPE 2-WM MEDIAN BARRIER
WITH TRAFFIC DELINEATOR BRACKET

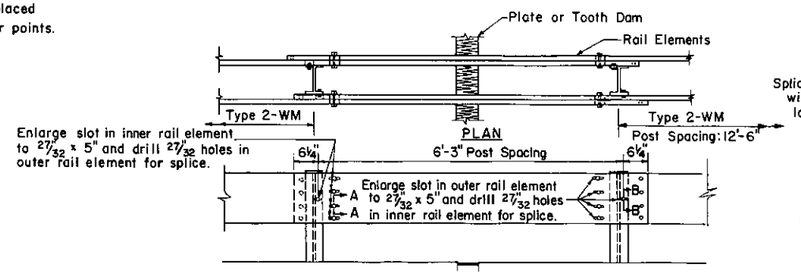


STRUCTURE MOUNTED BARRIER
(Existing Structure)



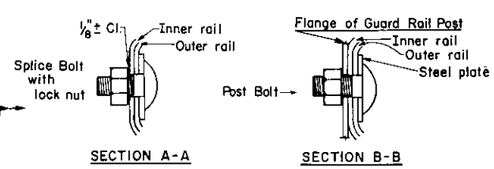
BASE PLATE DETAIL C

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

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

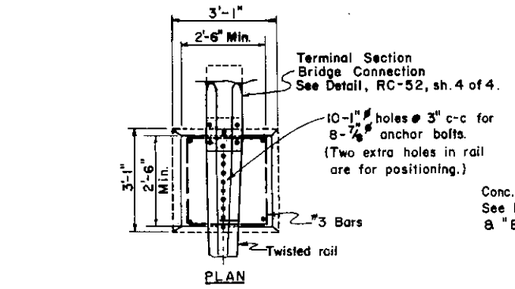
TYPE 2 WEAK POST MEDIAN BARRIER

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

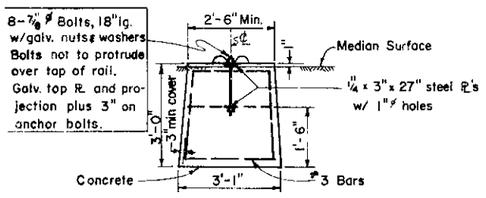
Approved May 1, 1978
James R. Sheehan
Deputy Chief Hwy. Engr.

Sht. 1 Of 1

RC-55

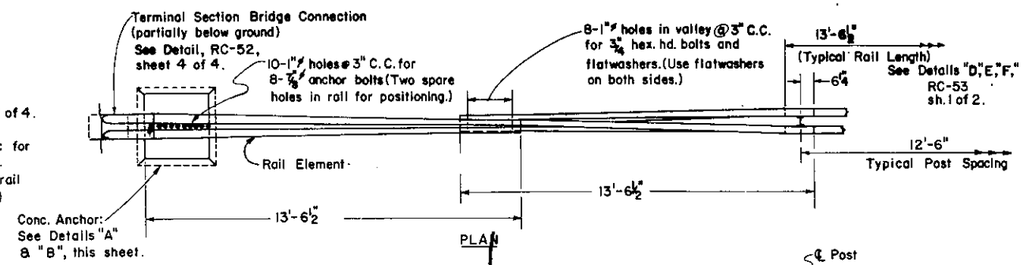


PLAN

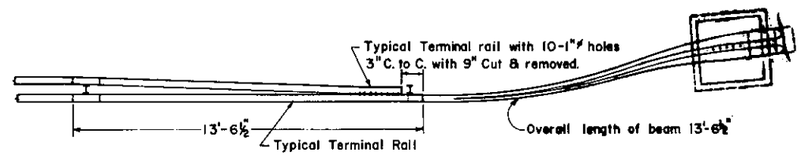


ELEVATION

DETAIL "A"
CONCRETE ANCHOR



PLAN



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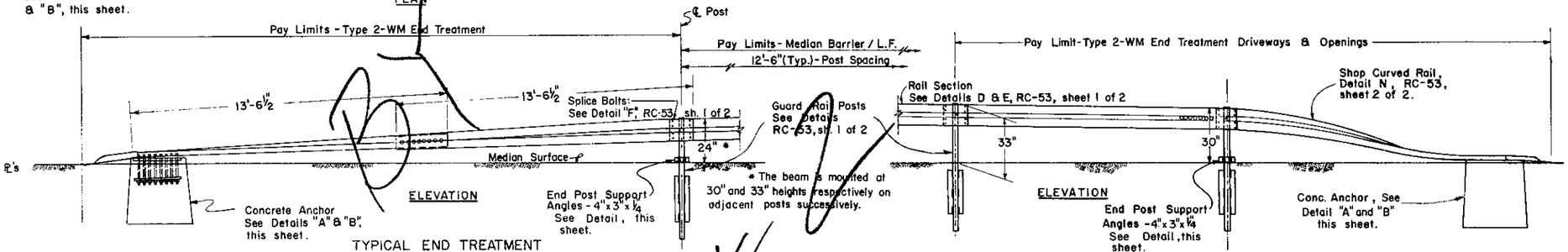
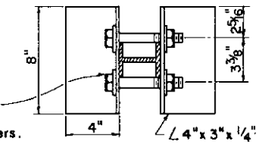


ELEVATION

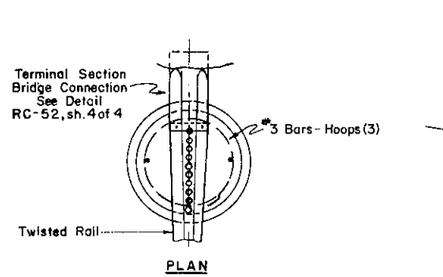
TYPICAL END TREATMENT

ELEVATION

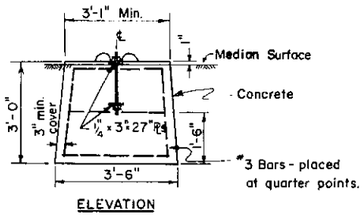
END TREATMENT DRIVEWAYS & OPENINGS



END POST SUPPORT ANGLES

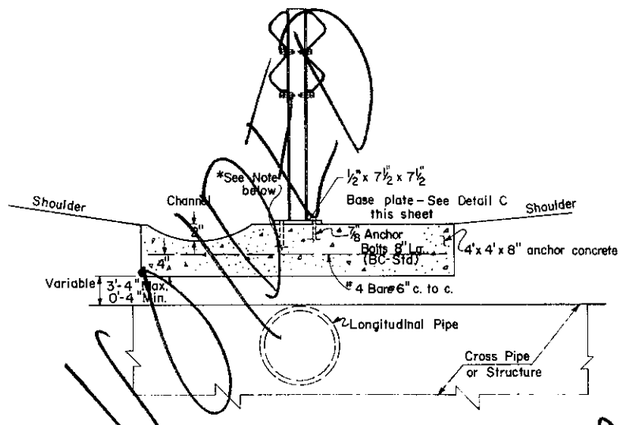


PLAN



ELEVATION

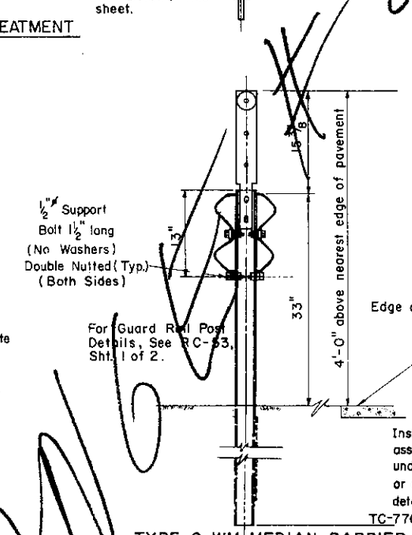
DETAIL "B"
ALTERNATE CONC. ANCHOR



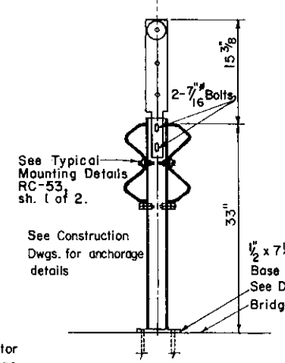
TYPICAL INSTALLATION WHEN CROSSING UNDERGROUND STRUCTURE

No separate payment will be made for this type construction. See Note 1 on RC-52 Sheet 2 of 4

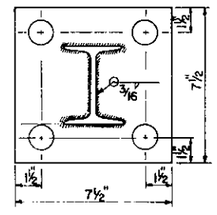
* For anchorage to existing bridge decks and divisors, see Bridge Construction Drawings.



TYPE 2-WM MEDIAN BARRIER
WITH TRAFFIC DELINEATOR BRACKET

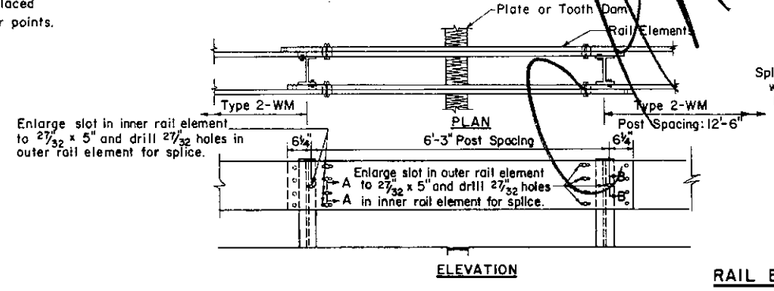


STRUCTURE MOUNTED BARRIER
(Existing Structure)



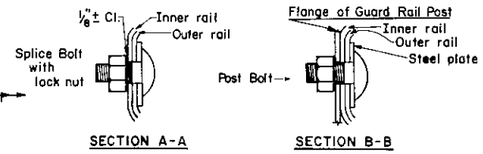
BASE PLATE DETAIL C

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

RAIL EXPANSION JT. DETAIL



SECTION A-A

SECTION B-B

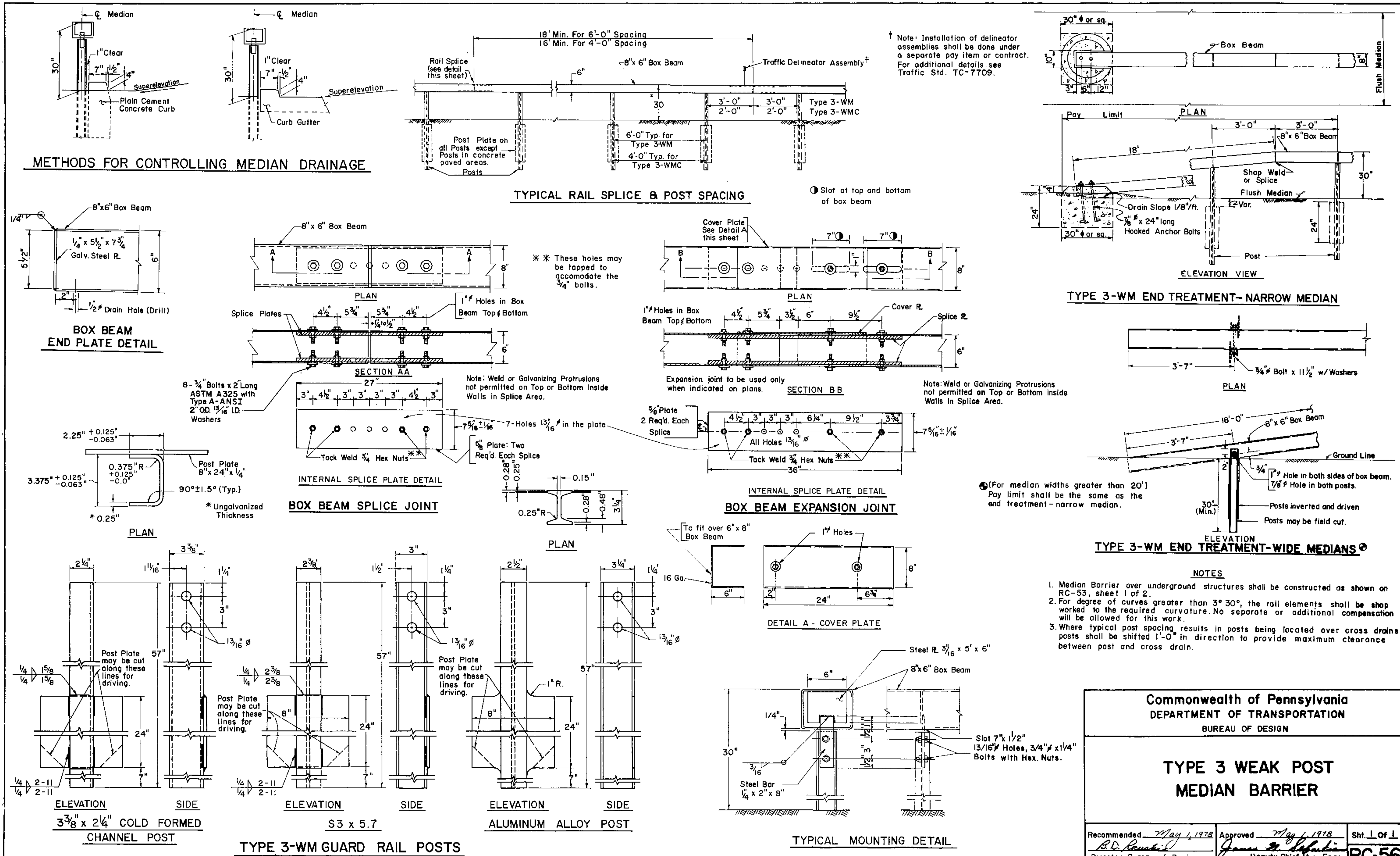
No separate or additional payments will be made for installing Rail Expansion Joints.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

TYPE 2 WEAK POST MEDIAN BARRIER

Recommended	Approved	Std. No.
June 1, 1976	June 1, 1976	RC-55
B.D. Burkis, Director, Bureau of Design	Robert R. Mason, Deputy Chief Engr.	

TRACED BY
CHKD BY



METHODS FOR CONTROLLING MEDIAN DRAINAGE
℄ Median
1" Clear
Superelevation
Plain Cement Concrete Curb
Curb Gutter
TYPICAL RAIL SPLICE & POST SPACING
18' Min. For 6'-0" Spacing
16' Min. For 4'-0" Spacing
Rail Splice (see detail this sheet)
8" x 6" Box Beam
Traffic Delineator Assembly †
Type 3-WM
Type 3-WMC
Post Plate on all Posts except Posts in concrete paved areas.
6'-0" Typ. for Type 3-WM
4'-0" Typ. for Type 3-WMC
† 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
Flush Median
PLAN
Pay Limit
8" x 6" Box Beam
Shop Weld or Splice
Drain Slope 1/8"/ft.
7/8" ø x 24" long Hooked Anchor Bolts
Post
ELEVATION VIEW
◑ Slot at top and bottom of box beam
BOX BEAM END PLATE DETAIL
1/4" x 5 1/2" x 7 3/4" Galv. Steel Pl.
1/2" ø Drain Hole (Drill)
BOX BEAM SPLICE JOINT
Splice Plates
1" ø Holes in Box Beam Top & Bottom
SECTION AA
8 - 3/4" Bolts x 2" Long ASTM A325 with Type A-ANSI 2" O.D. 13/16" I.D. Washers
Note: Weld or Galvanizing Protrusions not permitted on Top or Bottom inside Walls in Splice Area.
** These holes may be tapped to accomodate the 3/4" bolts.
7-Holes 13/16" ø in the plate
5/8" Plate: Two Req'd. Each Splice
Tack Weld 3/4" Hex Nuts **
INTERNAL SPLICE PLATE DETAIL
BOX BEAM EXPANSION JOINT
Cover Plate See Detail A this sheet
Cover Pl.
Splice Pl.
Expansion joint to be used only when indicated on plans.
SECTION BB
5/8" Plate 2 Req'd. Each Splice
All Holes 13/16" ø
INTERNAL SPLICE PLATE DETAIL
Post Plate 8" x 24" x 1/4"
90° ± 1.5° (Typ.)
* Ungalvanized Thickness
PLAN
3/4" ø Bolt x 11 1/2" w/ Washers
Ground Line
1" ø Hole in both sides of box beam.
7/8" ø Hole in both posts.
Posts inverted and driven
Posts may be field cut.
ELEVATION
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.
DETAIL A - COVER PLATE
To fit over 6" x 8" Box Beam
16 Ga.
1" ø Holes
TYPICAL MOUNTING DETAIL
Steel Pl. 3/16 x 5" x 6"
8" x 6" Box Beam
Slot 7" x 1 1/2"
13/16" ø Holes, 3/4" ø x 1 1/4" Bolts with Hex. Nuts.
Steel Bar 1/4 x 2" x 8"
TYPE 3-WM GUARD RAIL POSTS
3 3/8" x 2 1/4" COLD FORMED CHANNEL POST
S3 x 5.7
ALUMINUM ALLOY POST
ELEVATION
SIDE
Post Plate may be cut along these lines for driving.

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

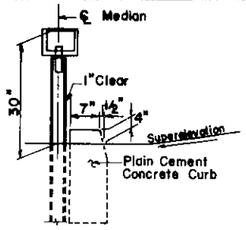
TYPE 3 WEAK POST MEDIAN BARRIER

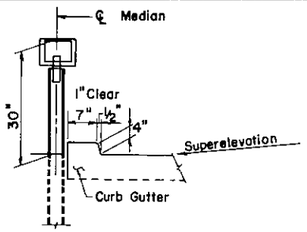
Recommended May 1, 1978 B.D. Rowski — Director, Bureau of Design

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

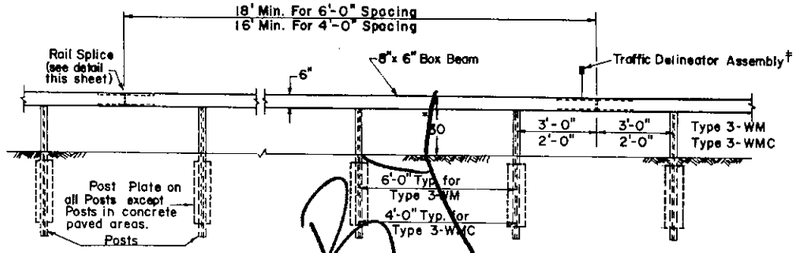
Sht. 1 Of 1

RC-56



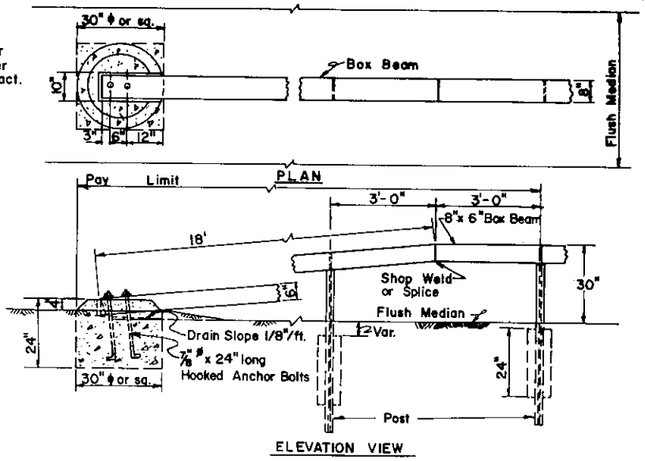


METHODS FOR CONTROLLING MEDIAN DRAINAGE

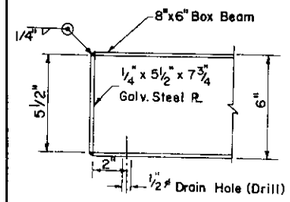


TYPICAL RAIL SPLICE & POST SPACING

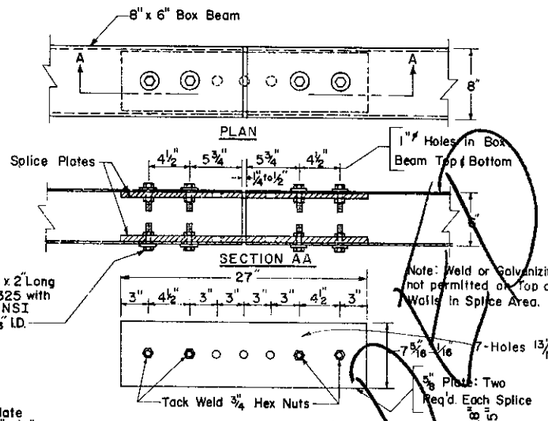
† Note: Installation of delineator assemblies shall be done under a separate pay item or contract. For additional details see Traffic Std. TC-7709.



TYPE 3-WM END TREATMENT- NARROW MEDIAN

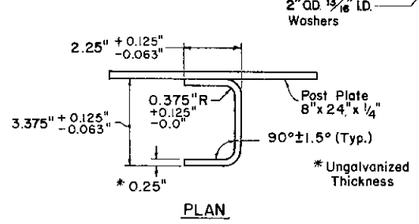


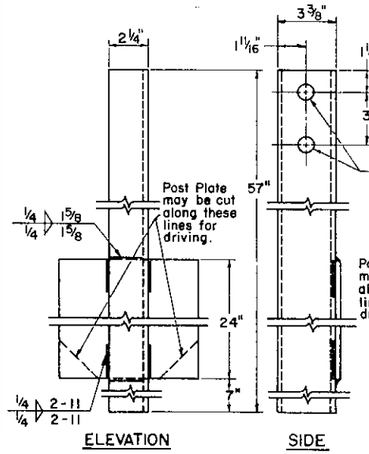
BOX BEAM END PLATE DETAIL



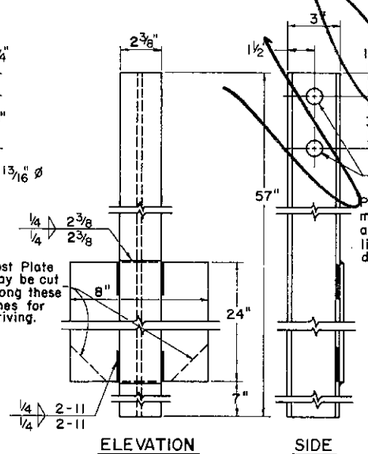
Note: Weld or Galvanizing Protrusions not permitted on Top or Bottom Inside Walls in Splice Area.

BOX BEAM SPLICE JOINT

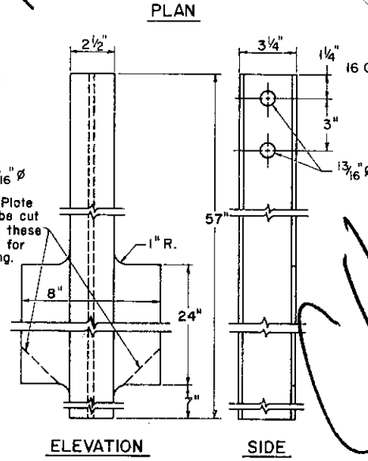




3⅜" x 2¼" COLD FORMED CHANNEL POST



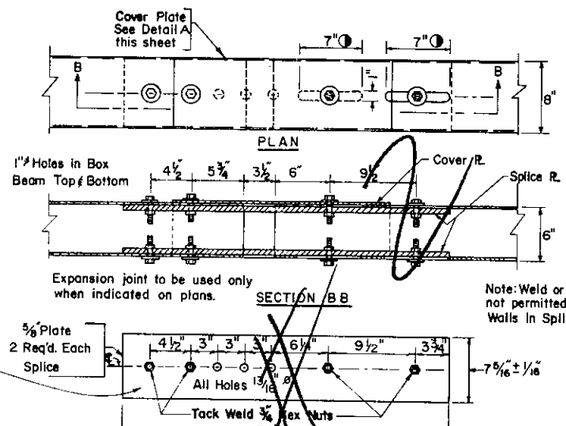
S3 x 5.7



ALUMINUM ALLOY POST

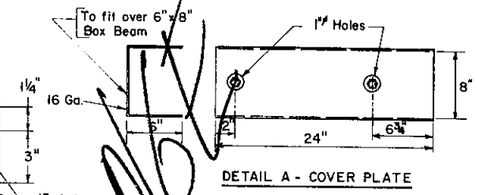
TYPE 3-WM GUARD RAIL POSTS

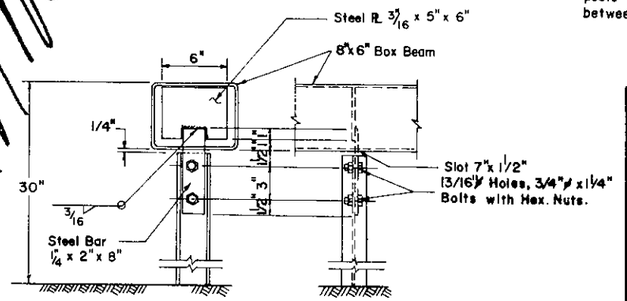
◑ Slot at top and bottom of box beam



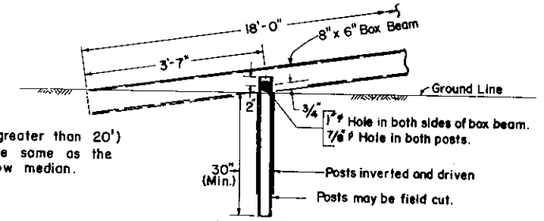
Note: Weld or Galvanizing Protrusions not permitted on Top or Bottom inside Walls in Splice Area.

BOX BEAM EXPANSION JOINT





TYPICAL MOUNTING DETAIL



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.

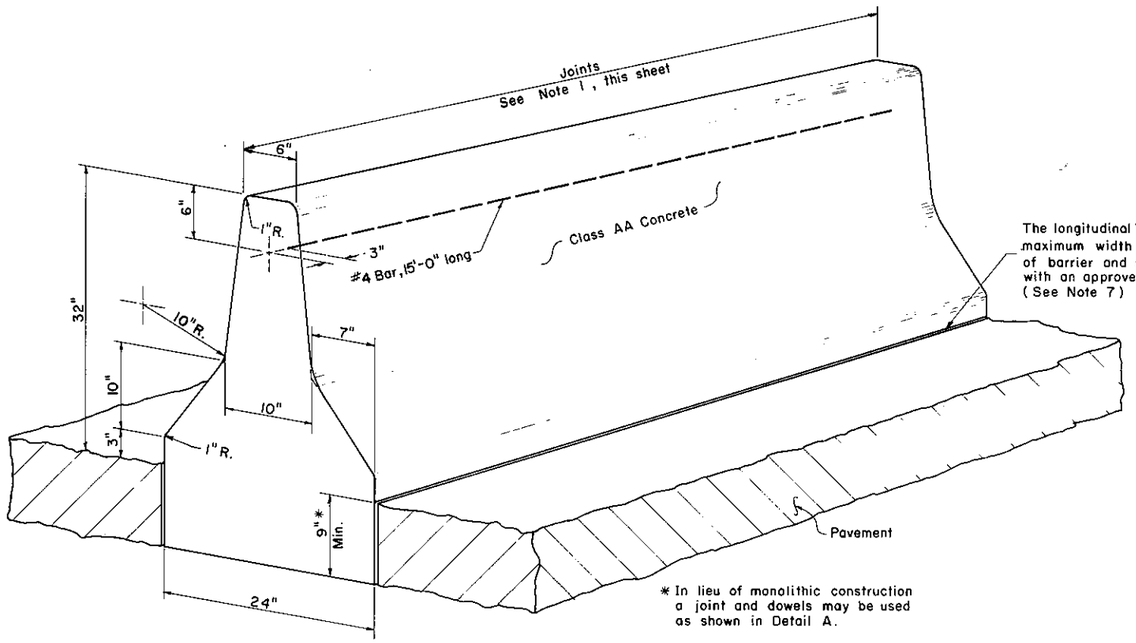
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

TYPE 3 WEAK POST MEDIAN BARRIER

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

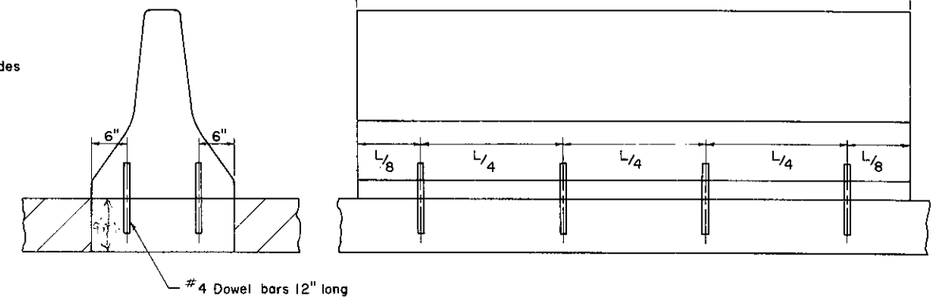
Approved: June 1, 1976
Robert P. Maxon
Deputy Chief Hwy. Engr.

SHT. 1 OF 1
RC-56



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)

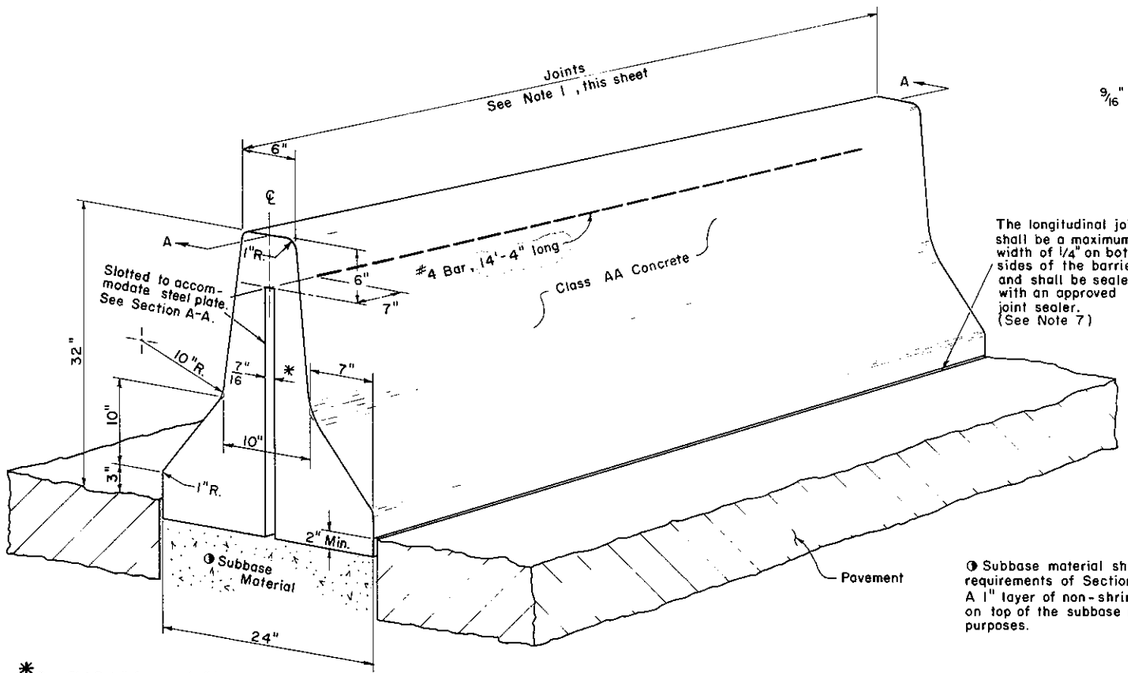
* In lieu of monolithic construction a joint and dowels may be used as shown in Detail A.



DETAIL A

CONCRETE MEDIAN BARRIER WITHOUT JOINT CONTINUITY

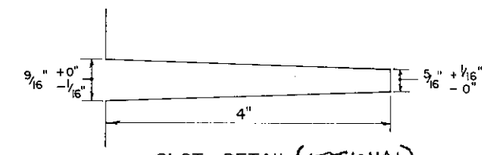
(See Note 2)



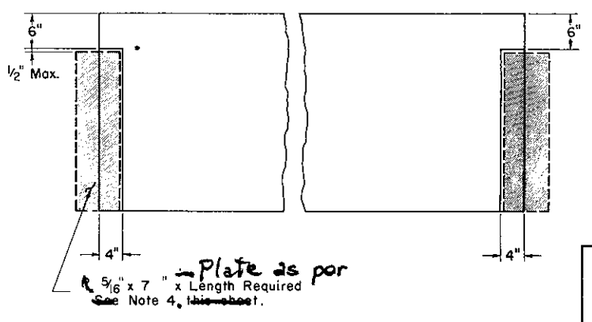
The longitudinal joint shall be a maximum width of 1/4" on both sides of the barrier and shall be sealed with an approved joint sealer. (See Note 7)

◑ 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 (OPTIONAL)



SECTION A-A

CONCRETE MEDIAN BARRIER WITH JOINT CONTINUITY

(See Note 2)

NOTES

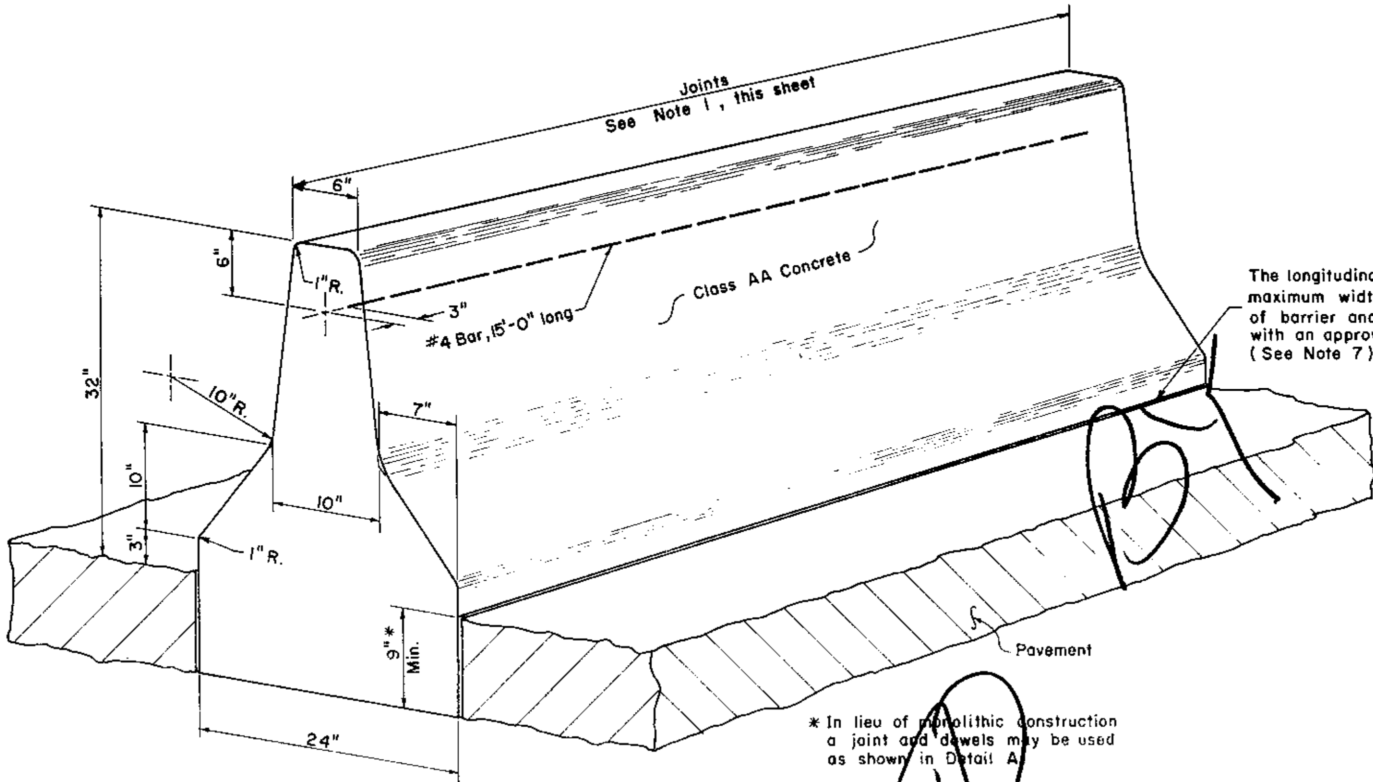
1. Barrier joints, alignment, surface texture, and other construction details shall be in accordance with Section 623, Form 408.
2. The concrete median barrier shown may be constructed using either slip forming, cast in place, or precast units. Modifications or deviation from the standards will require 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

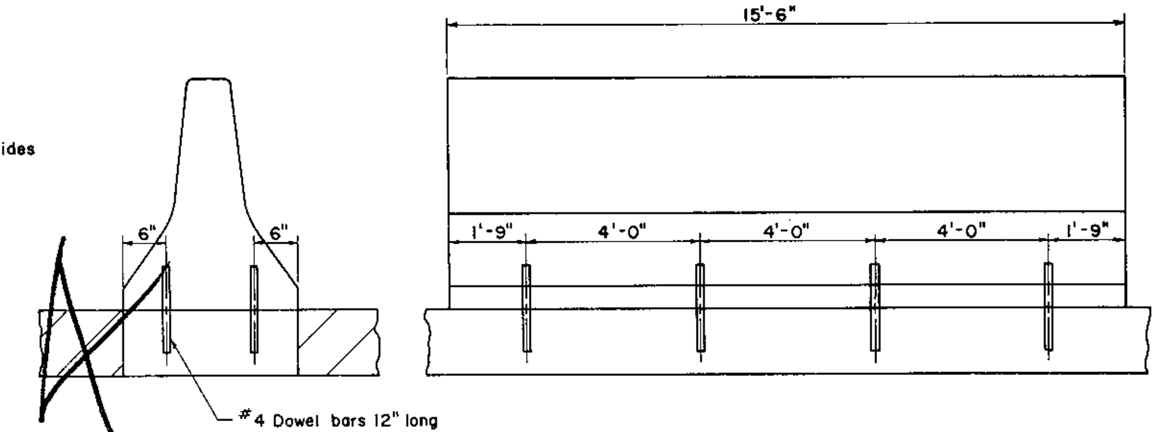
Recommended May 31, 1979 B.D. Gamble Director, Bureau of Design	Approved May 31, 1979 David Oliver Chief Hwy. Engr.	Sht. 1 Of 2 RC-57

TRACED BY
FINAL BY

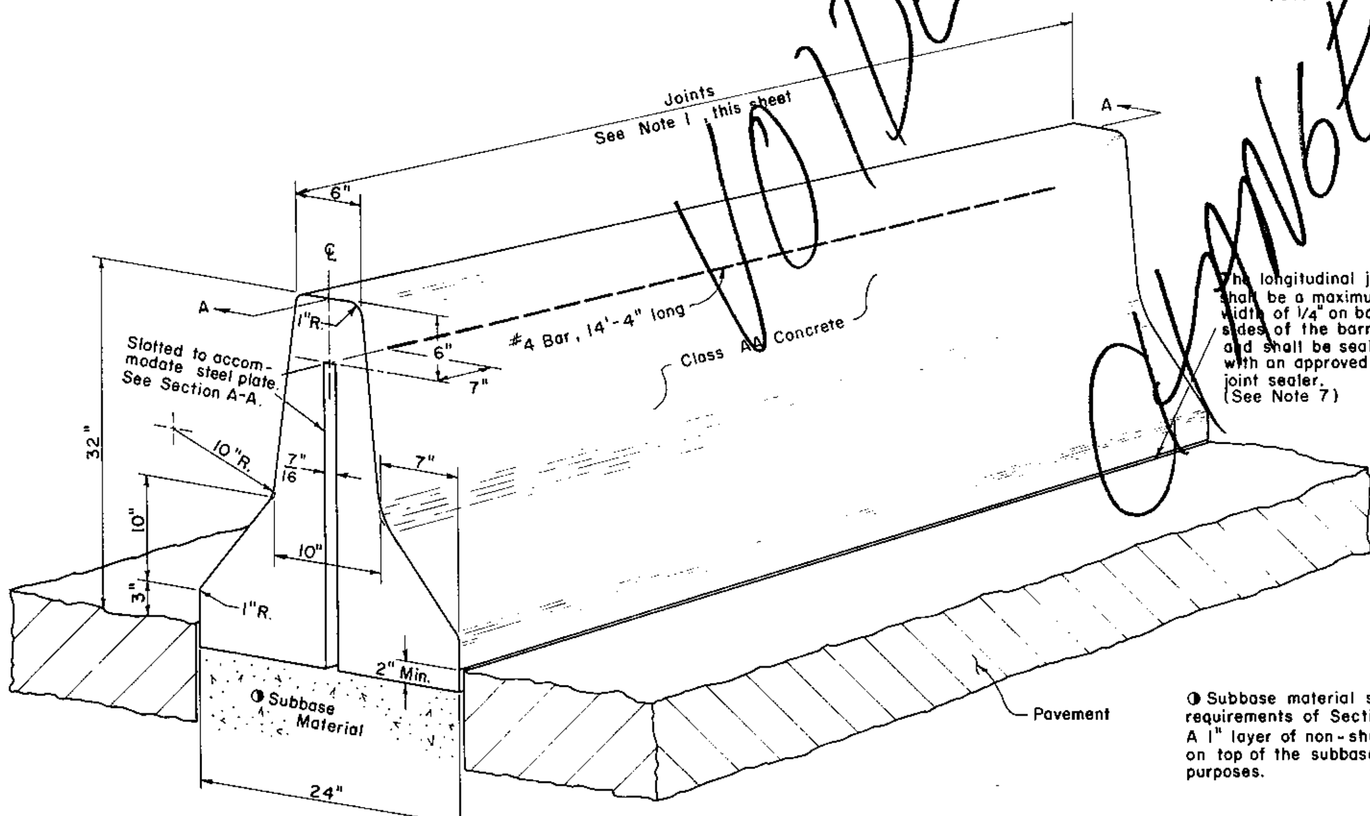


CONCRETE MEDIAN BARRIER WITHOUT JOINT CONTINUITY

(See Note 2)



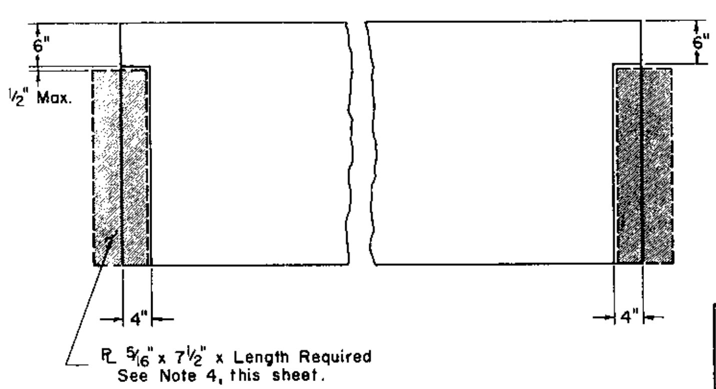
DETAIL A



◑ 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.

CONCRETE MEDIAN BARRIER WITH JOINT CONTINUITY

(See Note 2)

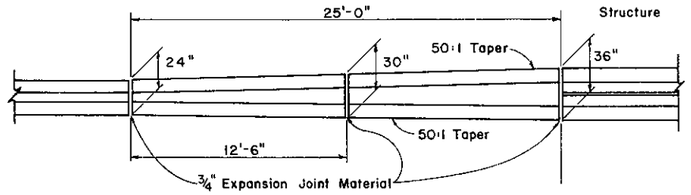


SECTION A-A

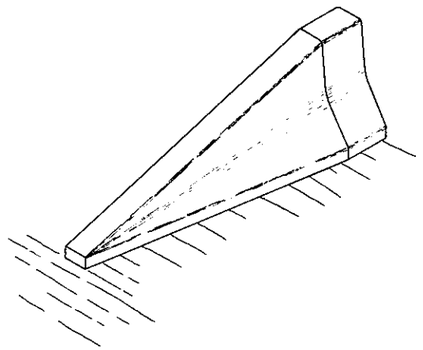
NOTES

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.
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' barriers must be adjusted to maintain longitudinal joint tolerances.

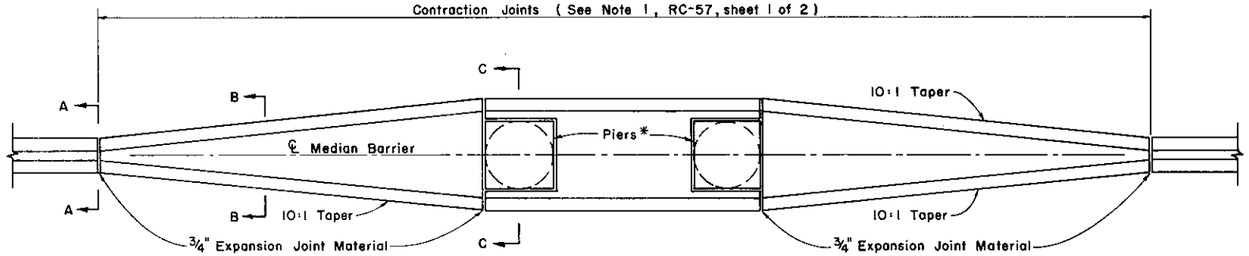
Commonwealth of Pennsylvania DEPARTMENT OF TRANSPORTATION BUREAU OF DESIGN		
CONCRETE MEDIAN BARRIER		
Recommended June 1, 1976 B.D. Rankin Director, Bureau of Design	Approved June 1, 1976 Robert R. Munson Deputy Chief Hwy. Engr.	Sht. 1 Of 2 RC-57



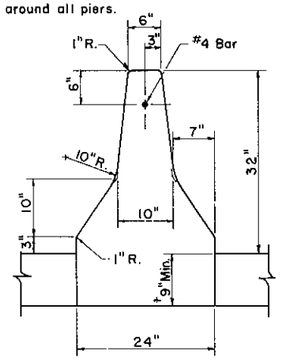
MEDIAN BARRIER TRANSITION DETAIL



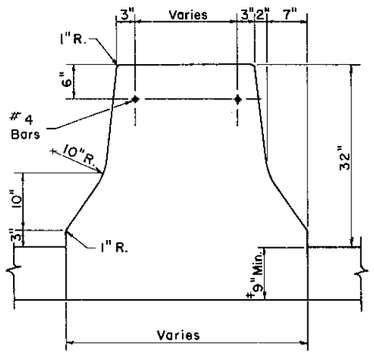
† See RC-57, sheet 1 of 2, for other approved foundation alternates.



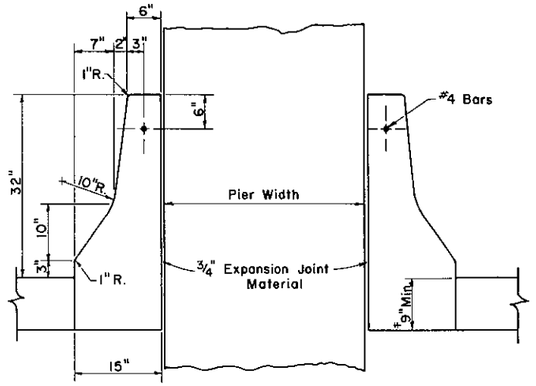
* ¾" Expansion Joint Material shall be used around all piers.



SECTION A-A

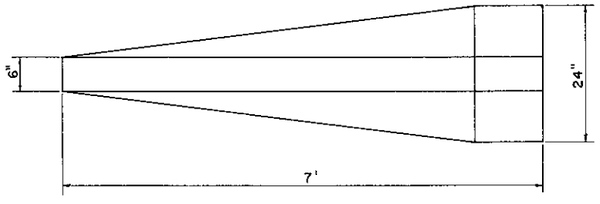


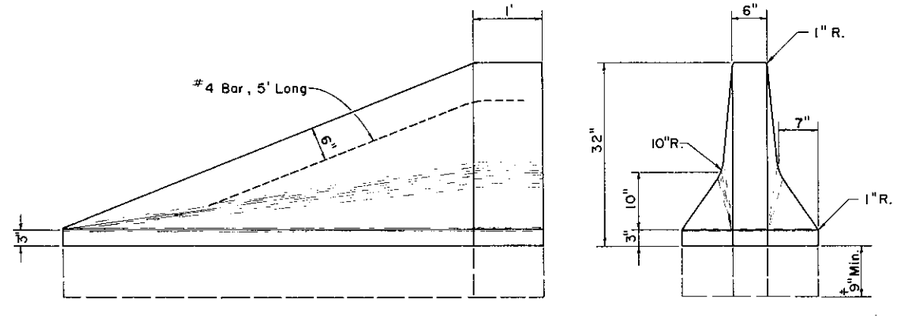
SECTION B-B



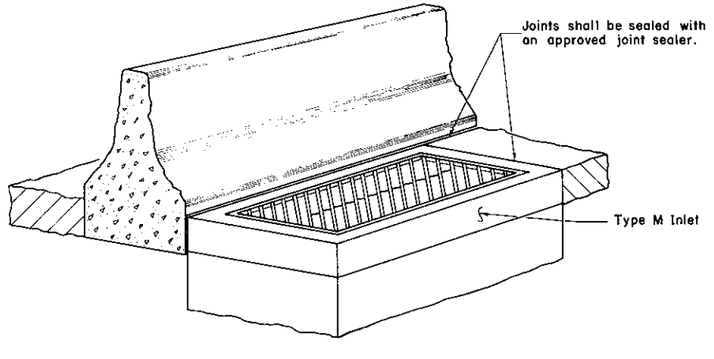
SECTION C-C

CONCRETE MEDIAN BARRIER TREATMENT AT PIERS





CONCRETE MEDIAN BARRIER END TRANSITION



INLET PLACEMENT AT CONCRETE MEDIAN BARRIER

NOTES

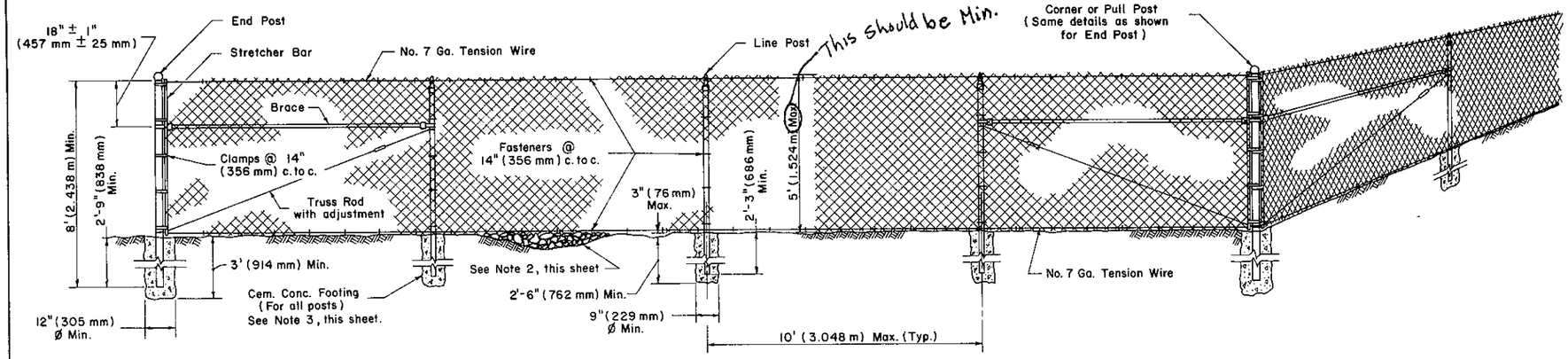
1. No additional compensation will be allowed for transitions in the concrete median barrier at piers or structures.
2. At hazardous locations, impact attenuators such as Hydro Cushion, G.R.E.A.T. System, or Texas Barrels, should only be considered for installations after all alternative protective methods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

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

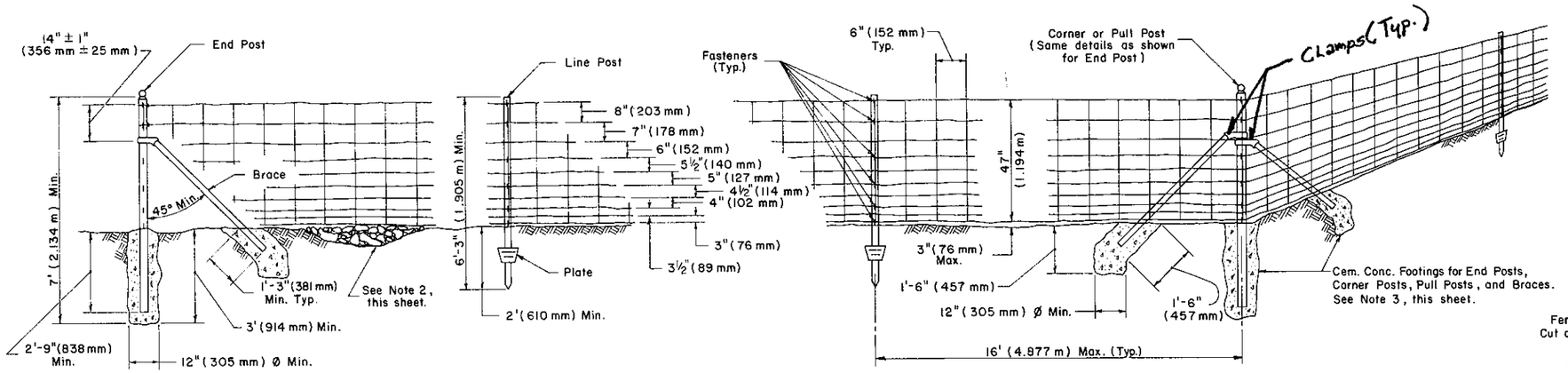
CONCRETE MEDIAN BARRIER

May 31, 1979 — drawing #4 — May 31, 1979

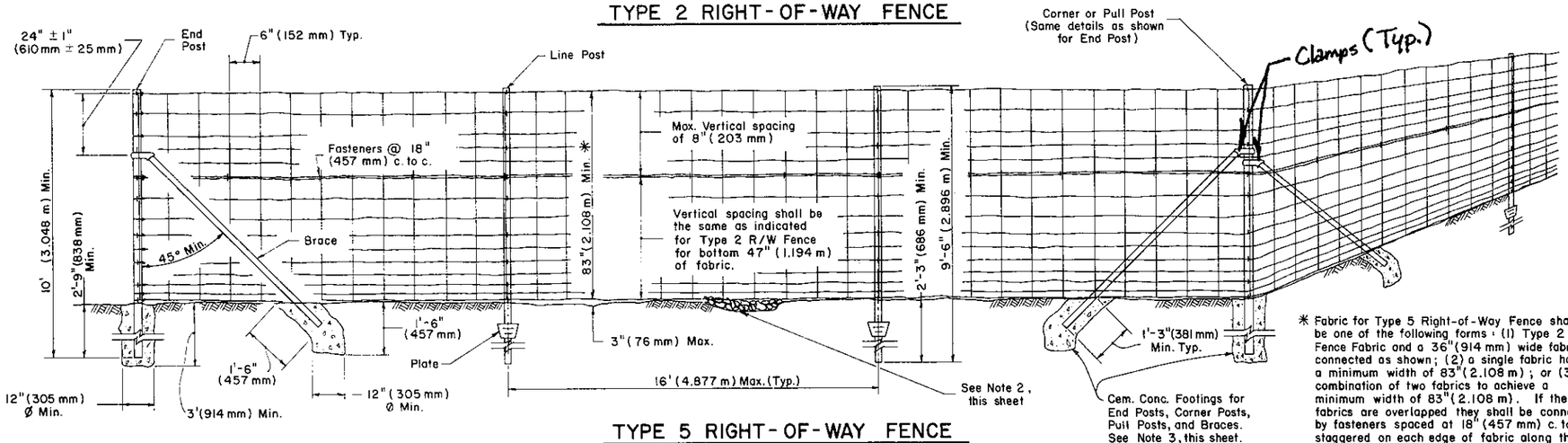
Recommended June 1, 1976	Approved June 1, 1976	Sht. 2 Of 2
B.D. Rudisill	Robert R. Mercer	RC-57
Director, Bureau of Design	Deputy Chief Hwy. Engr.	



TYPE 1 RIGHT-OF-WAY FENCE



TYPE 2 RIGHT-OF-WAY FENCE

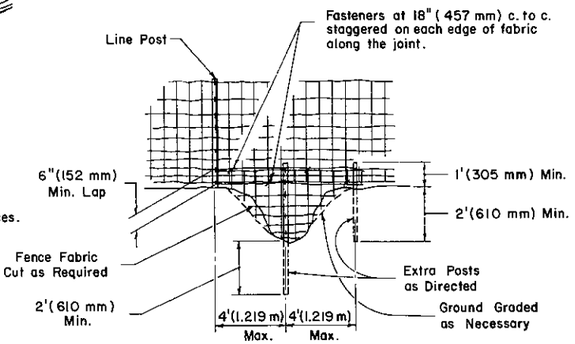


TYPE 5 RIGHT-OF-WAY FENCE

* 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 [redacted], Form 408 Specifications, Section 624, Right-of-Way Fence
2. All depressions greater than 3" (76mm) & less than 1' (305mm) 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.



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

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

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

RIGHT-OF-WAY FENCE

Clamps #3

Sept 1, 1978 — Sept 1, 1978

Recommended [illegible]
Director, Bureau of Design

Approved [illegible]
Deputy Chief Hwy. Engr.

Sht. 1 Of 2

RC-60

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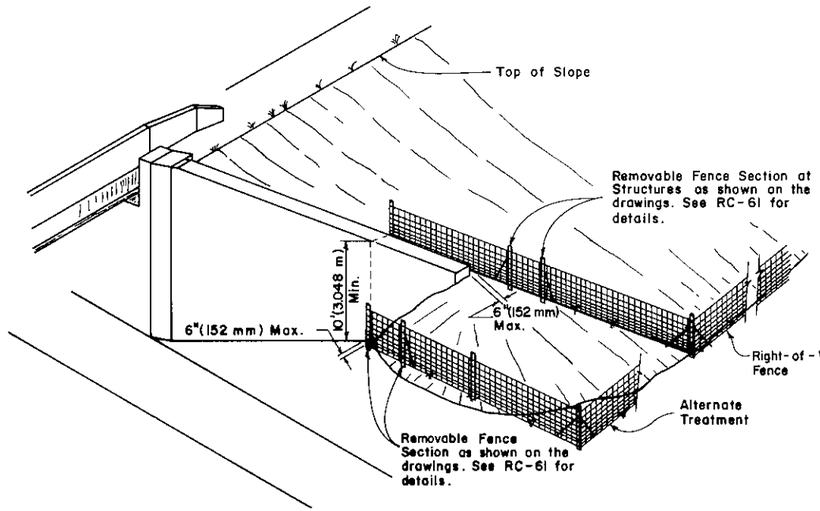
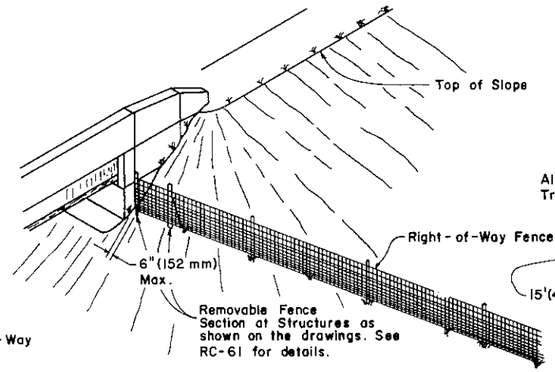
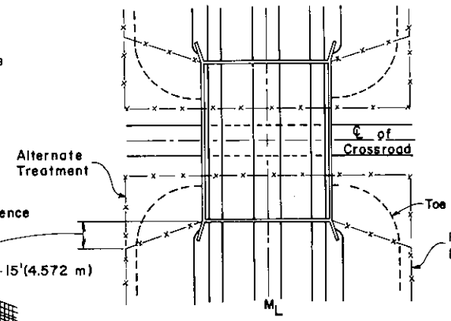
FINAL BY



R/W FENCE TREATMENT AT HIGH WALLED ABUTMENT

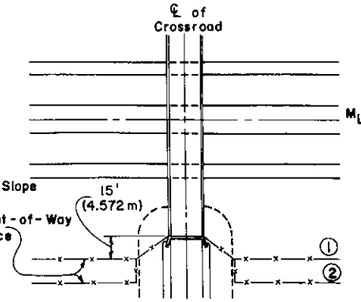


R/W FENCE TREATMENT AT STUB ABUTMENTS



HIGHWAY OVER CROSSROAD

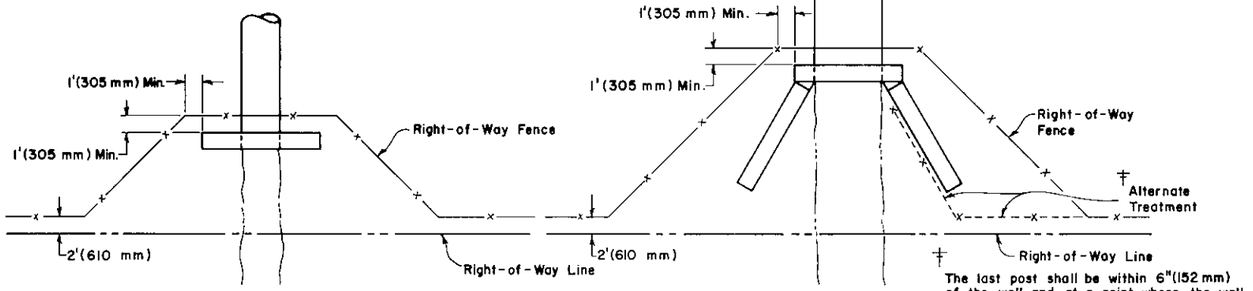
If the roadway has dual stuctures, the right-of-way fence shall be erected to close off the median area.



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.

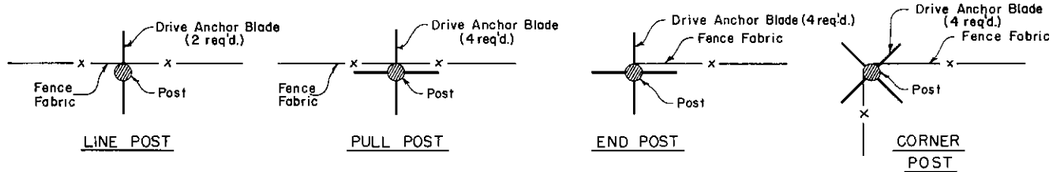
② If right-of-way is greater than 15'(4.572 m) from the projected face of the backwall, place fence parallel to crossroad and angle into abutment as shown.



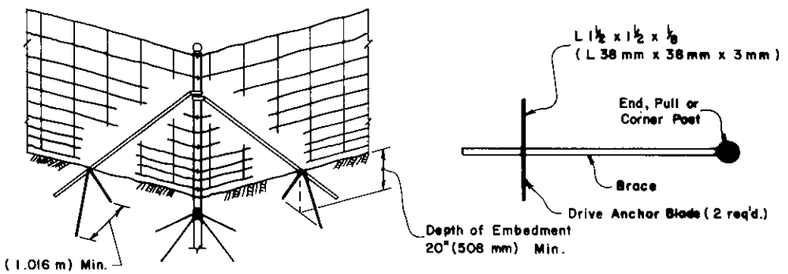
The last post shall be within 6"(152 mm) of the wall and at a point where the wall height is not less than 10'(3.048 m).

R/W FENCE TREATMENT AT CULVERTS

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

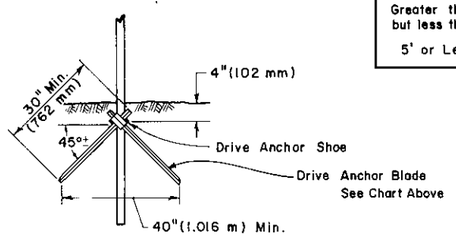


DRIVE ANCHOR ORIENTATION



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
B.O. Considine
Director, Bureau of Design

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

Sht. 2 Of 2

RC-60

TRACED BY
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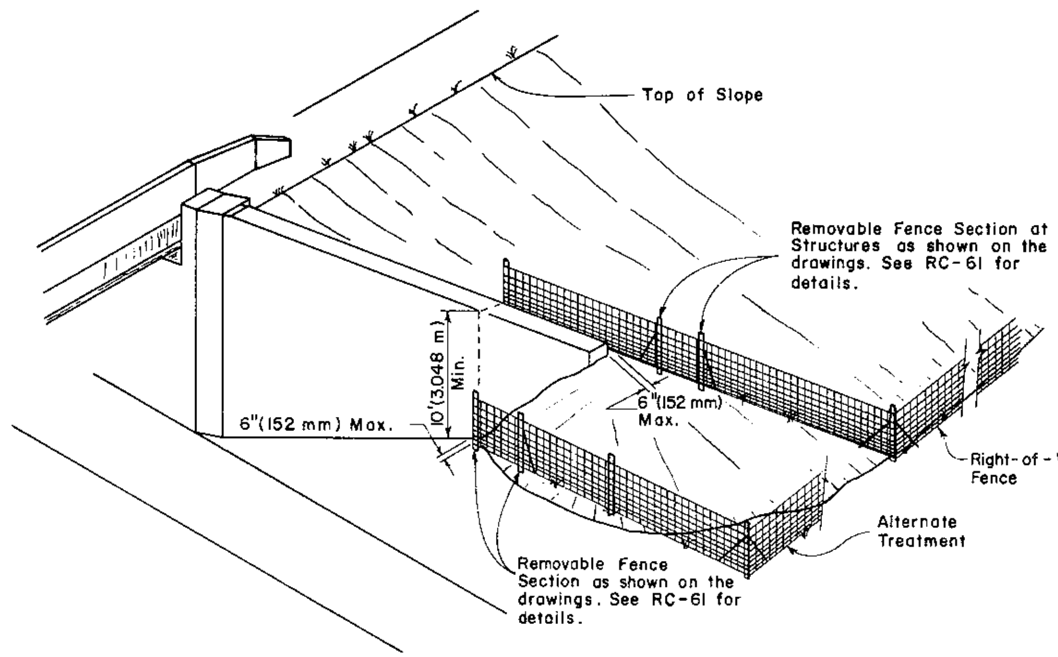
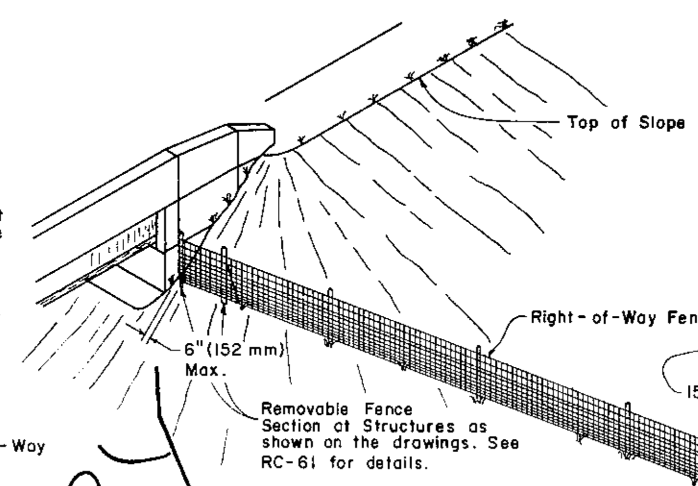
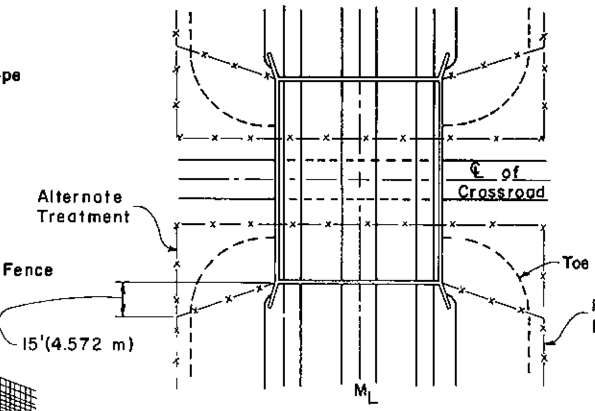
7930-2380-6140 K&E 19 1182 12-73 2793+



R/W FENCE TREATMENT AT HIGH WALLED ABUTMENT

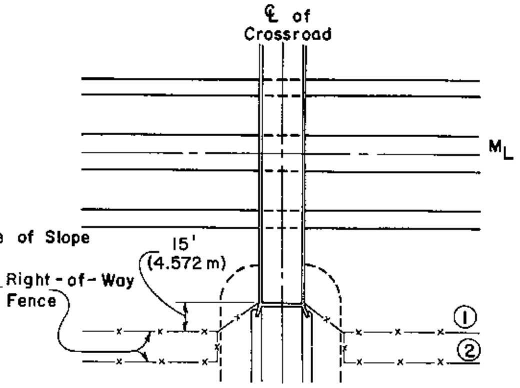


R/W FENCE TREATMENT AT STUB ABUTMENTS



HIGHWAY OVER CROSSROAD

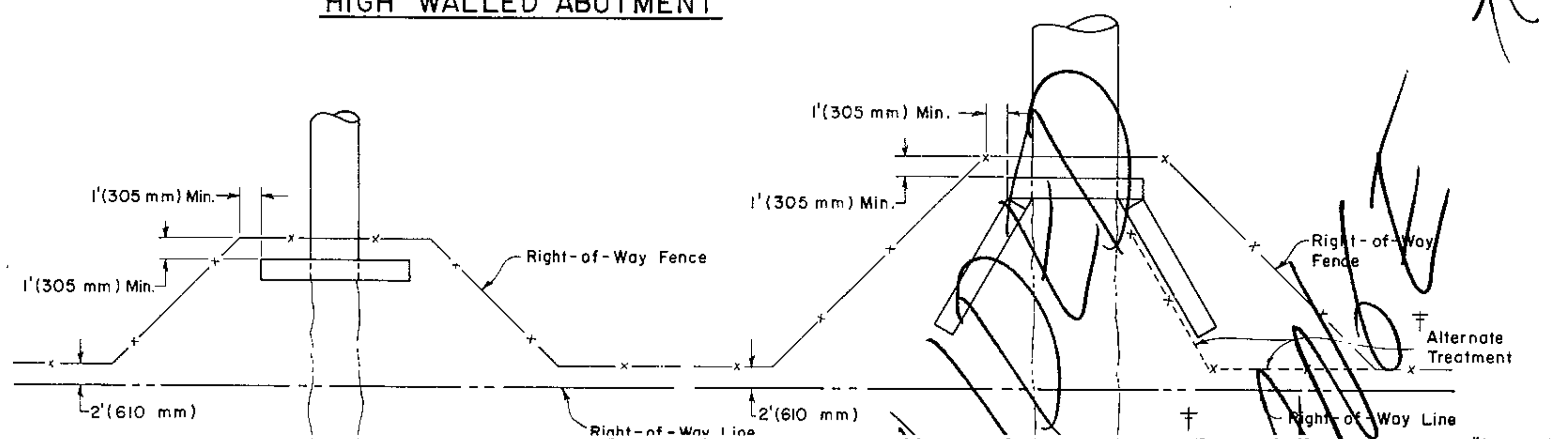
If the roadway has dual stuctures, the right-of-way fence shall be erected to close off the median area.



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.

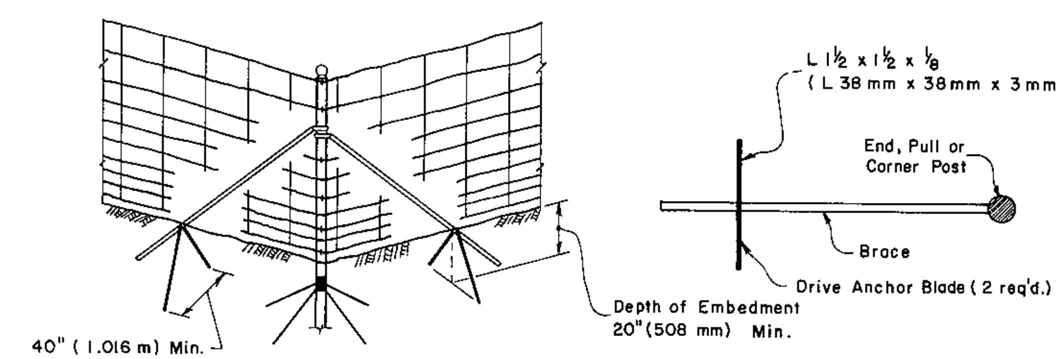
② If right-of-way is greater than 15'(4.572 m) from the projected face of the backwall, place fence parallel to crossroad and angle into abutment as shown.



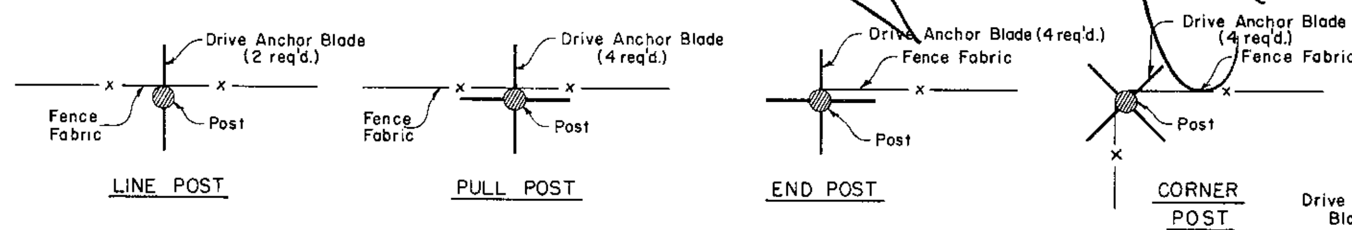
† The last post shall be within 6"(152 mm) of the wall and at a point where the wall height is not less than 10'(3.048 m).

R/W FENCE TREATMENT AT CULVERTS

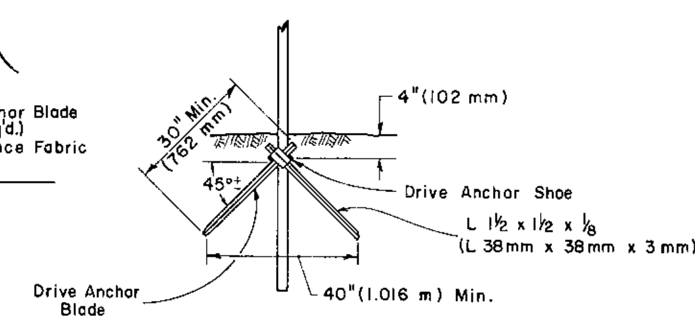
Caution should be exercised when locating posts near culvert. Any damage will be at contractor's expense.



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



DRIVE ANCHOR ORIENTATION



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 Jan. 31, 1977 B. O. Conchie Director, Bureau of Design	Approved Jan. 31, 1977 James B. Wilson Deputy Chief Hwy. Engr.	Sht. 2 Of 2 RC-60

TRACED BY
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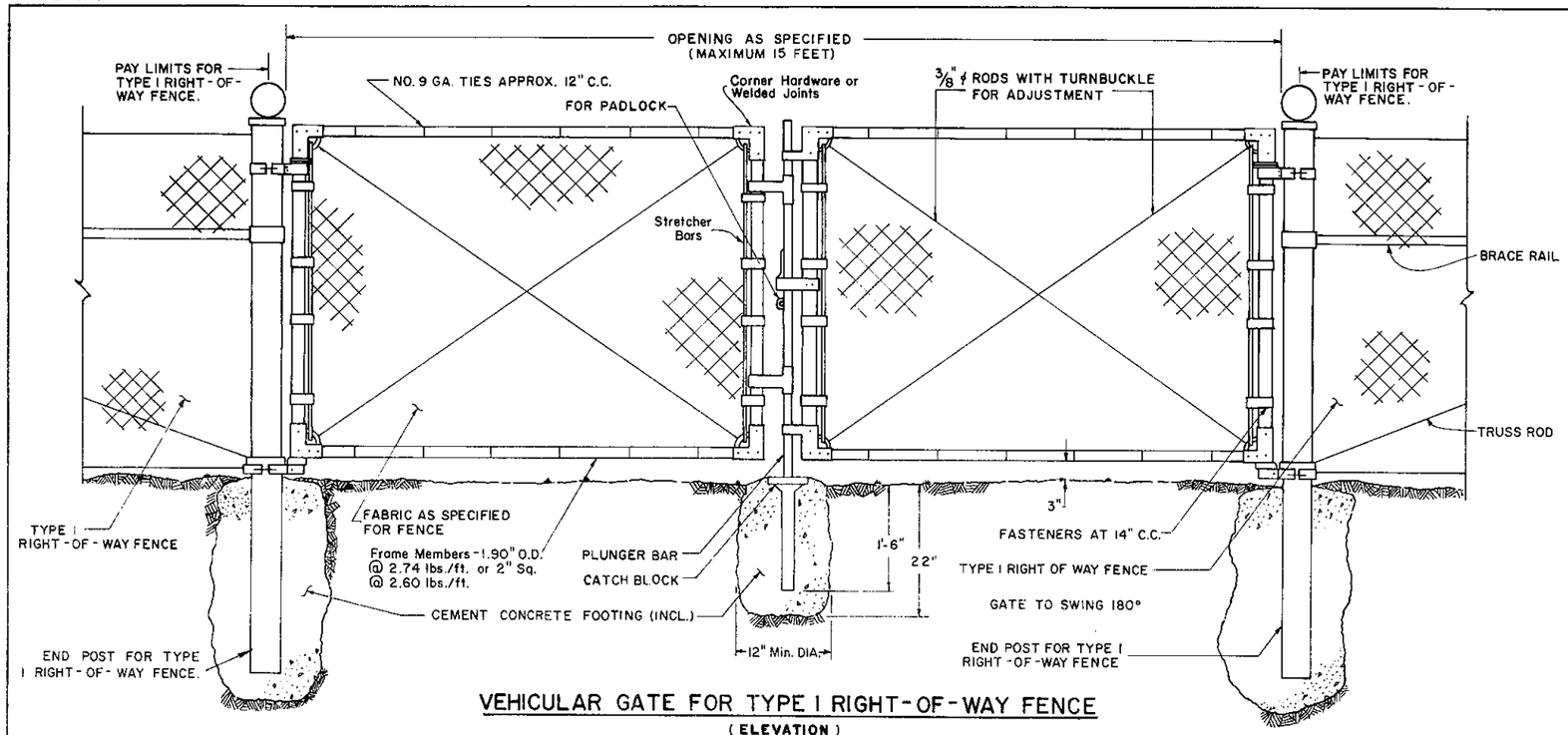
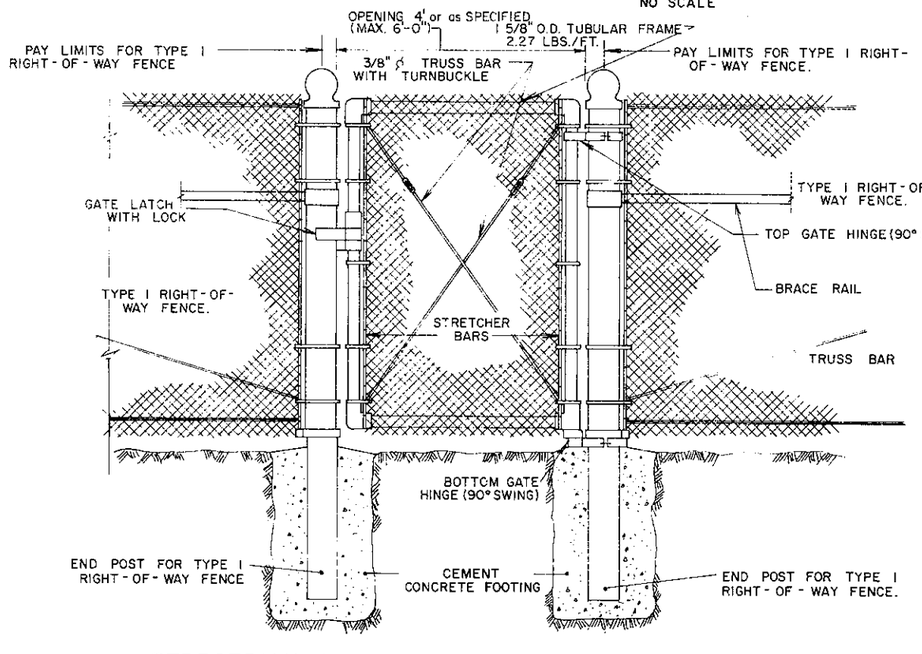
FORM C227 REV 7-95

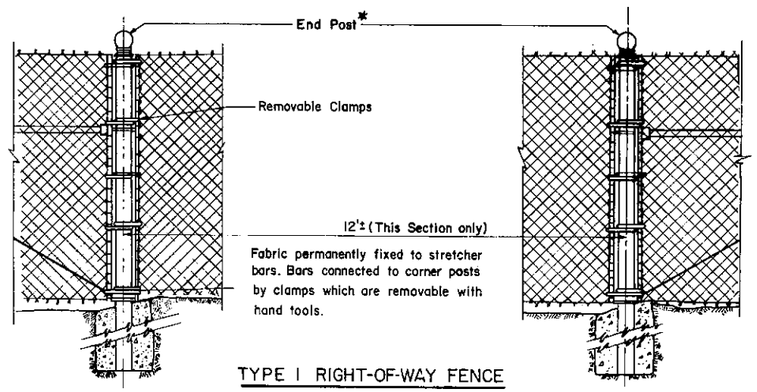


VEHICULAR GATE FOR TYPE I RIGHT-OF-WAY FENCE

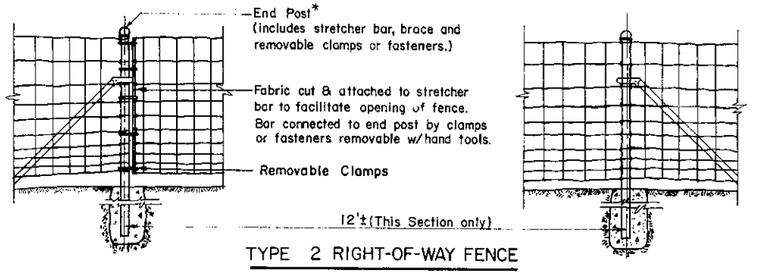
(ELEVATION)
NO SCALE



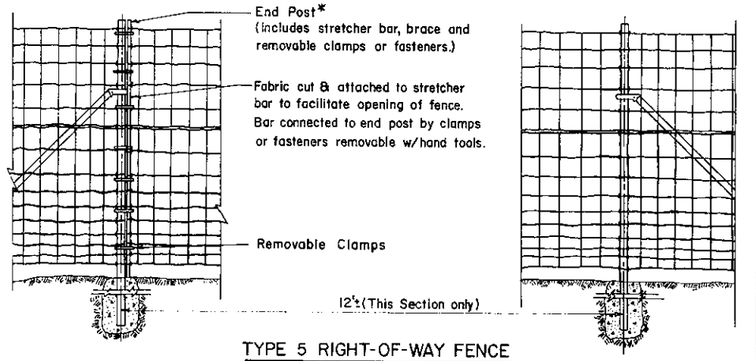
PEDESTRIAN GATE FOR TYPE I RIGHT-OF-WAY FENCE



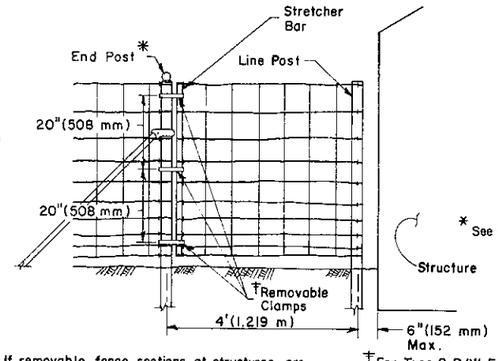
TYPE I RIGHT-OF-WAY FENCE



TYPE 2 RIGHT-OF-WAY FENCE



TYPE 5 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.

* See sheet RC-60 for details.

† For Type 2 R/W Fence use 3 clamps as shown. For Type 1 R/W Fence use 4 clamps equally spaced. For Type 5 R/W Fence use 5 clamps equally spaced.

REMOVABLE FENCE SECTIONS AT STRUCTURES

REMOVABLE FENCE SECTIONS

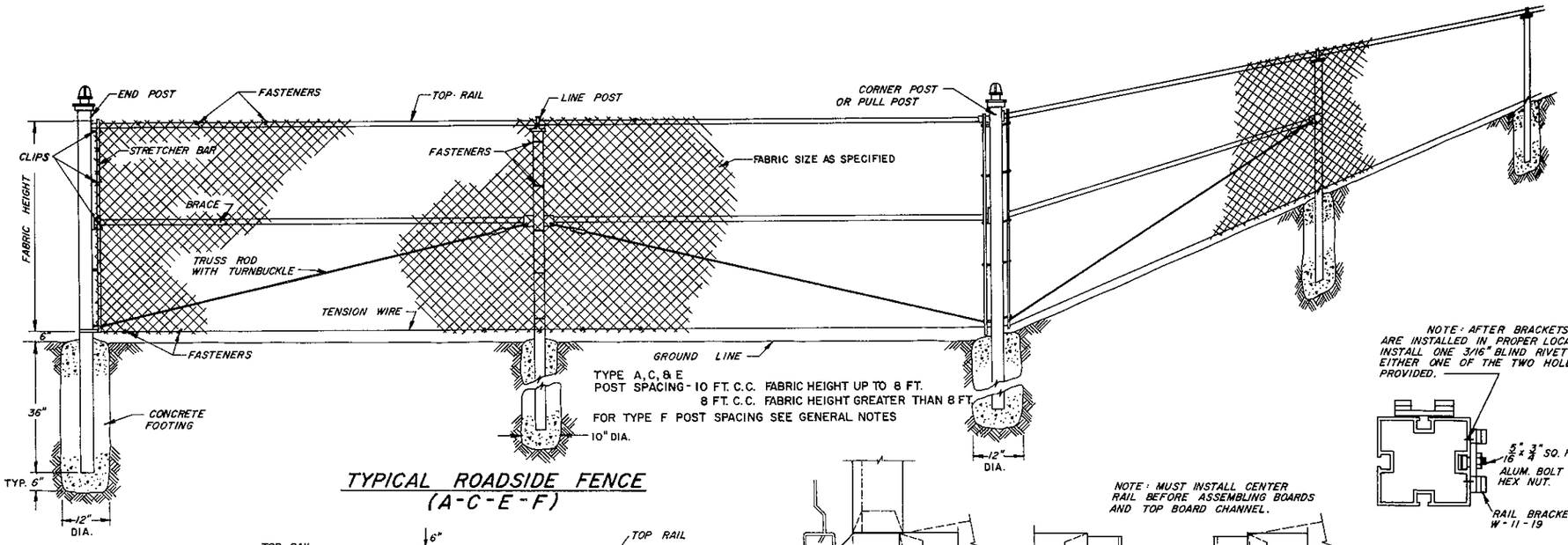
Note:
The payment for Removable Fence Sections will be considered incidental to the R/W fence.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

R/W GATE AND REMOVABLE FENCE SECTIONS

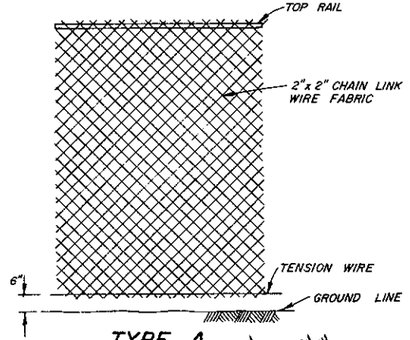
Recommended Jan. 31, 1977	Approved Jan. 31, 1977	Sht. 1 Of 1
Director, Bureau of Design	Deputy Chief Hwy. Engr.	RC-61

TRACED BY
FINAL BY



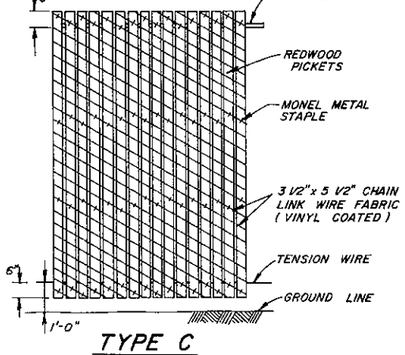
TYPE A, C, & E
POST SPACING - 10 FT. C.C. FABRIC HEIGHT UP TO 8 FT.
8 FT. C.C. FABRIC HEIGHT GREATER THAN 8 FT.
FOR TYPE F POST SPACING SEE GENERAL NOTES

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

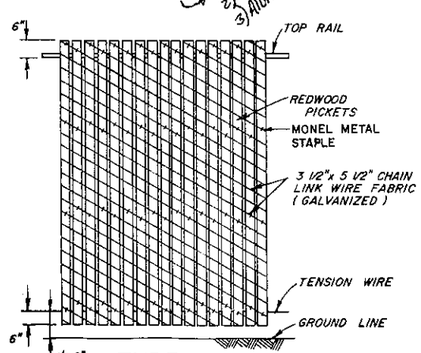


TYPE A

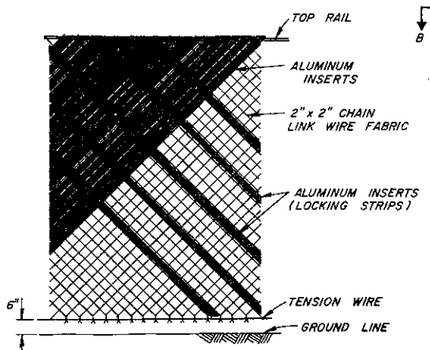
Posted
1) Vinyl
2) Aluminum Alloy



TYPE C



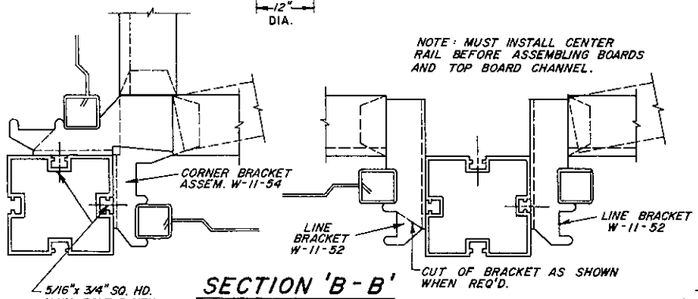
TYPE E



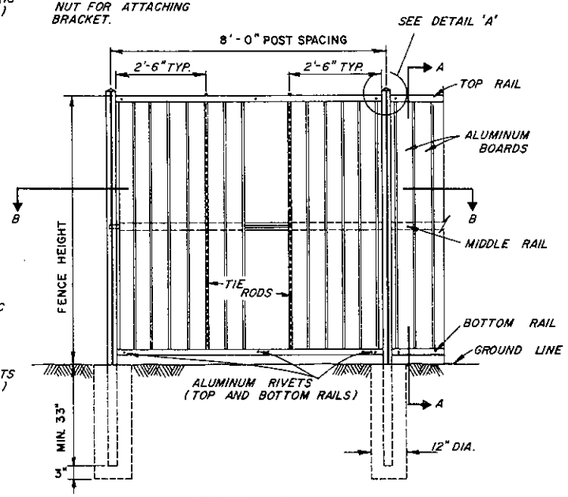
TYPE F

1) Vinyl
2) Aluminum Alloy

NOTE: MUST INSTALL CENTER RAIL BEFORE ASSEMBLING BOARDS AND TOP BOARD CHANNEL.

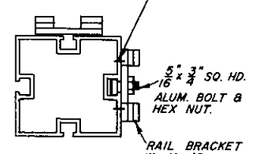


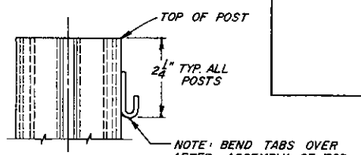
SECTION 'B-B'



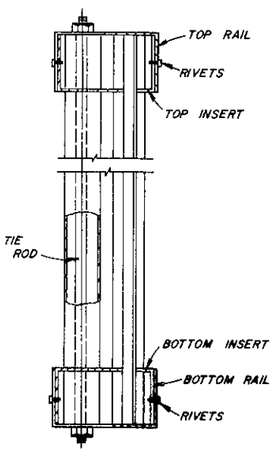
TYPE G

NOTE: AFTER BRACKETS ARE INSTALLED IN PROPER LOCATION, INSTALL ONE 3/16" BLIND RIVET IN EITHER ONE OF THE TWO HOLES PROVIDED.

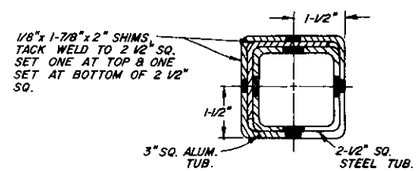




DETAIL 'A'
ATTACHMENT FOR TOP AND BOTTOM RAILS



SECTION 'A-A'



DETAIL OF GATE POST REINFORCING

GENERAL NOTES

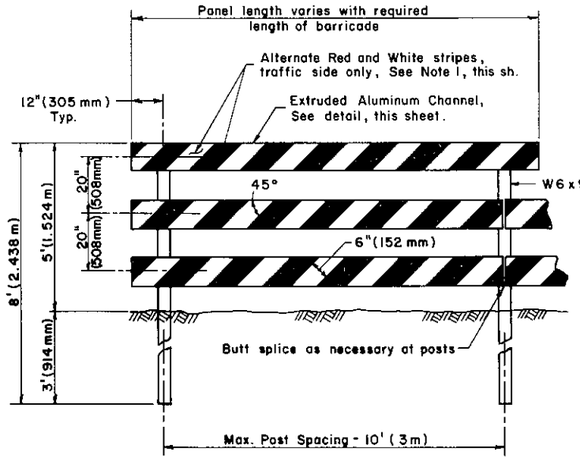
POST SPACING & FOOTING SIZES-TYPE F			
FABRIC HEIGHT (FT.)	POST SPACING STEEL (FT)	POST SPACING ALUMINUM (FT)	FOOTING SIZE (IN.)
6	10	10	9 x 42
7	10	6	10 x 42
8	8	6	12 x 42
9	6	5 *	15 x 42
10	5	5 *	18 x 42
11	5 *	6 **	18 x 48
12	5 *	6 **	18 x 48

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

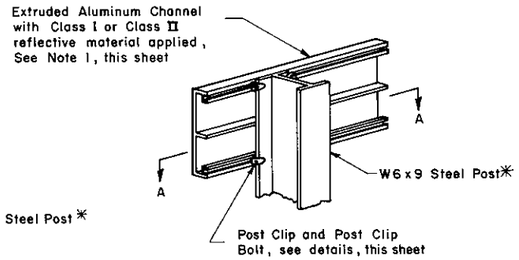
ROADSIDE FENCE

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



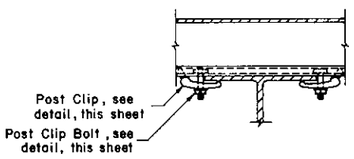
ALUMINUM PANEL - STEEL POSTS

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

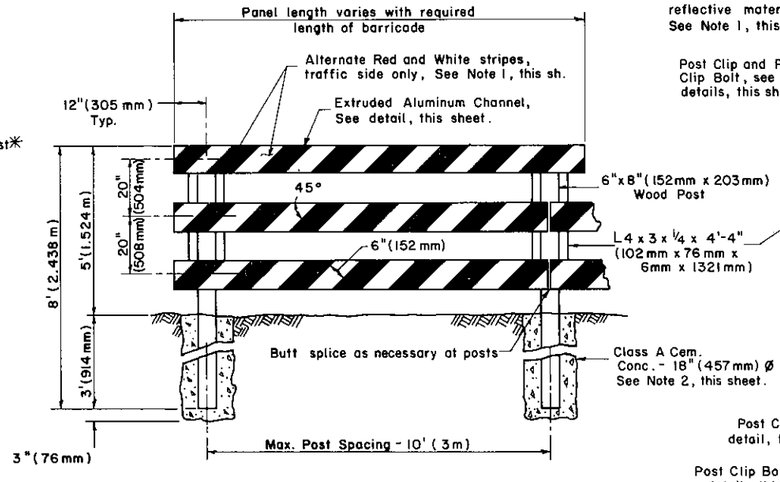


DETAIL A

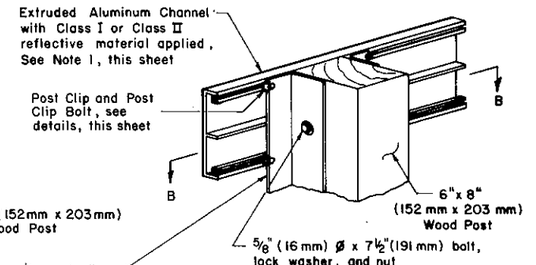
PANEL TO POST CONNECTION



SECTION A-A

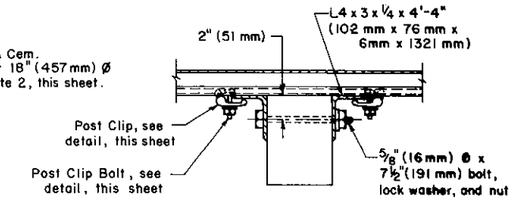


ALUMINUM PANEL - WOOD POSTS

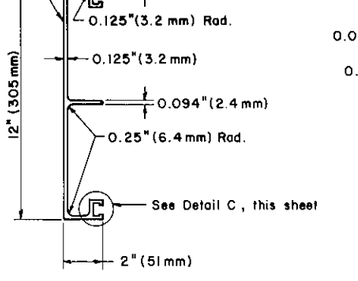


DETAIL B

PANEL TO POST CONNECTION

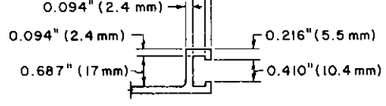


SECTION B-B

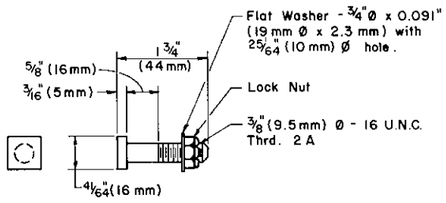


EXTRUDED ALUMINUM CHANNEL

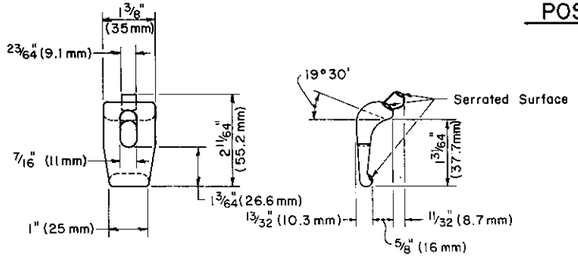
Dimensions for panels may vary depending upon manufacturing company's design.



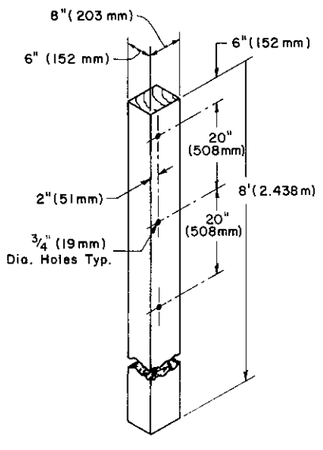
DETAIL C



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

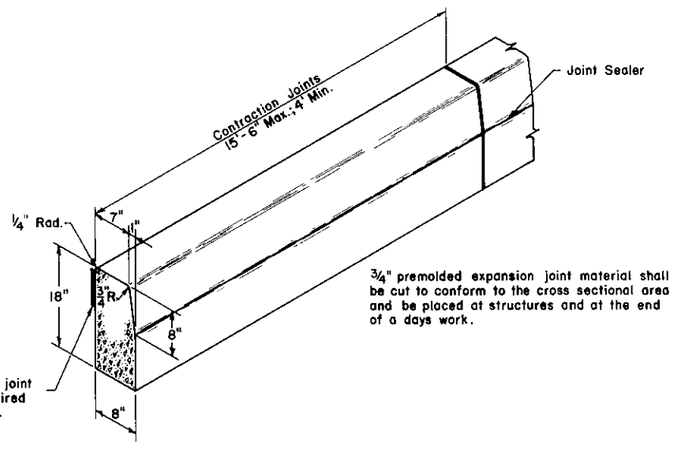
ALUMINUM PANEL

Recommended Sept 1, 1978
R. D. Gamble
Director, Bureau of Design

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

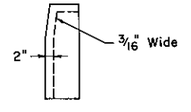
Sht. 1 Of 2

RC-63

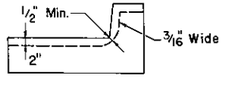


3/4" premolded expansion joint material shall be cut to conform to the cross sectional area and be placed at structures and at the end of a days work.

PLAIN CEMENT CONCRETE CURB

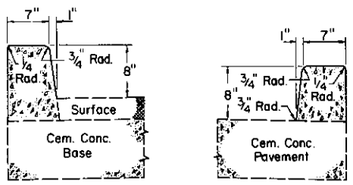


PLAIN CEMENT CONCRETE CURB



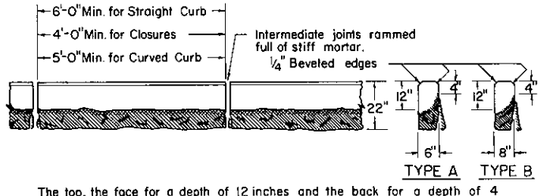
PLAIN CEMENT CONCRETE CURB GUTTERS

SAWED JOINT DETAILS



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

INTEGRAL CEMENT CONCRETE CURB

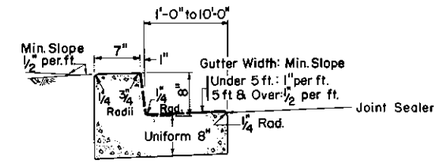


The top, the face for a depth of 12 inches and the back for a depth of 4 inches, as indicated, shall be peen-hammer dressed.

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

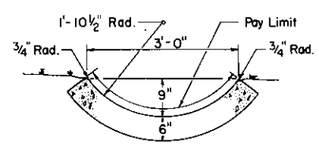
Joints shall not exceed 1/4-inch in width for a distance of 12 inches below the top of curb and 1/2-inch in width for the remainder of the joint.

STONE CURB - TYPES A & B

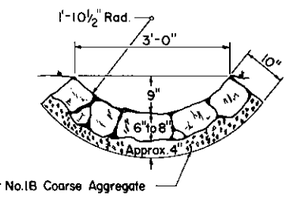


The width of gutter used in computing the pay area is indicated by — — — — —
The gutters shall be reinforced when indicated on the drawings or specified.

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

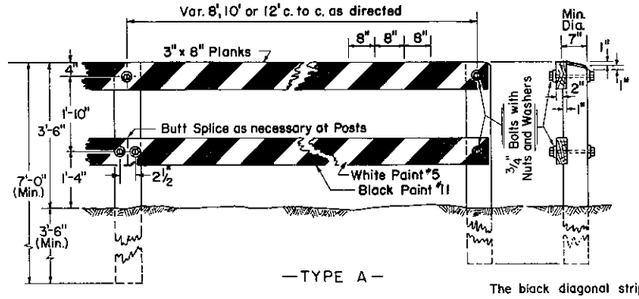
CURBS AND GUTTERS

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

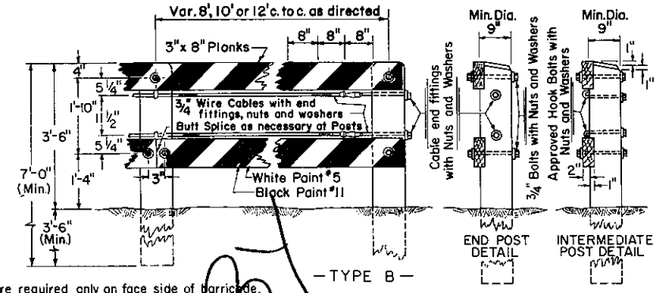
Approved Sept 1, 1978
James M. Sebastian
Deputy Chief Hwy. Engr.

Sht. 1 Of 1

RC-64



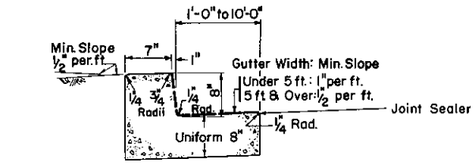
—TYPE A—



—TYPE B—

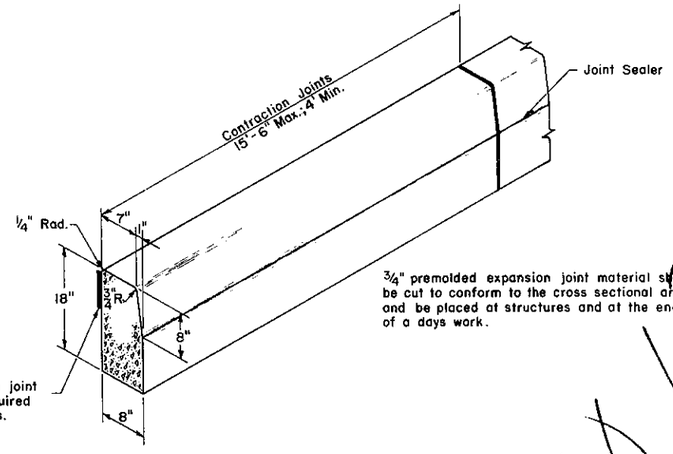
The black diagonal stripes are required only on face side of barricade.

PERMANENT BARRICADES - TYPES A AND B



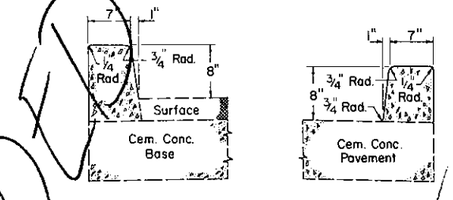
The width of gutter used in computing the pay area is indicated by — — — — —
The gutters shall be reinforced when indicated on the drawings or specified.

PLAIN CEMENT CONCRETE CURB GUTTER



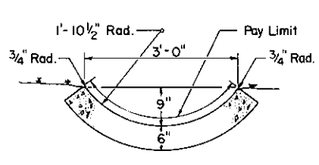
3/4" premolded expansion joint material shall be cut to conform to the cross sectional area and be placed at structures and at the end of a days work.

PLAIN CEMENT CONCRETE CURB

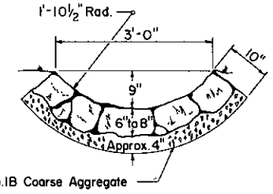


Curb face may be constructed vertical as permitted for PLAIN CEMENT CONCRETE CURB

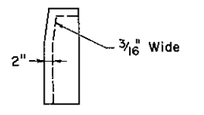
INTEGRAL CEMENT CONCRETE CURB



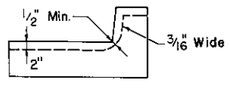
PLAIN CEMENT CONCRETE GUTTER



PLAIN OR MORTARED RUBBLE GUTTER

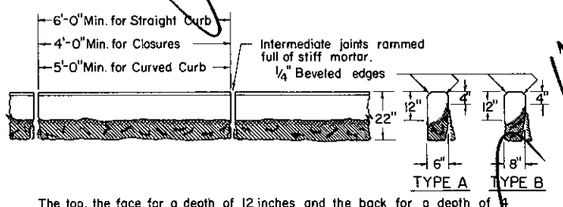


PLAIN CEMENT CONCRETE CURB



PLAIN CEMENT CONCRETE CURB GUTTERS

SAWED JOINT DETAILS



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

NOTES

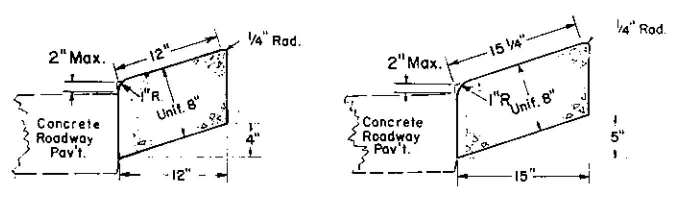
1. All items shall conform to the requirements of Form 408.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

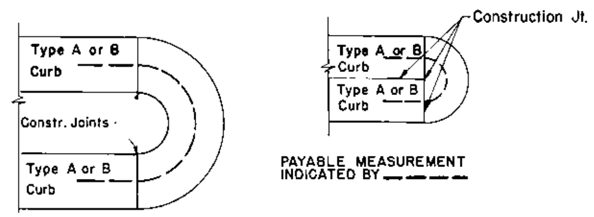
BARRICADES CURBS AND GUTTERS

Recommended	Approved	Sht. 1 Of 1
June 1, 1976	June 1, 1976	RC-64
B. D. Bowser	Robert R. Mercer	
Director, Bureau of Design	Deputy Chief Hwy. Engr.	

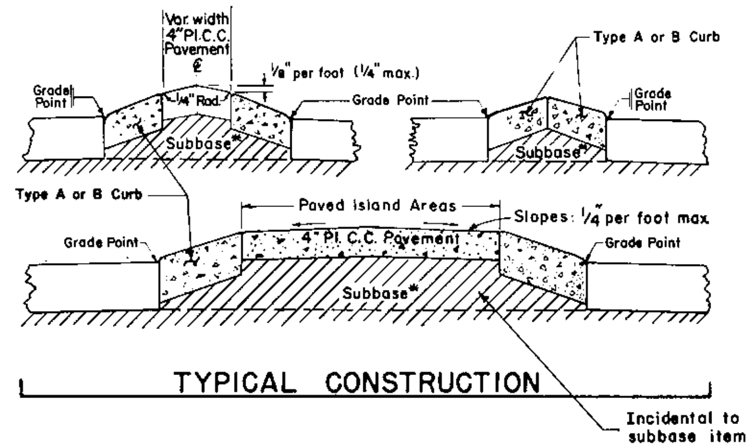
TRACED BY
FINAL BY



CONCRETE MOUNTABLE CURBS



END DETAILS

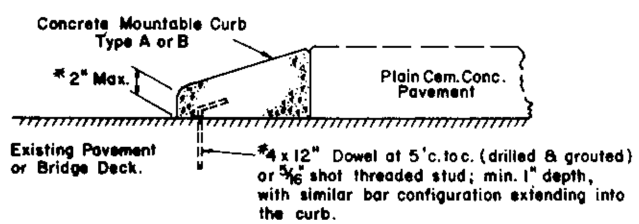


TYPICAL CONSTRUCTION

NOTES

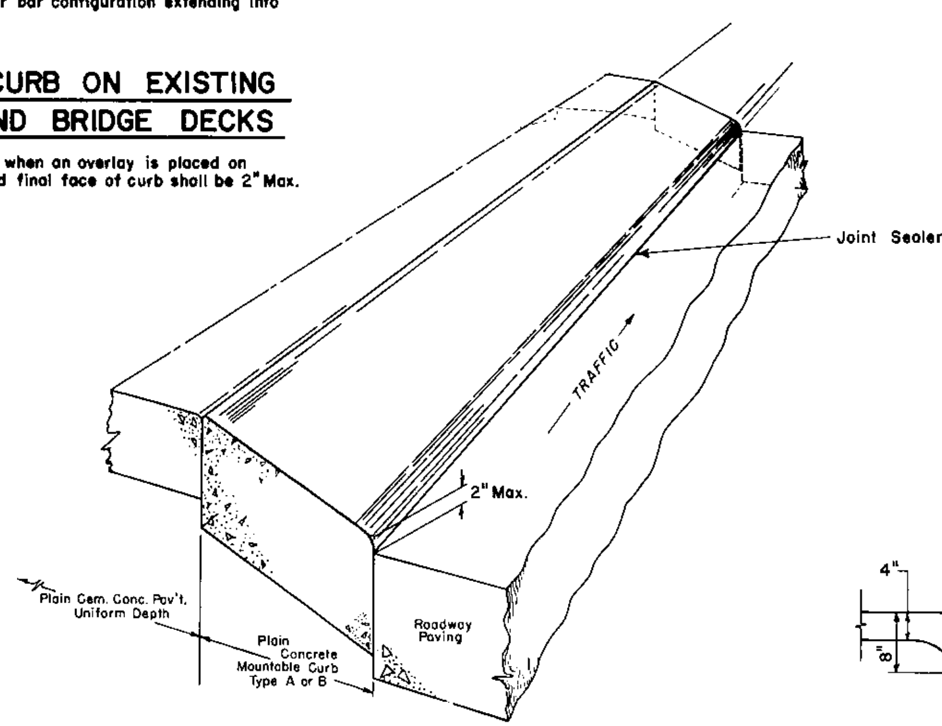
(1) Joints for Mountable Curbs shall conform to the requirements of specifications Form 408.

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

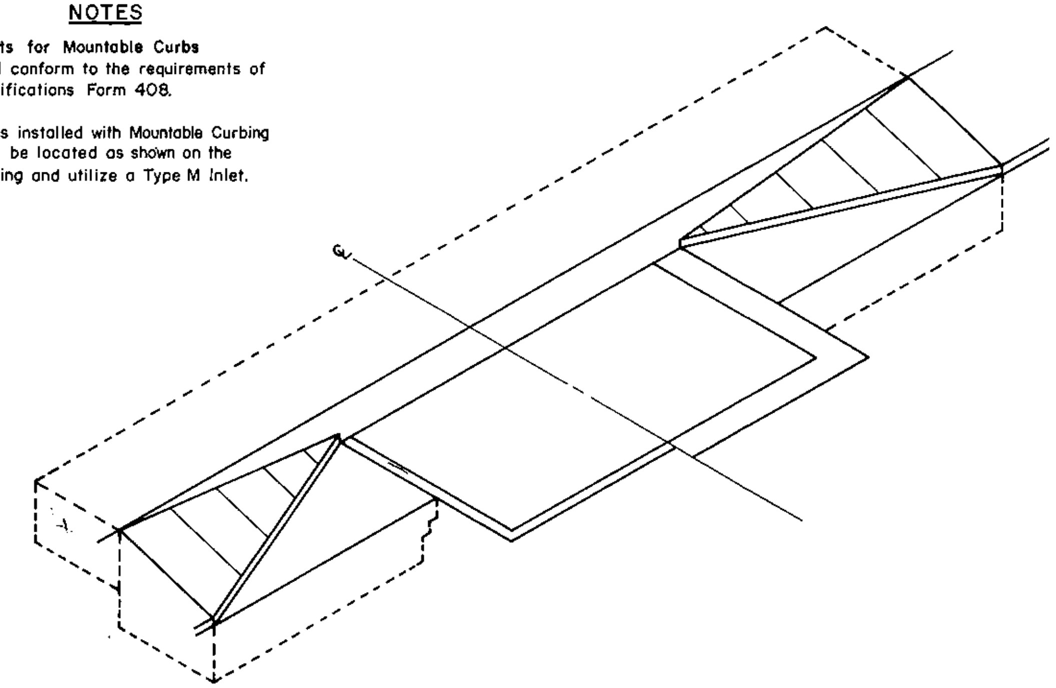


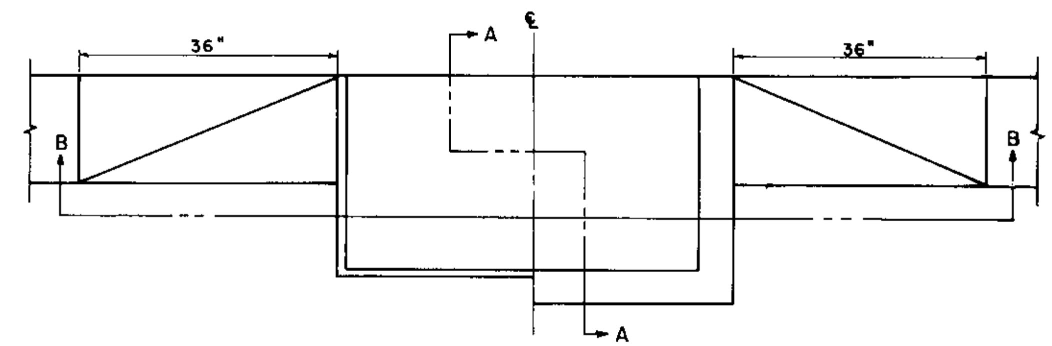
CONCRETE MOUNTABLE CURB ON EXISTING CONCRETE PAVEMENT AND BRIDGE DECKS

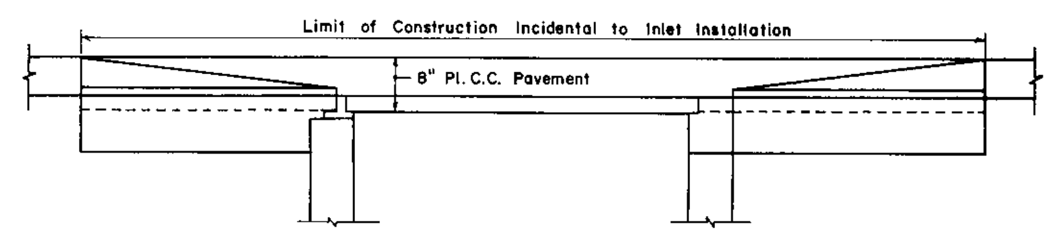
*Plans may provide for a deeper face at curb when an overlay is placed on the existing pavement, however this exposed final face of curb shall be 2" Max.



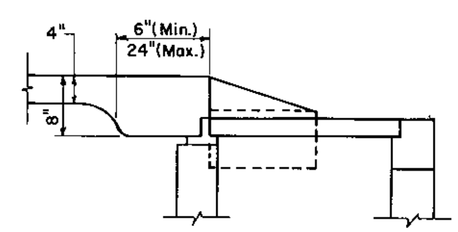
TYPICAL DIVISOR AREA







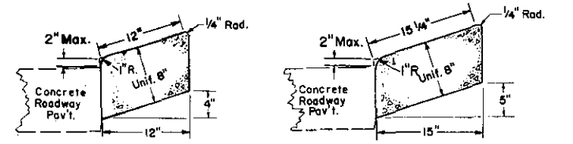
SECTION B-B



SECTION A-A

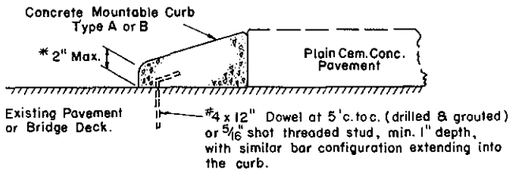
TREATMENT FOR CONCRETE MOUNTABLE CURBS AT INLETS

Commonwealth of Pennsylvania DEPARTMENT OF TRANSPORTATION BUREAU OF DESIGN		
CONCRETE MOUNTABLE CURBS		
Recommended Sept. 1, 1978 B.D. [signature] Director, Bureau of Design	Approved Sept. 1, 1978 [signature] Deputy Chief Hwy. Engr.	Sht. 1 Of 1 RC-65



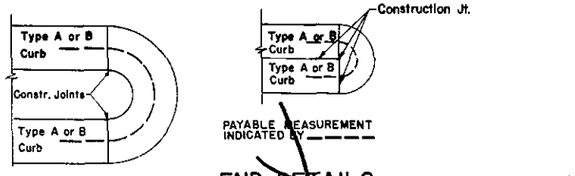
TYPE A TYPE B

CONCRETE MOUNTABLE CURBS

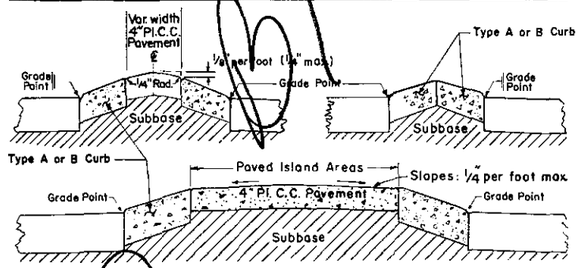


CONCRETE MOUNTABLE CURB ON EXISTING CONCRETE PAVEMENT AND BRIDGE DECKS

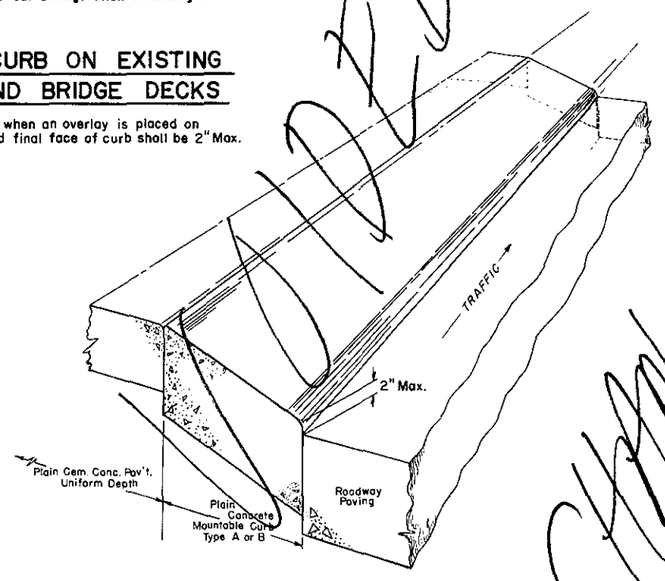
*Plans may provide for a deeper face at curb when an overlay is placed on the existing pavement, however this exposed final face of curb shall be 2" Max.



END DETAILS



TYPICAL CONSTRUCTION

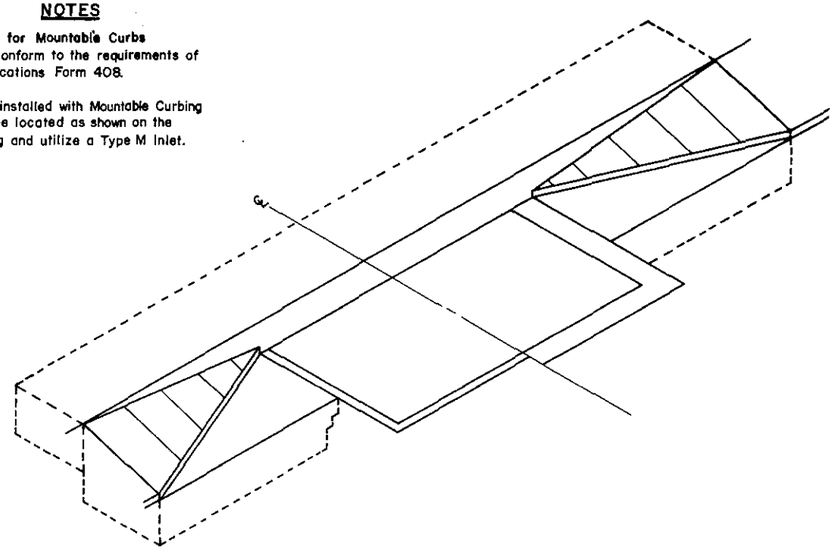


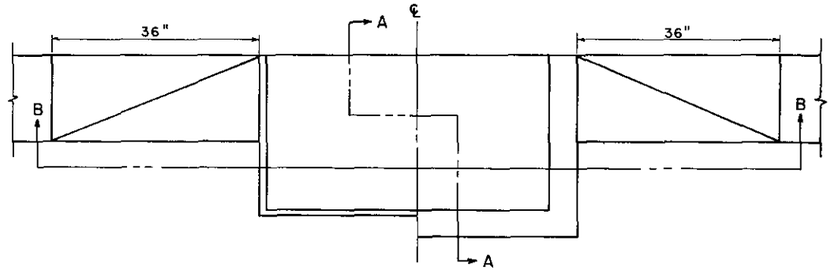
TYPICAL DIVISOR AREA

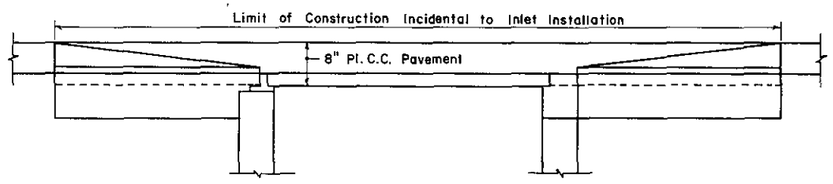
NOTES

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

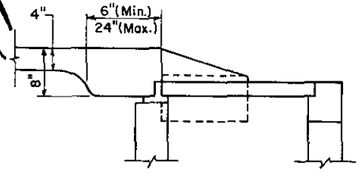
(2) Inlets installed with Mountable Curbing shall be located as shown on the drawing and utilize a Type M Inlet.







SECTION B-B



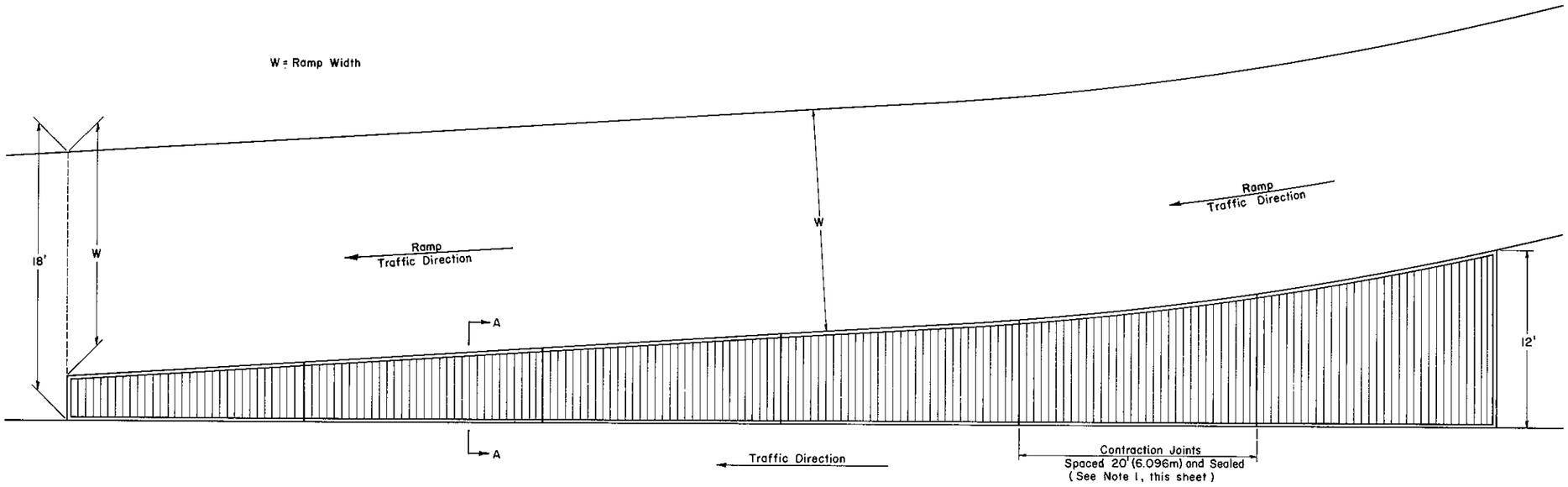
SECTION A-A

TREATMENT FOR CONCRETE MOUNTABLE CURBS AT INLETS

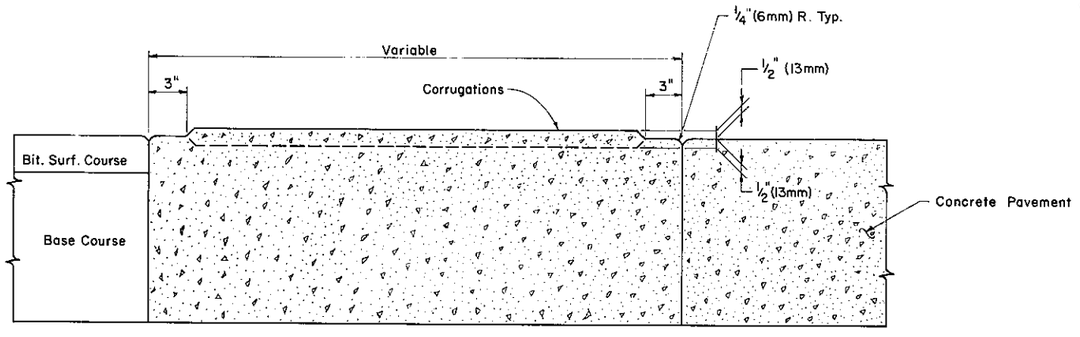
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

CONCRETE MOUNTABLE CURBS

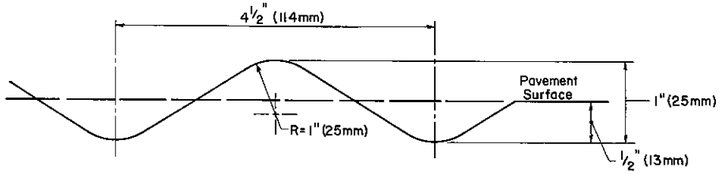
Recommended: June 1, 1976	Approved: June 1, 1976	Std. 1 of 1
Director, Bureau of Design	Deputy Chief Engr. Engr.	RC-65



TRAFFIC SEPARATOR IN RAMP GORE AREA



SECTION A-A



CORRUGATION DETAIL

(Not to Scale)

NOTES

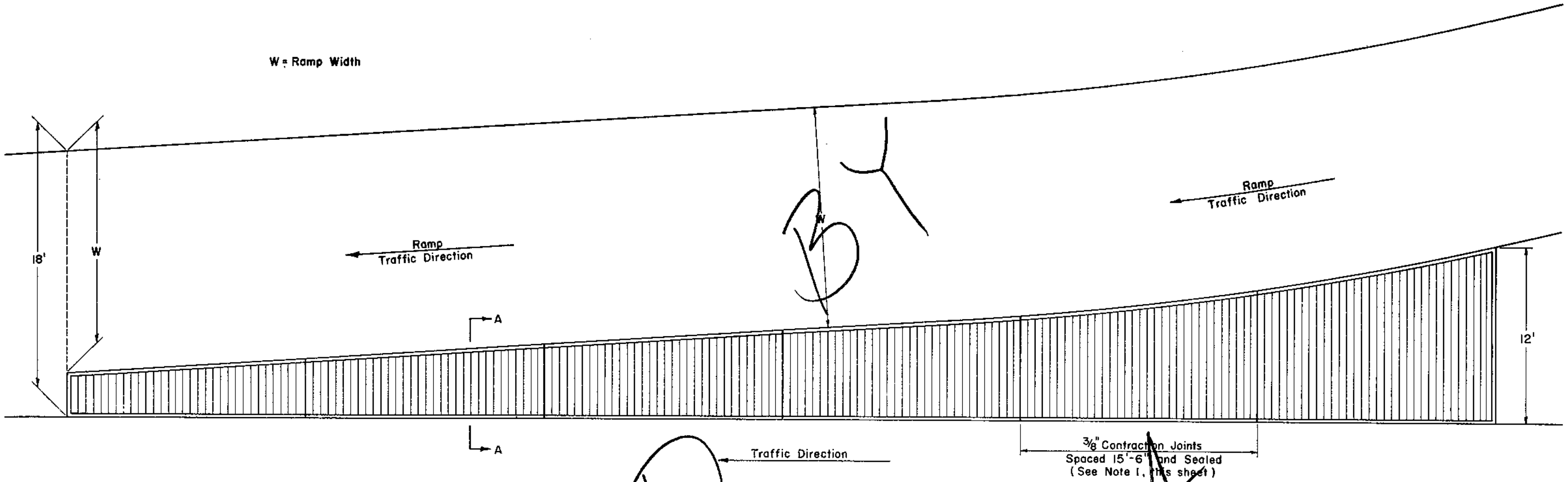
1. Contraction joints shall be spaced at approximately 20'(6.096m) intervals and shall be placed in line with adjacent pavement joints. They may be either hand-formed or sawed joints, but shall be 3/8"(10mm) wide and the depth equal to 1/4th. of the pavement depth.
2. The contraction joints and corrugations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

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

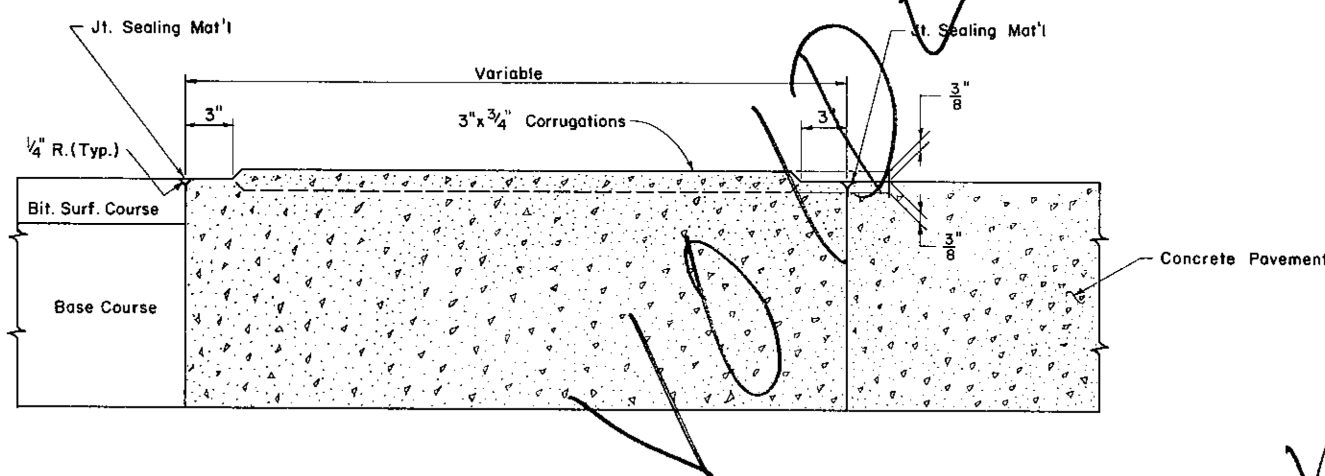
CONCRETE TRAFFIC SEPARATOR

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

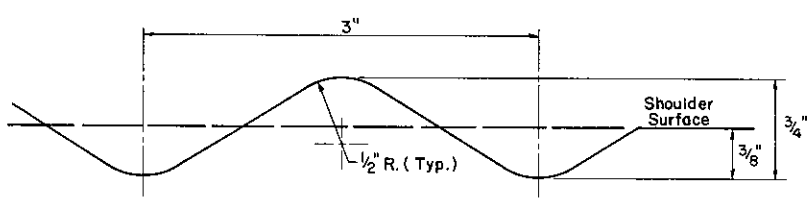
TRACED BY
FINAL BY



TRAFFIC SEPARATOR IN RAMP GORE AREA



SECTION A-A



CORRUGATION DETAIL

NOTES

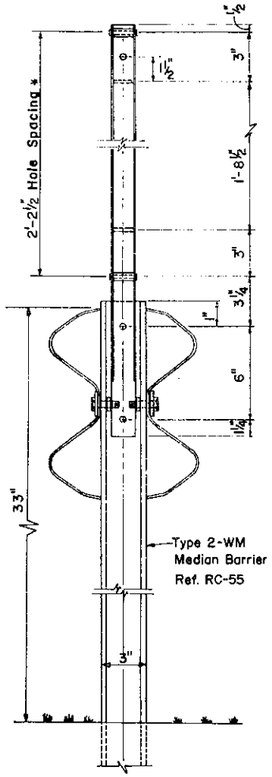
1. Contraction joints shall be spaced in uniform lengths or sections of 15.5' and shall be placed in line with adjacent pavement contraction joints. They may be either hand-formed or sawed joints, but shall be 3/8" wide and the depth equal to 1/4 of the pavement depth.
2. Concrete traffic separator shall conform to Section 629, Form 408.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

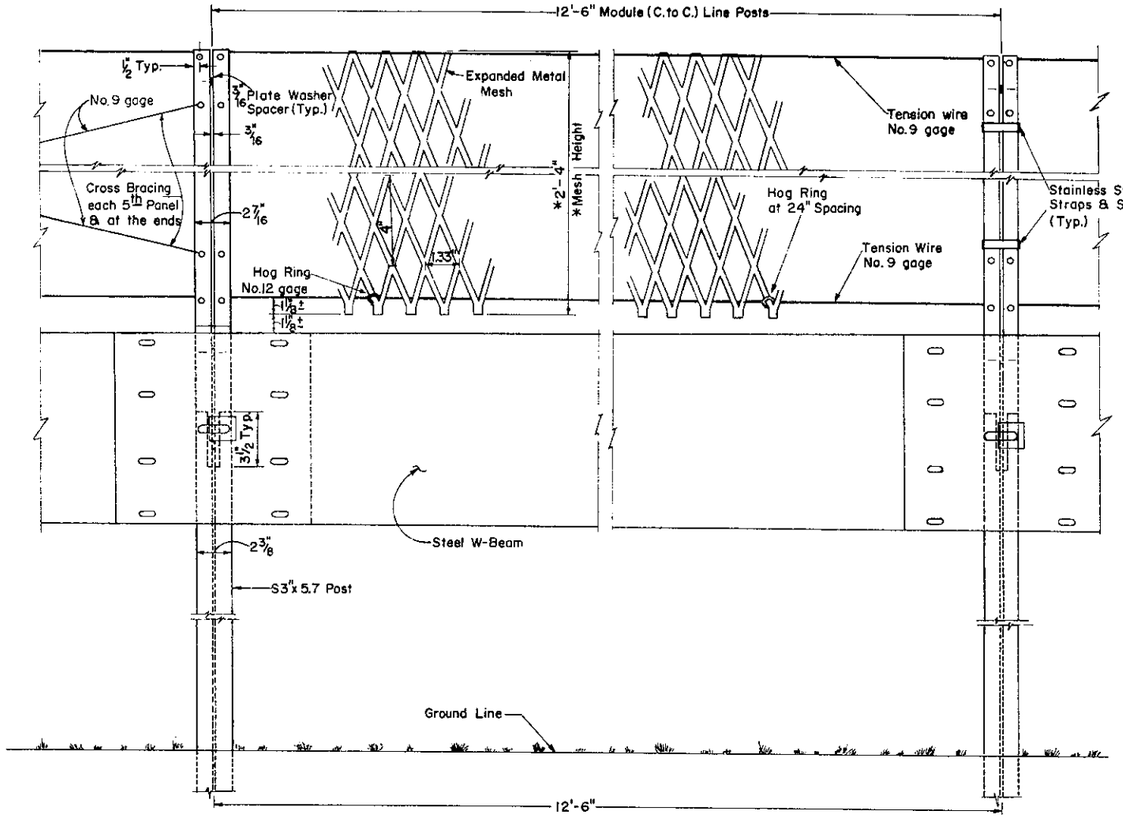
CONCRETE TRAFFIC SEPARATOR

Recommended June 1, 1976 B.D. Rowlskie Director, Bureau of Design	Approved June 1, 1976 Robert H. [signature] Deputy Chief Hwy. Engineer	Sht. 1 Of 1 RC-66

7530-2350-0140

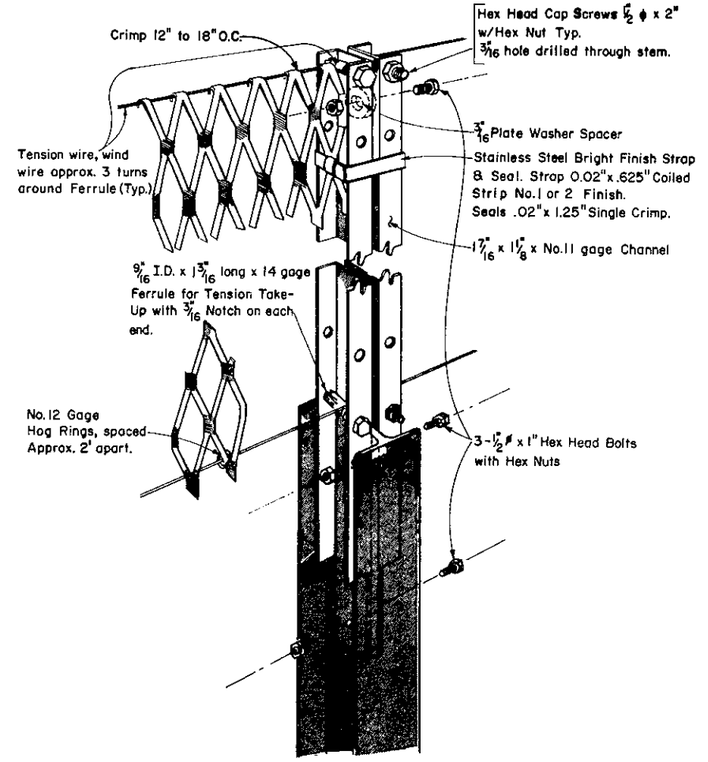


SECTION

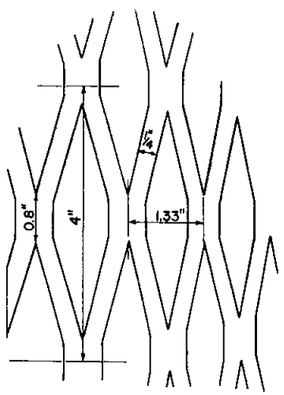


* Hole spacing for different mesh-heights when required: 2'-10½" for 3' height
3'-10½" for 4' height

ELEVATION



LINE POST DETAILS



MESH SIZE AND TOLERANCES

TYPE-A INSTALLATION ON TYPE 2-WM MEDIAN BARRIER

The mesh openings shall have the following nominal dimensions:

Diamond Size - 1.33" ± .05" short dimension (center to center of bridges)
4.00" ± .05" long dimension (center to center of bridges)

Bridge size - 0.80" ± .10" uncut, vertical bridge distance between diamonds.

Strand size - 0.25" minimum width
0.050" nominal thickness, excluding paint (aluminum panels)
0.0478" (18 gage) nominal thickness, excluding paint and zinc coating (steel panels)

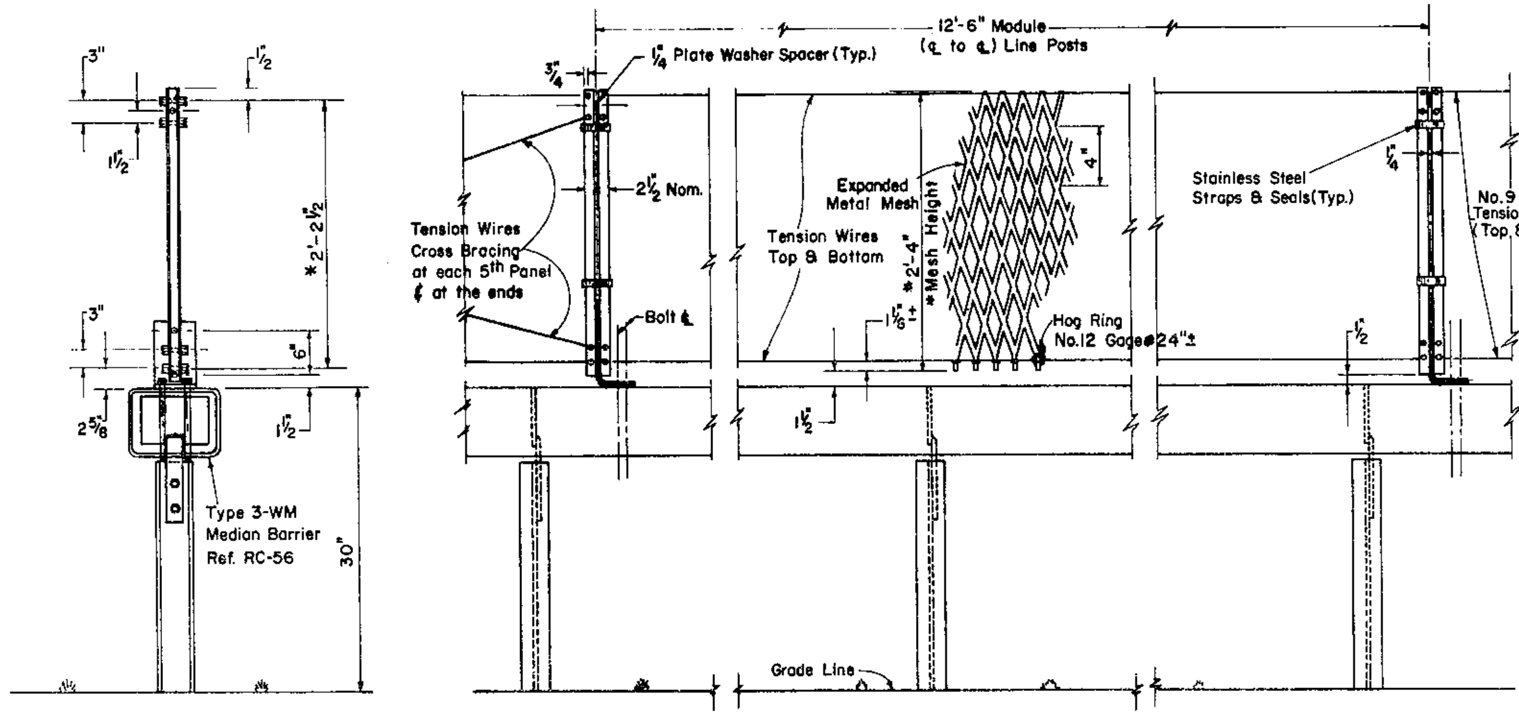
Panel size - 2'-4 3/16" ± 0.25" along the long dimension of diamonds before bending, (2'-4" finished height) 12'-2" along short dimension of diamonds.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

ANTI-GLARE SCREEN

Recommended Oct. 1, 1974	Approved Oct. 1, 1974	Sht. 1 Of 2
B.O. Rountree	Robert R. Thomson	RC-67
Director, Bureau of Design	Deputy Chief Hwy. Engr.	

TRACED BY
FINAL BY

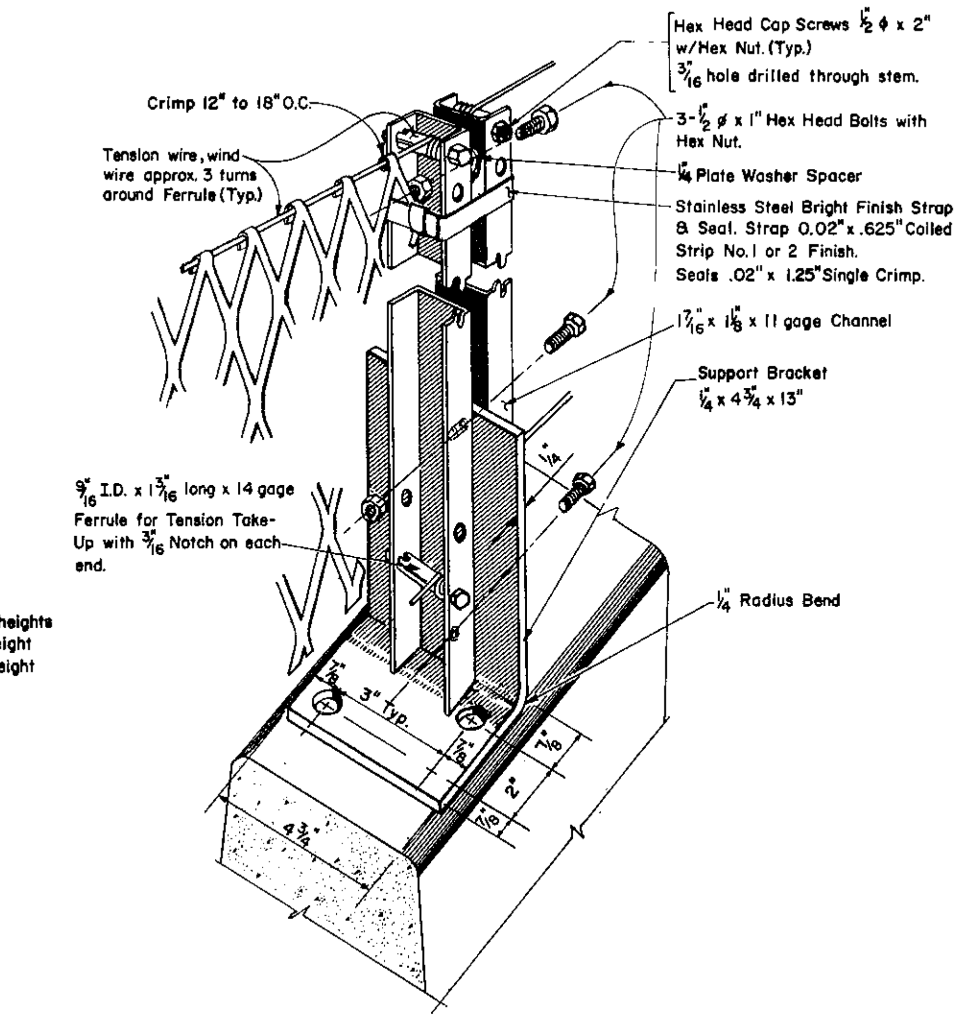


SECTION

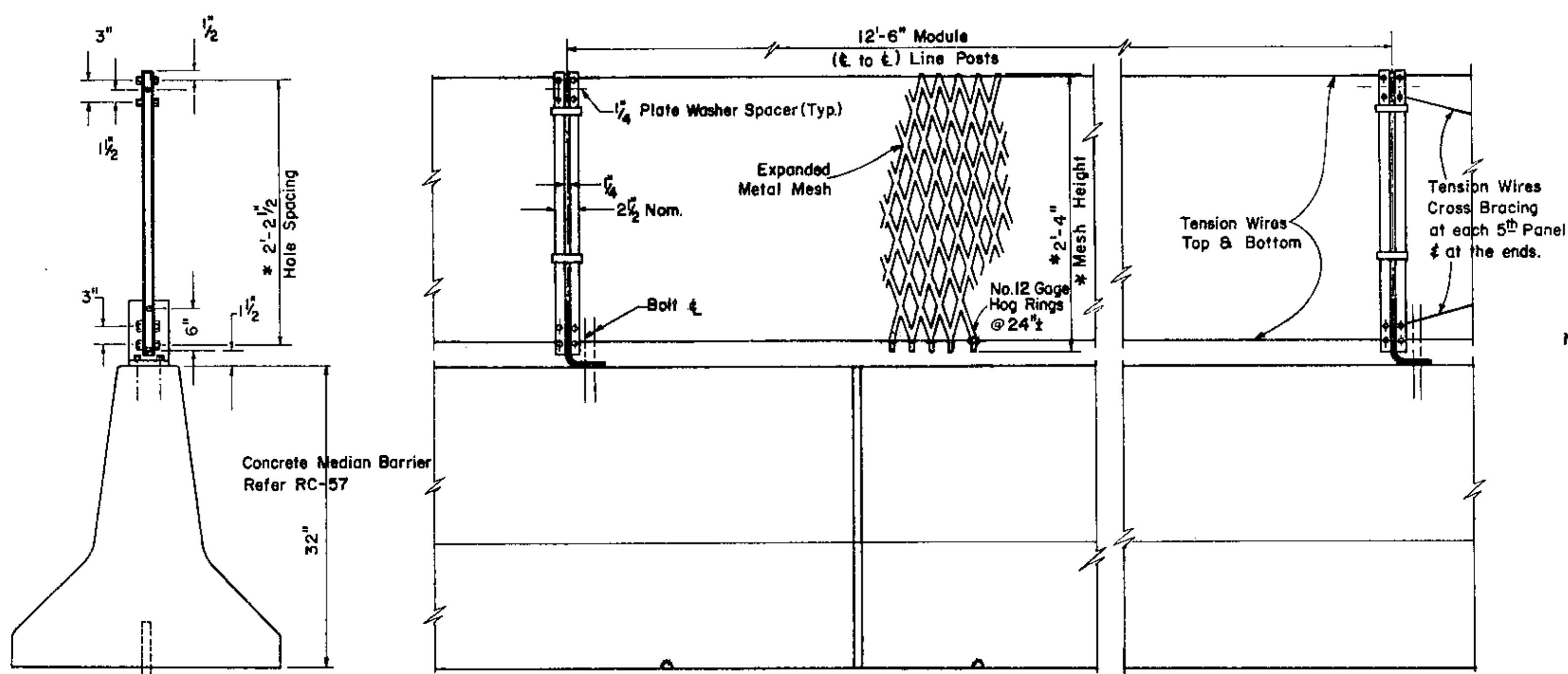
ELEVATION

* Hole spacing for different mesh-heights when required: 2'-10 1/2" for 3' height
3'-10 1/2" for 4' height

TYPE B-INSTALLATION ON TYPE 3-WM MEDIAN BARRIER



LINE POST AND MOUNTING DETAILS



SECTION

ELEVATION

INSTALLATION ON CONCRETE MEDIAN BARRIER TYPE B

Notes:

For a split concrete median barrier on a structure fasten the line posts to either side of the barrier.

Cross bracing or diagonal bracing may be provided at each panel of anti-glare screen to stop vibrations at critical locations like bridges.

1/2 dia. x 7" bolts should extend thru the box beam with a hex nut & washer at the bottom.

Use double support brackets (back to back) at every third post for installation on curves with curvature greater than 3°, and at end posts. Use double washer spacers at top of posts.

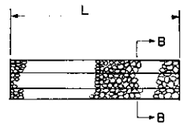
Drill concrete to receive 1/2 dia. x 3 3/4 long, expansion bolt of the Hilti-Fastening system type, or Wej-It type, or an approved equal.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

ANTI-GLARE SCREEN

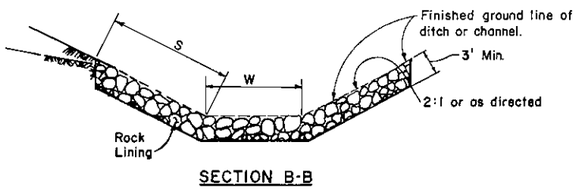
Recommended Oct. 1, 1974	Approved Oct. 1, 1974	Sht. 2 Of 2
B.D. [signature] Director, Bureau of Design	Robert R. [signature] Deputy Chief Hwy. Engr.	RC-67

7530 7350-0140



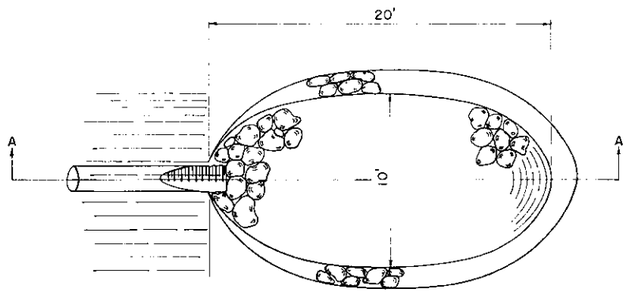
PLAN

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

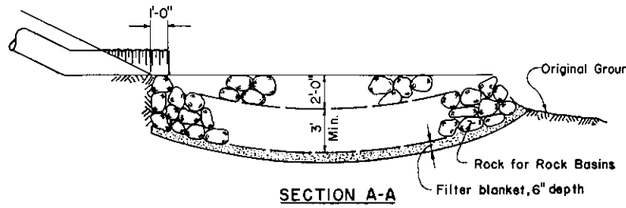


SECTION B-B

ROCK LINING

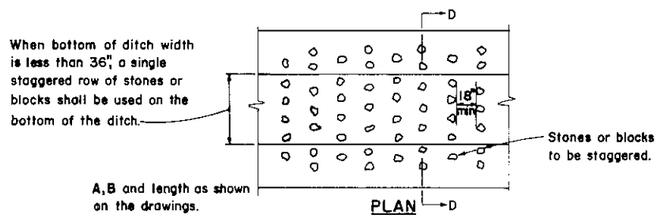


PLAN

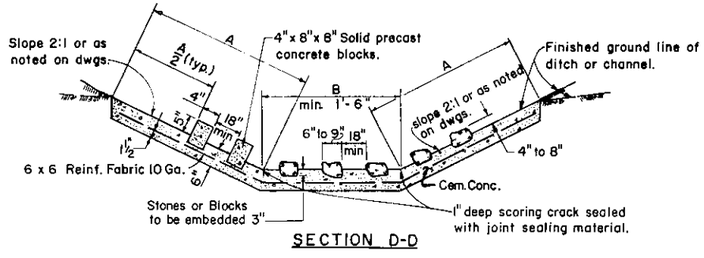


SECTION A-A

ROCK BASIN

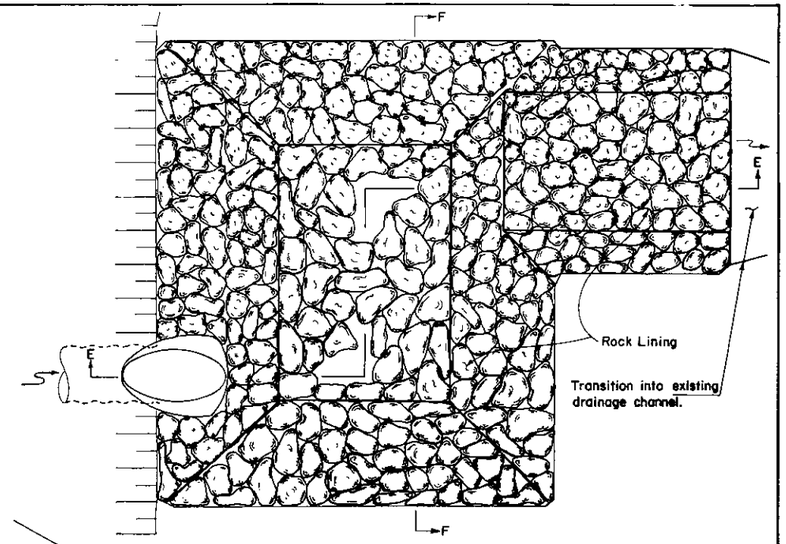


PLAN

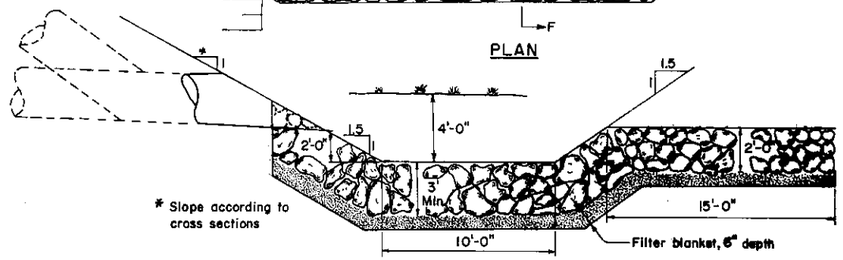


SECTION D-D

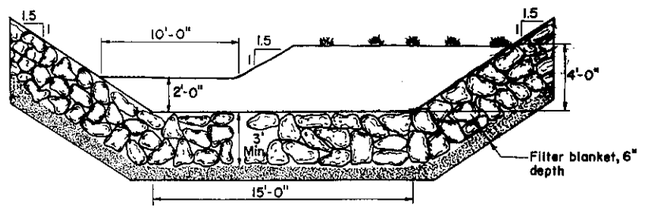
PAVED ENERGY DISSIPATOR



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
B.D. Lewakis
Director, Bureau of Design

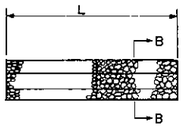
Approved Sept. 1, 1978
James M. Sabatini
Deputy Chief Hwy. Engr.

Sht. 1 Of 4

RC-70

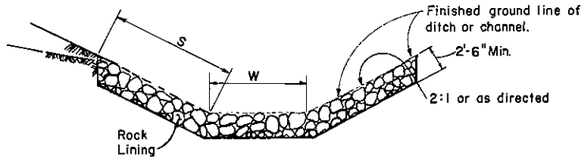
TRACED BY

7530-8350-0140



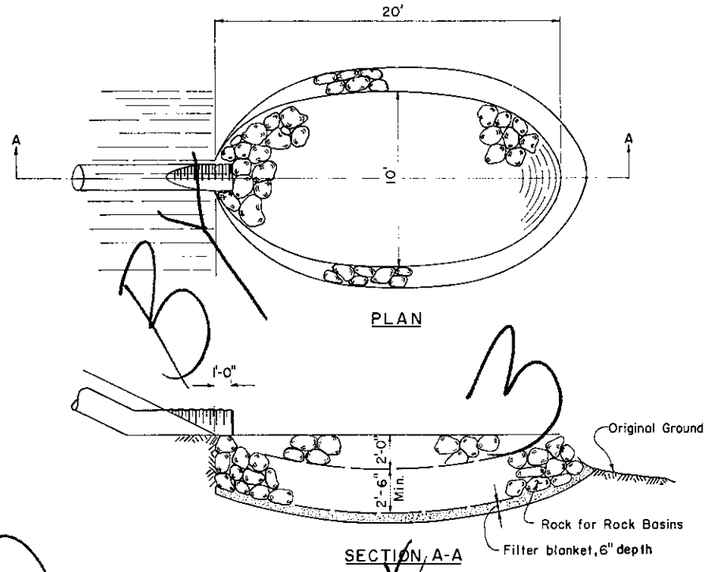
PLAN

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



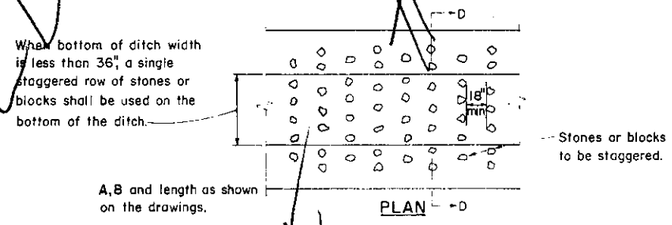
SECTION B-B

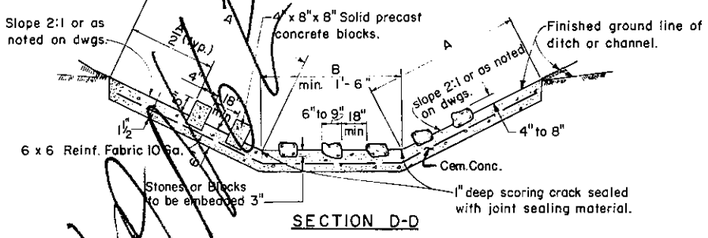
ROCK LINING



SECTION, A-A

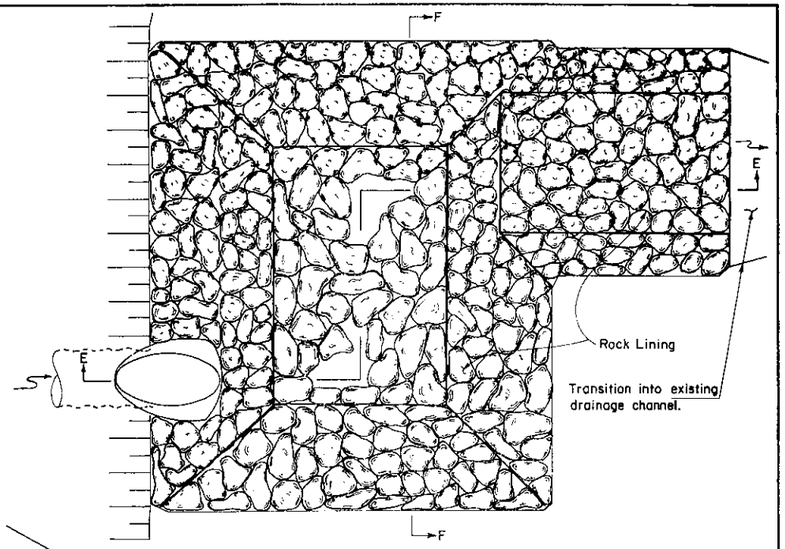
ROCK BASIN



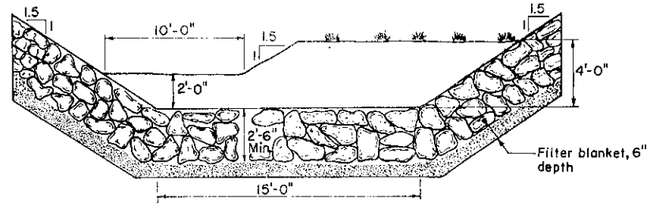


SECTION D-D

PAVED ENERGY DISSIPATOR



SECTION E-E



SECTION F-F

ROCK ENERGY DISSIPATOR

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

EROSION & SEDIMENT CONTROL

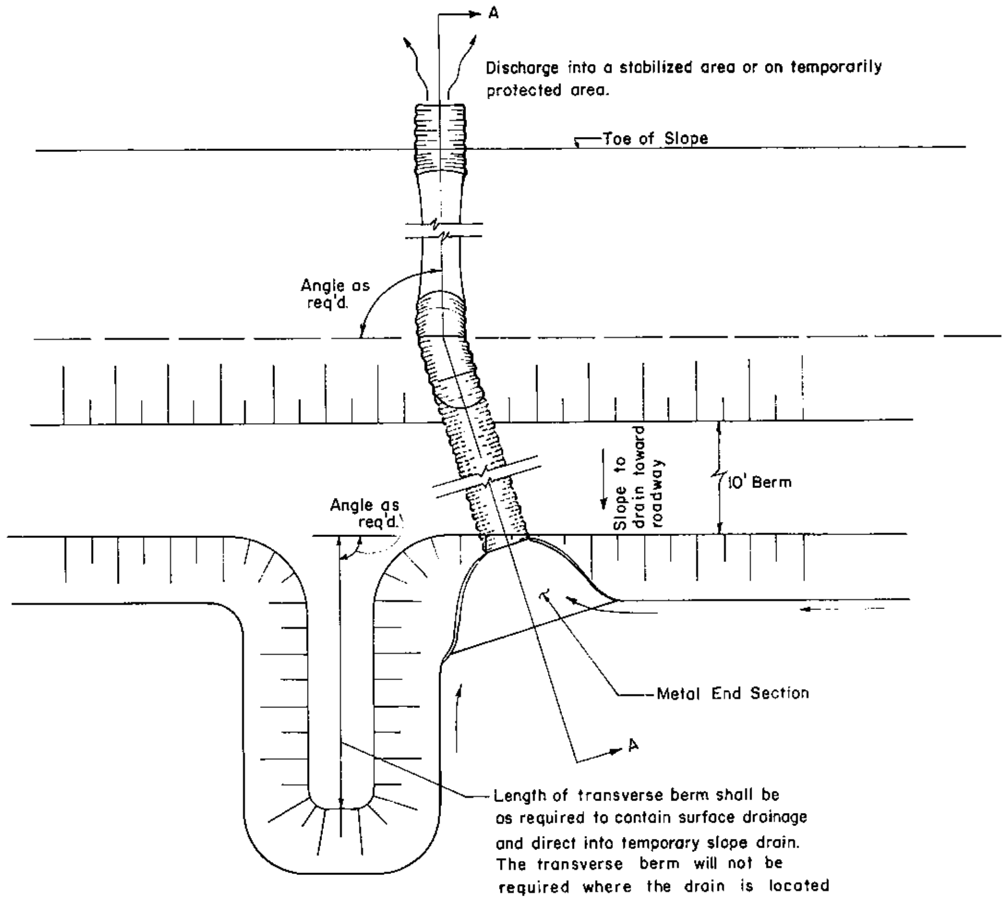
Recommended June 1, 1976
B.D. Landis
Director, Bureau of Design

Approved June 1, 1976
Robert P. Mann
Deputy Chief Hwy. Engr.

Sht. 1 Of 4
RC-70

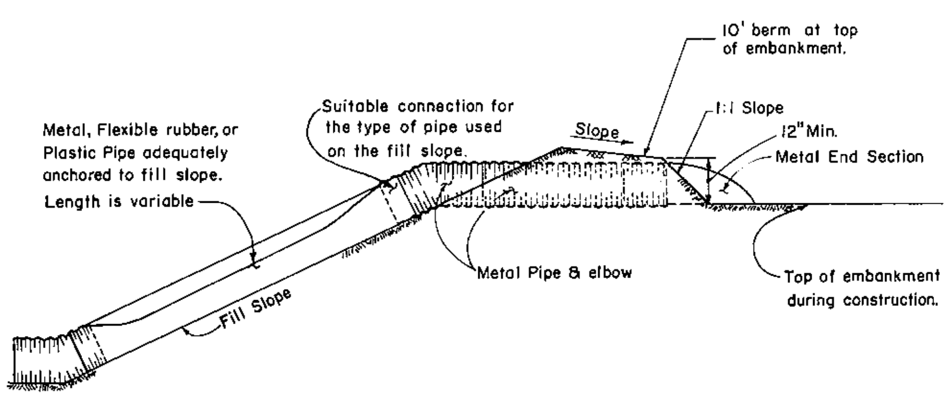
TRACED BY
FINAL BY

7520 2350-0140



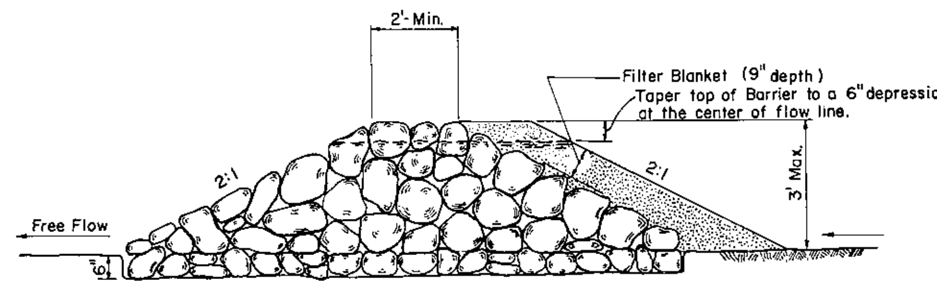
PLAN

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

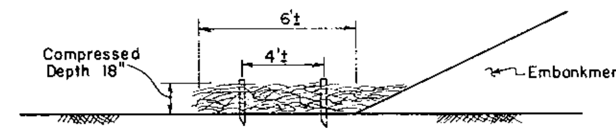


SECTION A-A

TEMPORARY SLOPE PIPE DRAIN

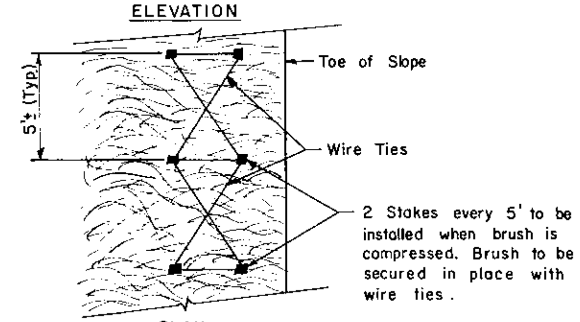


ROCK BARRIER



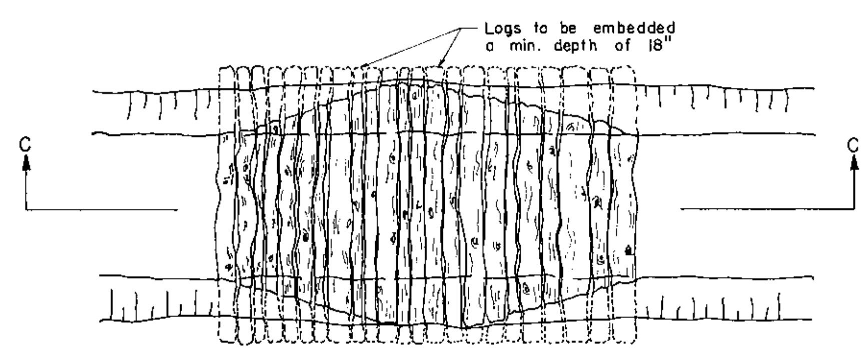
2" Maximum diameter brush from clearing operation to be placed at start of embankment fill or in drainage swale areas and compressed in place.

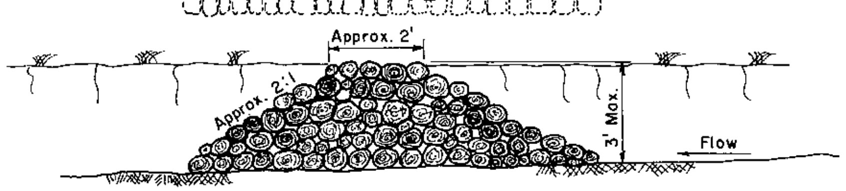
ELEVATION



PLAN

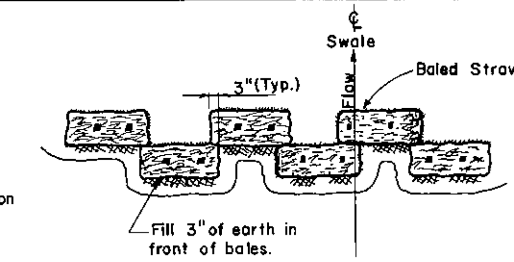
BRUSH BARRIER



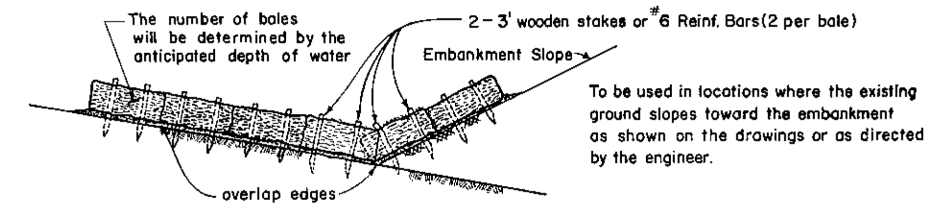


SECTION C-C

LOG BARRIER



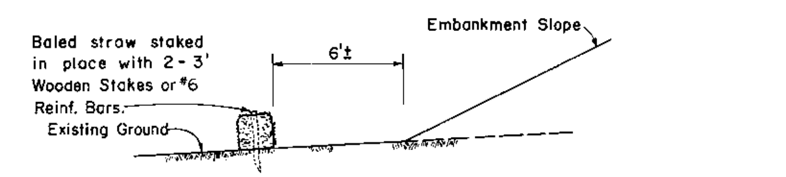
PLAN



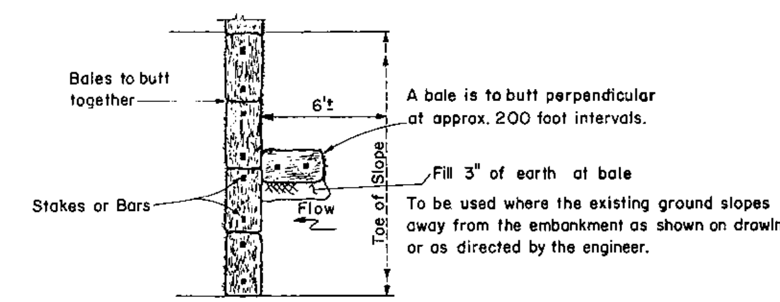
To be used in locations where the existing ground slopes toward the embankment as shown on the drawings or as directed by the engineer.

ELEVATION

DITCH CONDITION



ELEVATION



To be used where the existing ground slopes away from the embankment as shown on drawings or as directed by the engineer.

PLAN

TOE OF SLOPE CONDITION

BALED STRAW BARRIER

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

EROSION & SEDIMENT CONTROL

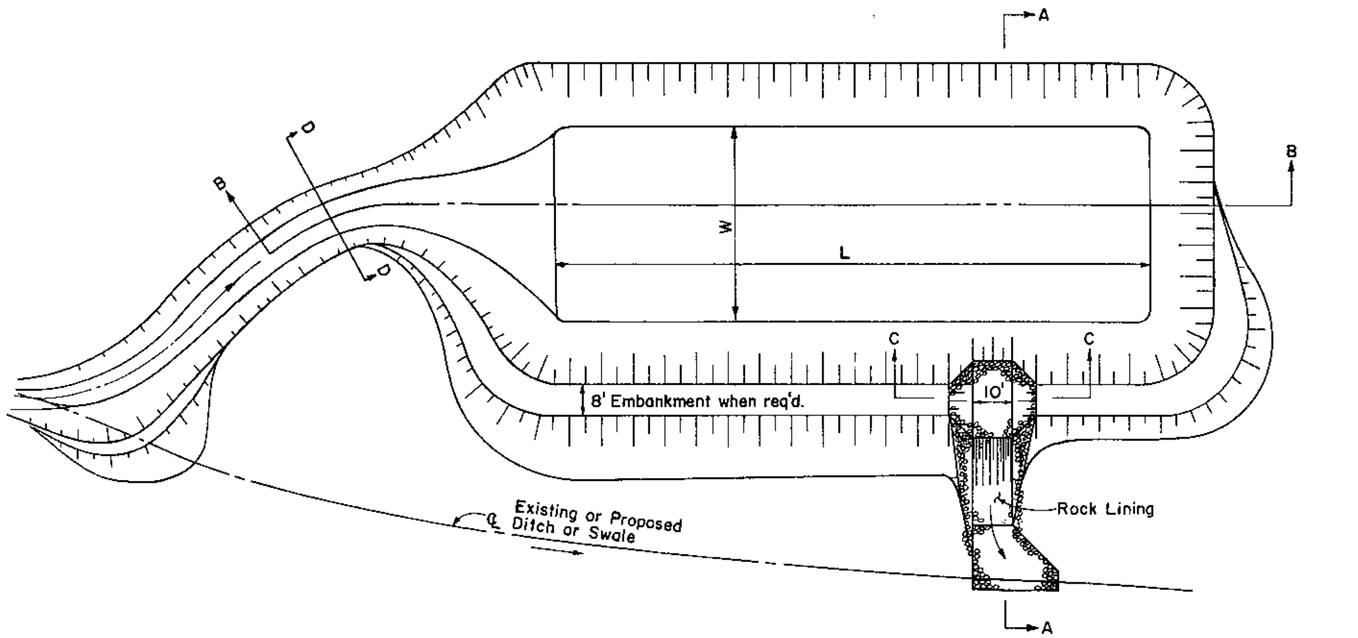
change #3

Sept 1, 1978 Sept 1, 1976

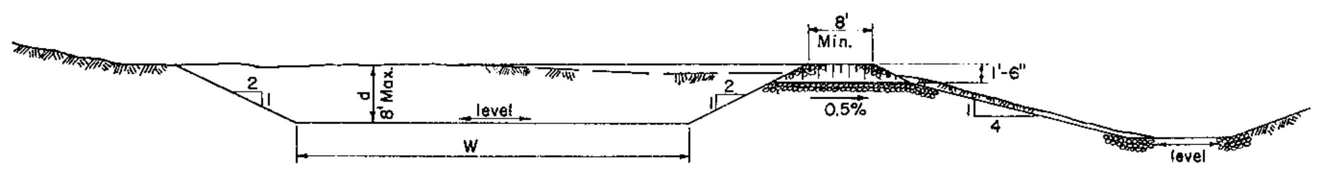
Recommended ~~January~~ 1976	Approved ~~January~~ 1976	Sht. 2 Of 4
B.D. Lourie / Director, Bureau of Design	Robert R. Mueser / Deputy Chief Hwy. Engr.	RC-70

TRACED BY
FINAL BY

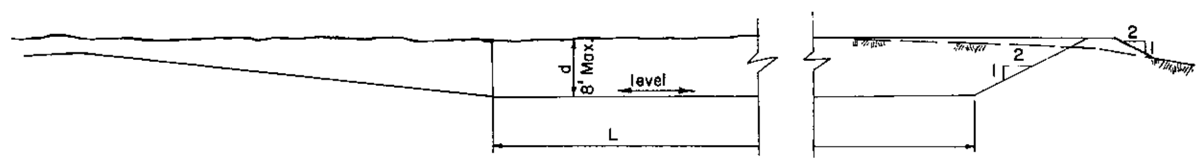
7530-2330-0140



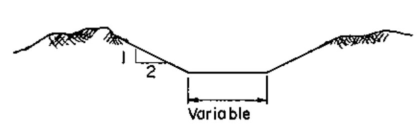
PLAN



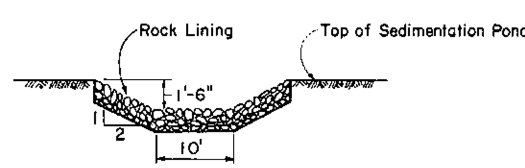
SECTION A-A



SECTION B-B

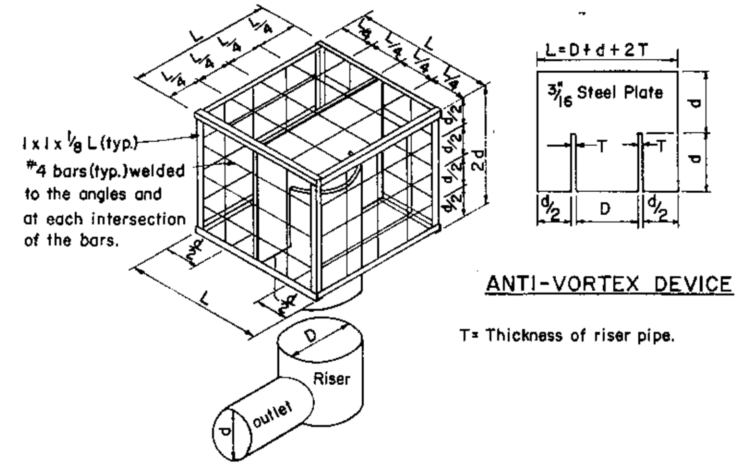


SECTION D-D

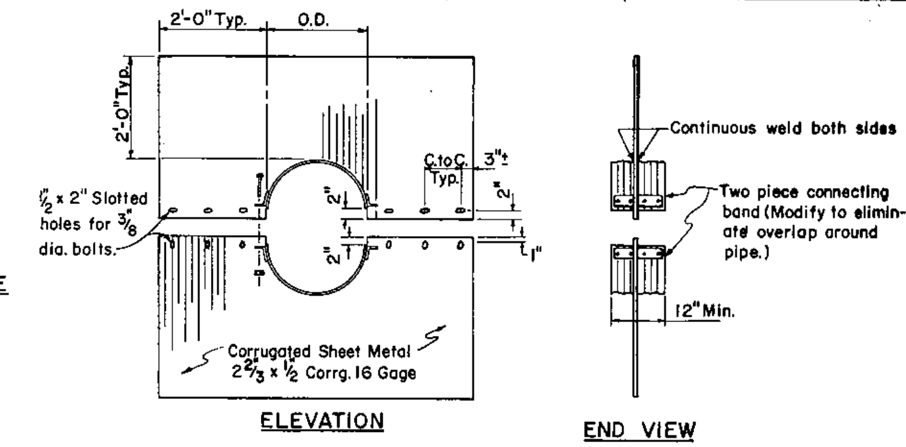


SECTION C-C

SEDIMENTATION POND - TYPE 2

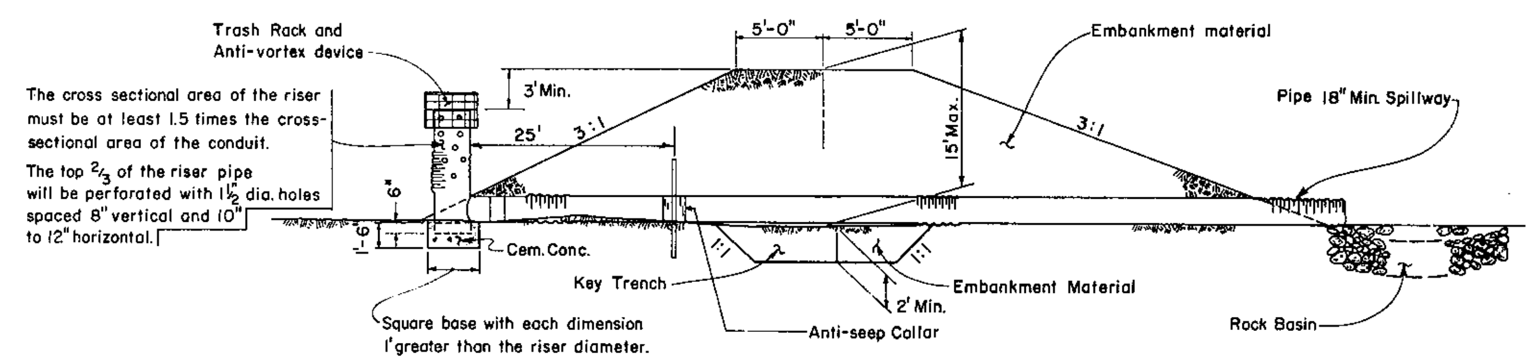


TRASH RACK AND ANTI-VORTEX DEVICE



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.

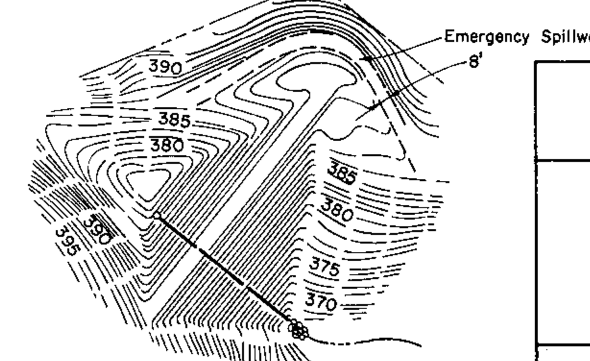
DETAIL OF ANTI-SEEP COLLAR



SEDIMENTATION POND - TYPE I

NOTES:

- An emergency spillway with a min. bottom width of 8' must be provided for every Sedimentation Pond - Type I.
- 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.

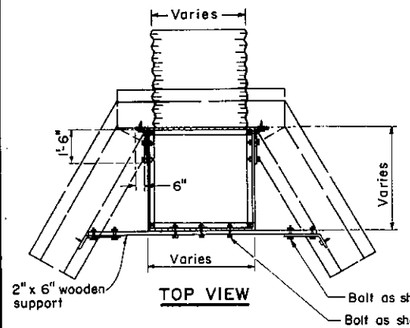


PLAN VIEW OF AN EMERGENCY SPILLWAY CUT INTO EXISTING GROUND

Commonwealth of Pennsylvania DEPARTMENT OF TRANSPORTATION BUREAU OF DESIGN		
EROSION & SEDIMENT CONTROL Change #3 Sept 1, 1978 Sept 1, 1978		
Recommended ~~June 1, 1976~~ B.D. Rounds Director, Bureau of Design	Approved ~~June 1, 1976~~ Robert R. Munro Deputy Chief Hwy. Engr.	Sht. 3 Of 4 RC-70

TRACED BY
FINAL BY

7530-8350-0140

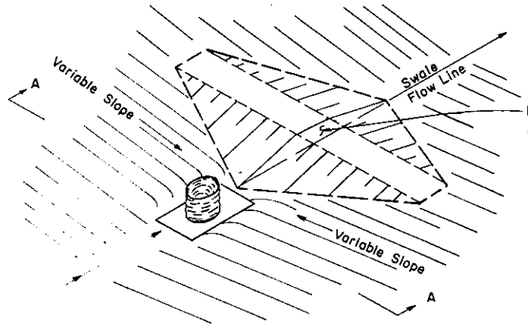


TOP VIEW

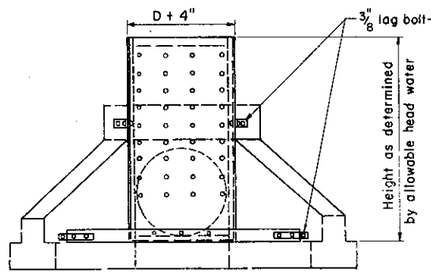
Notes:

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.

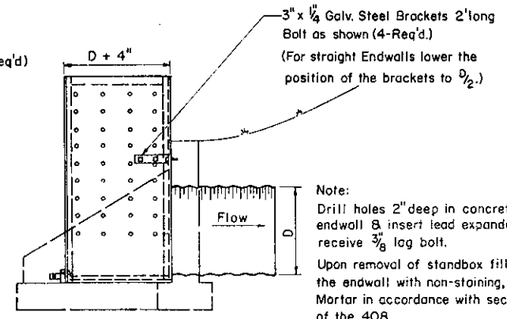
The Basin and/or area upstream from the Standbox shall be cleaned periodically and the sediment and debris disposed of in an area approved by the engineer.



ISOMETRIC VIEW OF INLET RISER PIPE & DRAINAGE DIKE



END VIEW

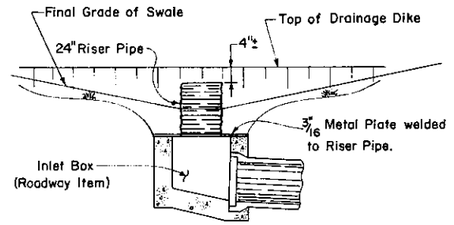


SIDE VIEW

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

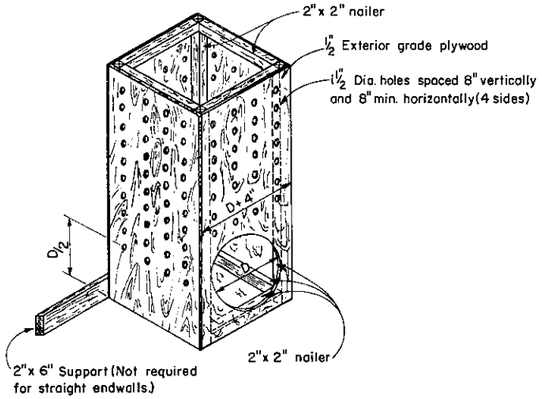


SECTION A-A

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

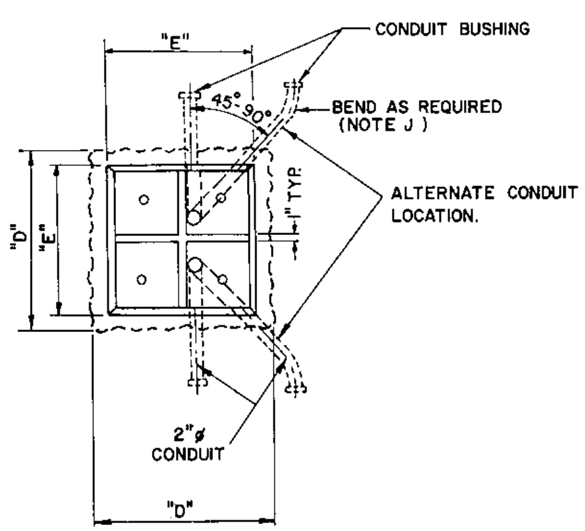
EROSION & SEDIMENT CONTROL

Change #3

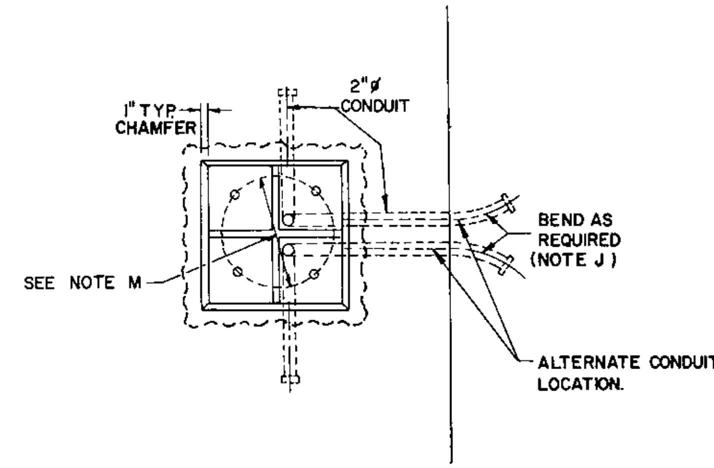
Recommended Sept 1, 1978	Approved Sept 1, 1978	Sht. 4 Of 4
Director, Bureau of Design	Deputy Chief Hwy Engr.	RC-70

TRACED BY
FINAL BY

FORM 4337 REV 3-61



PLAN



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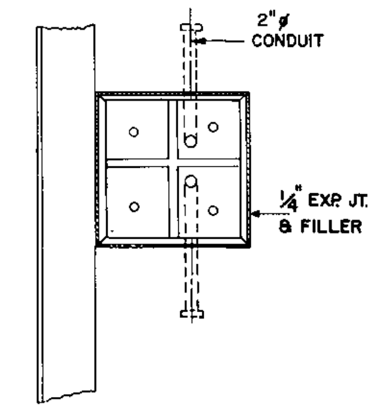


PLAN

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.

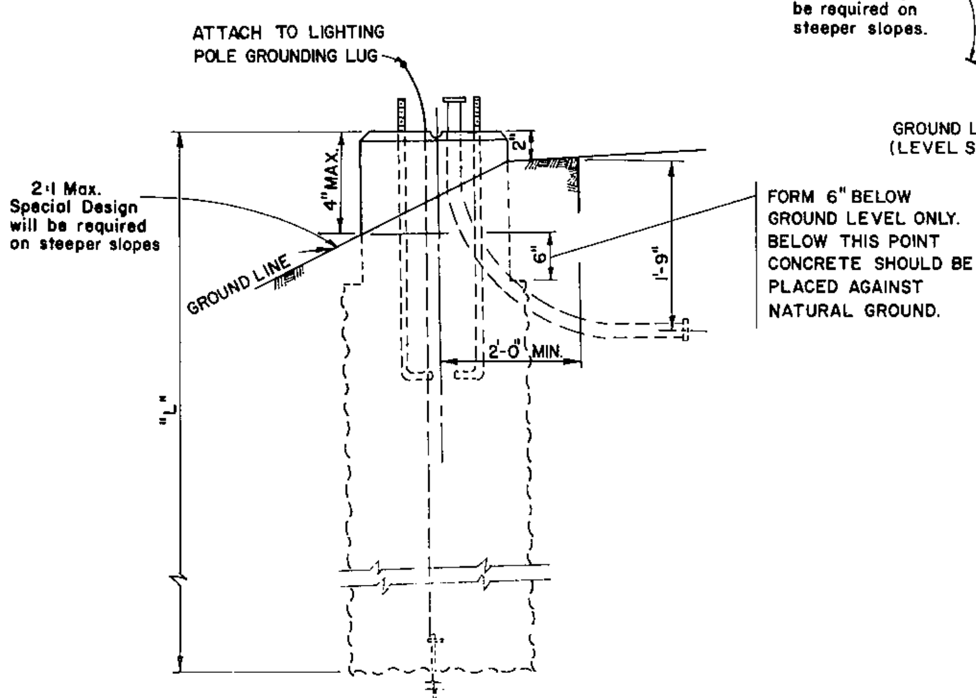
G- LEAVE 30 INCHES OF #4 GROUND WIRE COILED ABOVE FOUNDATION. (WIRE EXTENDS THROUGH CENTER OF FOUNDATION.)

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

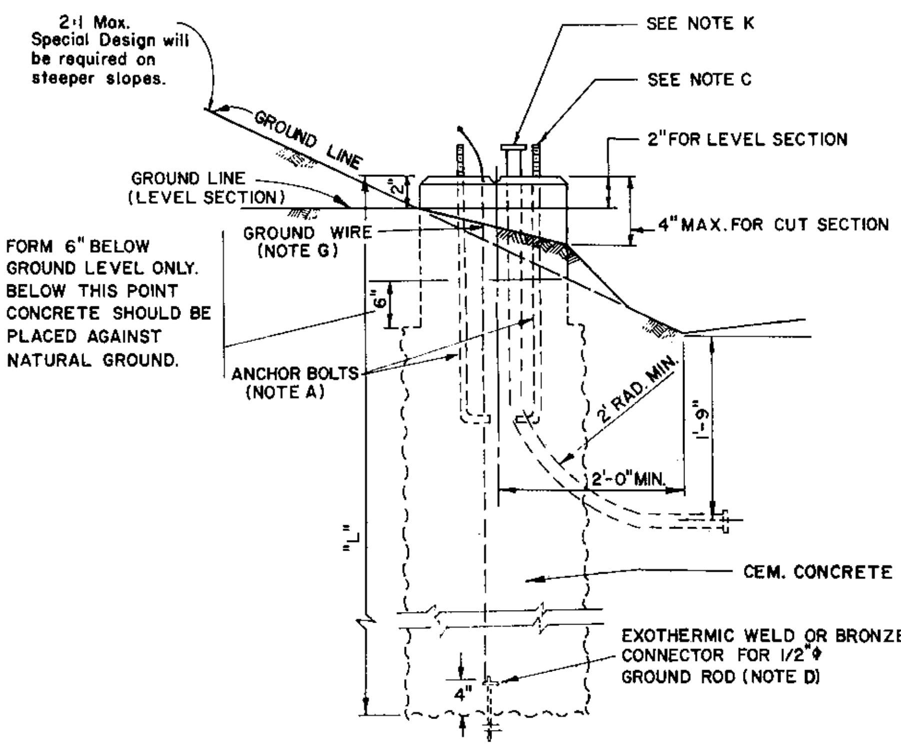
J- MINIMUM BEND RADIUS TO BE SIX TIMES CONDUIT DIAMETER, UNLESS OTHERWISE SPECIFIED.

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.

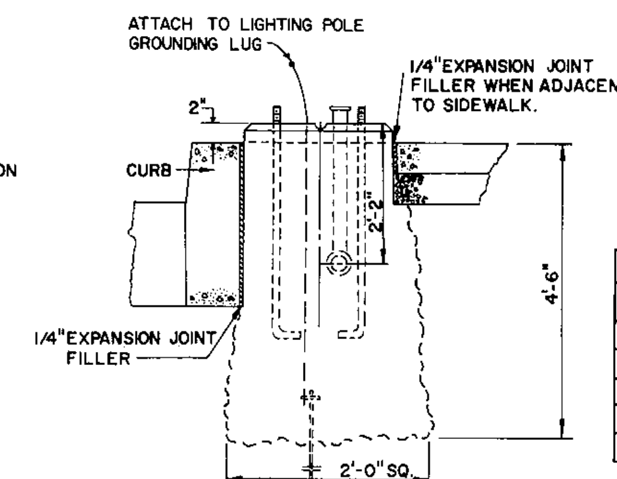


FOR FILL SECTION



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

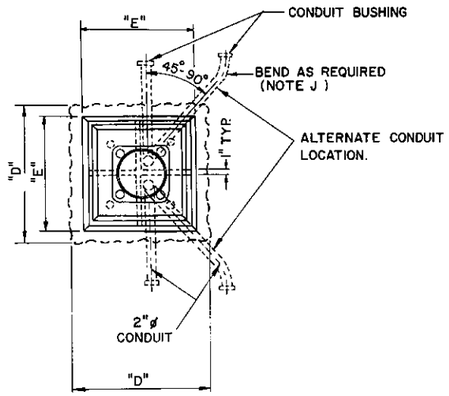
HIGHWAY LIGHTING FOUNDATIONS
CONVENTIONAL LIGHTING POLE

Recommended July 16, 1980
B.P. Lowski
Director, Bureau of Design

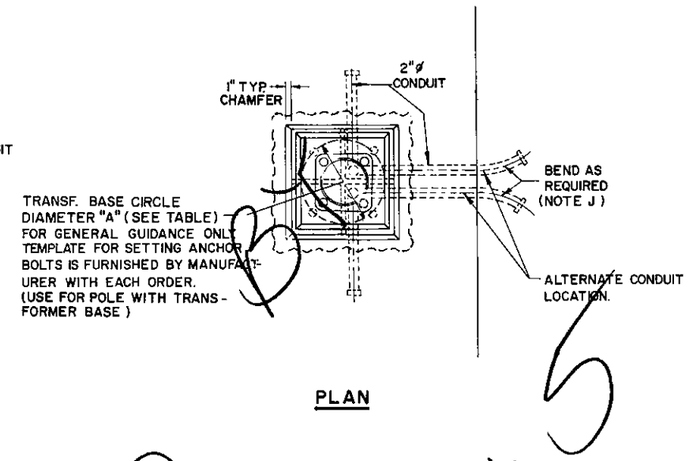
Approved July 16, 1980
David C. Sims
Deputy Sec. for Highway Admin.

Sht. 1 Of 2

RC-80



PLAN



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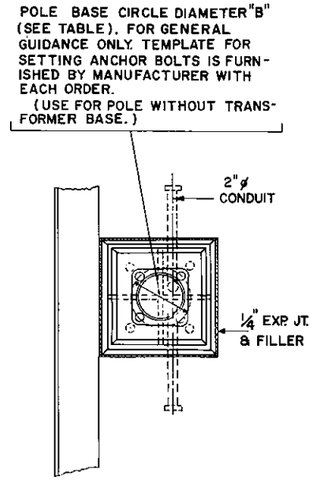


PLAN

NOTES:

A- 4 ANCHOR BOLTS REQUIRED, (SEE TABLE)

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

C- ALL ANCHOR BOLT NUTS, STEEL 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.

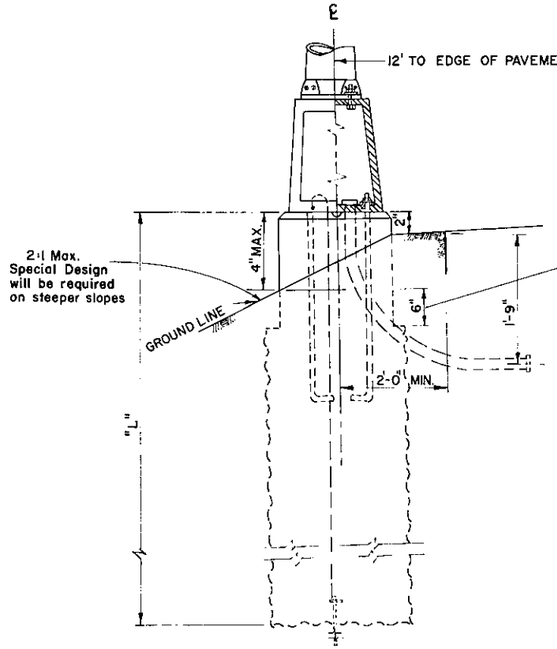
E- SEE RC-83 FOR POLE DETAILS.

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

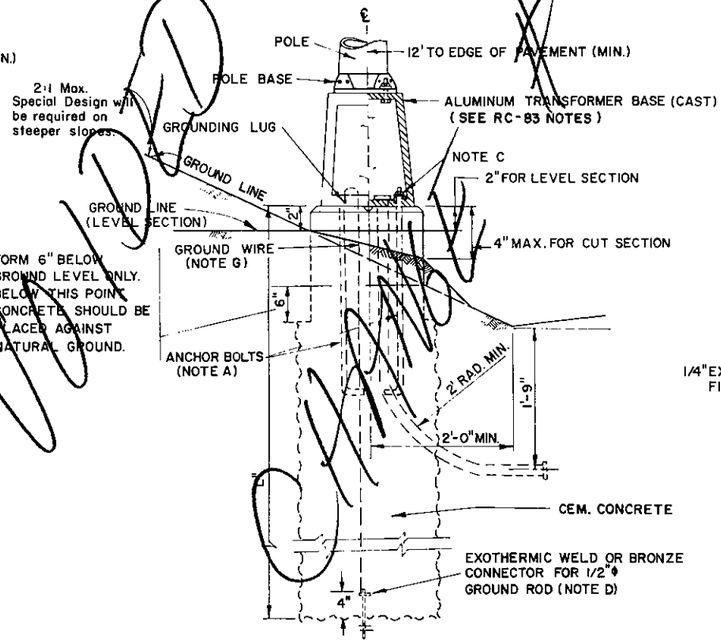
G- LEAVE 30 INCHES OF #4 GROUND WIRE COILED ABOVE FOUNDATION. (WIRE EXTENDS THROUGH CENTER OF FOUNDATION.)

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.

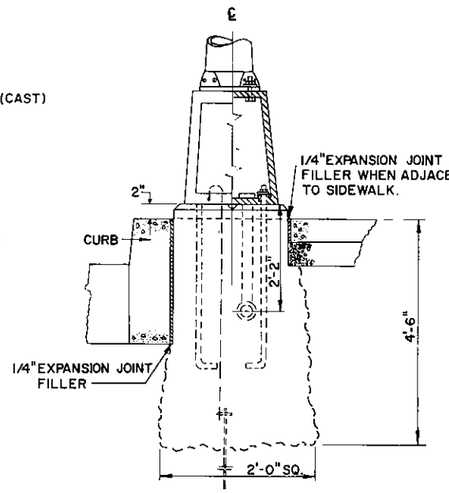


FOR FILL SECTION



FOR CUT OR LEVEL SECTION

TYPE - FC
(NOTE H)



FOR STREET LIGHTING

TYPE - P

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

	BOLT CIRCLE		
	TRANSF. BASE	POLE BASE	
MOUNTING HEIGHTS	"A"	"B"	ANCHOR BOLT SIZE
35' MAX.	15"	11"	1" x 40" *
40' — 50'	17 1/4"	15 1/4"	1 1/4" x 48" *

* LENGTH INCLUDES HOOK

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

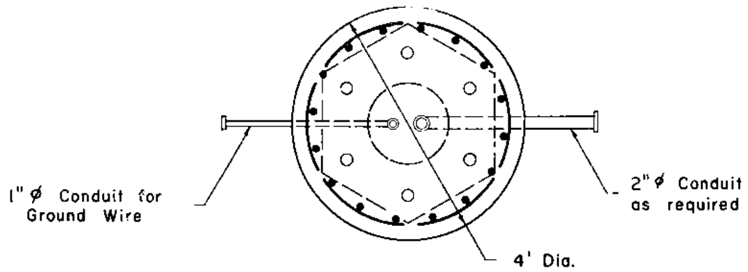
HIGHWAY LIGHTING FOUNDATIONS
CONVENTIONAL LIGHTING POLE

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

Approved June 1 1976
Deputy Chief Hwy. Engr.

Sht. 1 Of 2

RC-80



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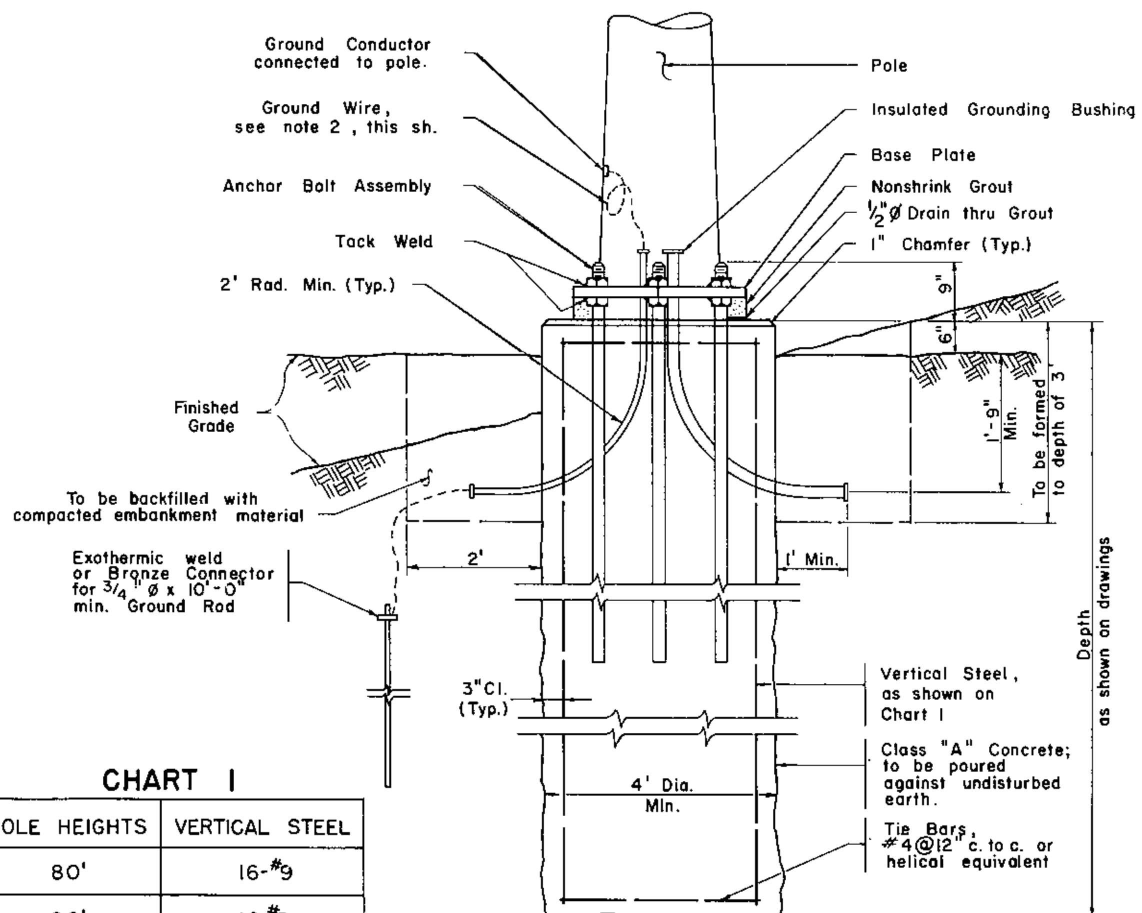
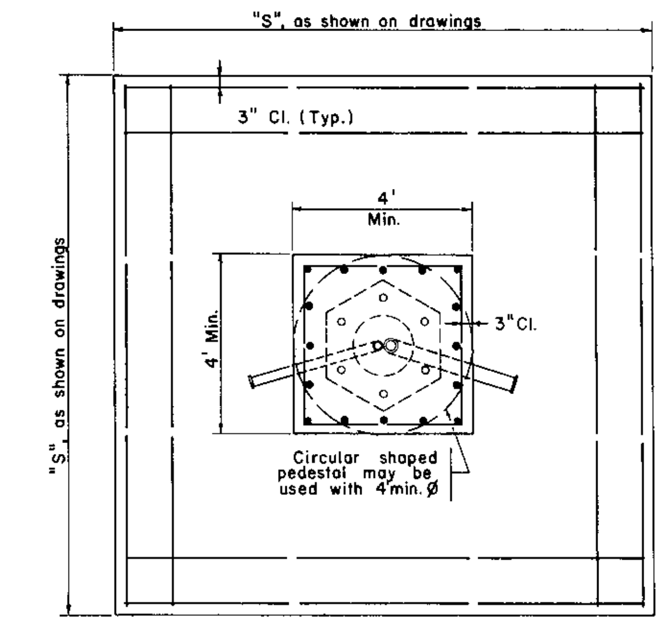


ELEVATION

DRILLED CAISSON FOUNDATION

CHART 1

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



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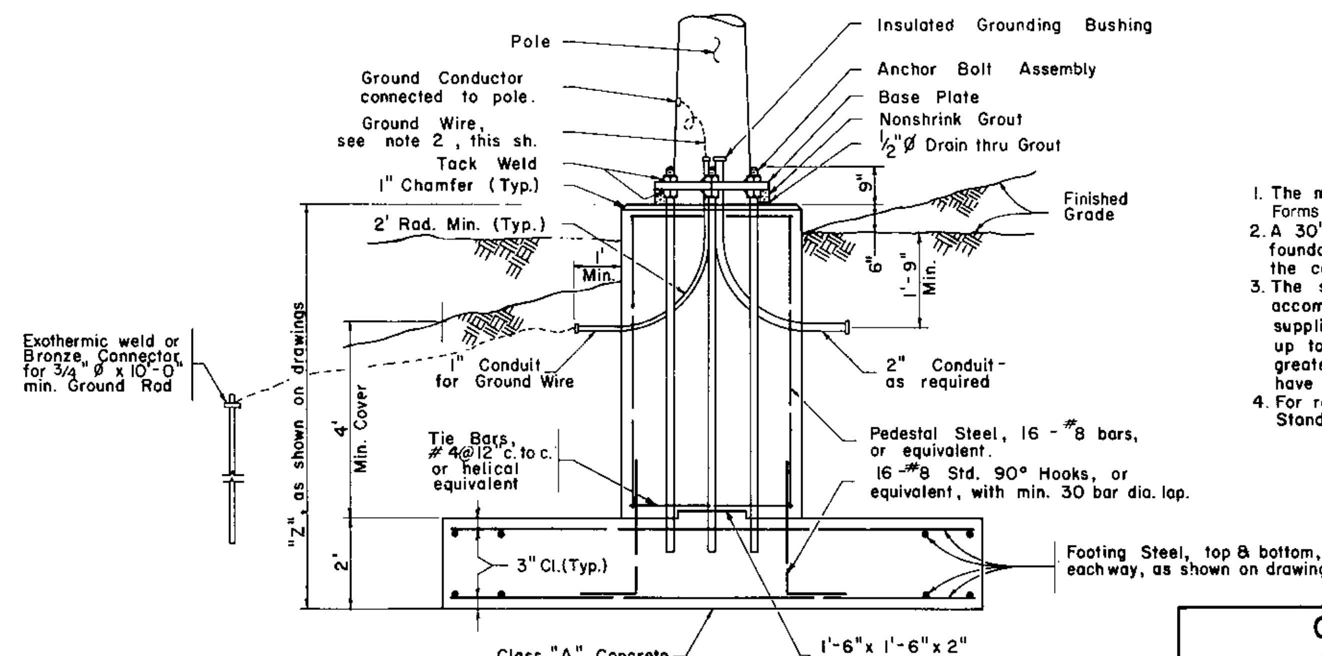


ELEVATION

SPREAD FOOTING FOUNDATION

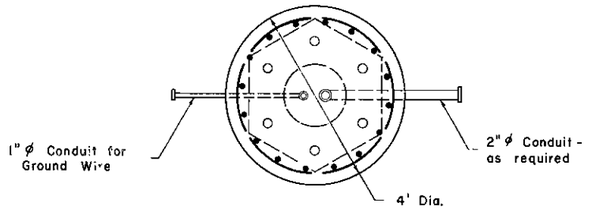
NOTES

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 16, 1980 B.D. Ronaski Director, Bureau of Design	Approved July 16, 1980 David Collins Deputy Sec. for Highway Admin.	Sht. 2 Of 2 RC-80



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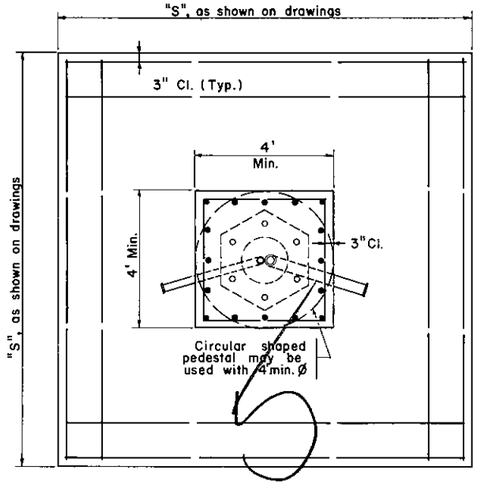

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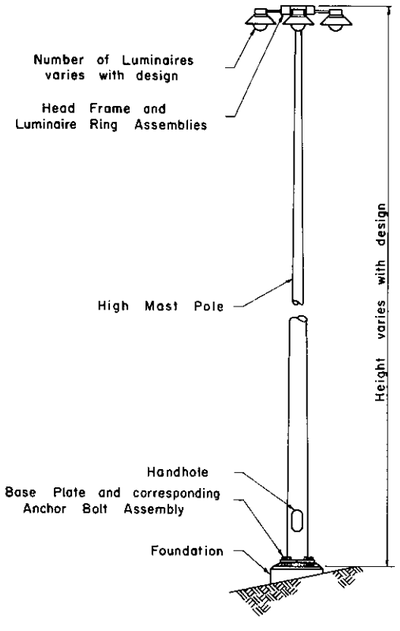
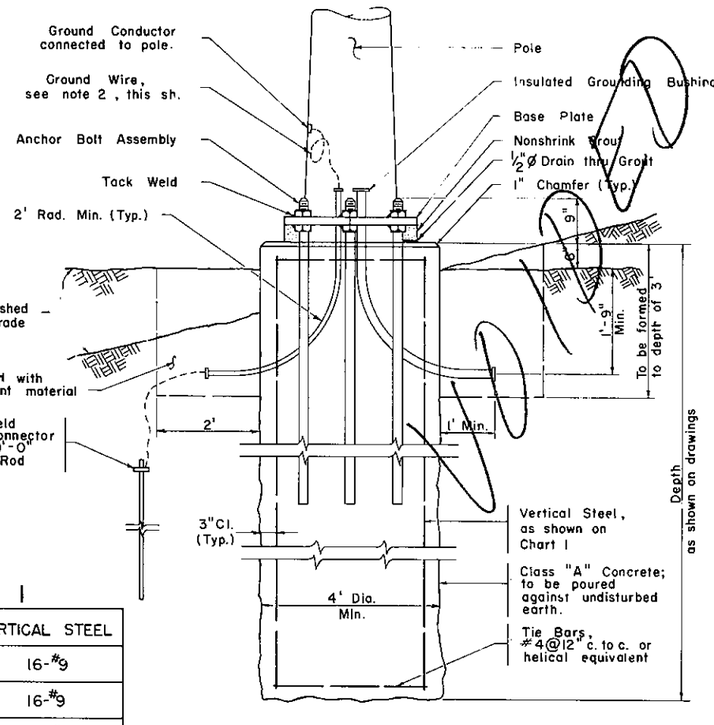


TYPICAL HIGH MAST POLE ELEVATION

NOTES

1. The materials and workmanship shall be in accordance with Penn DOT 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.

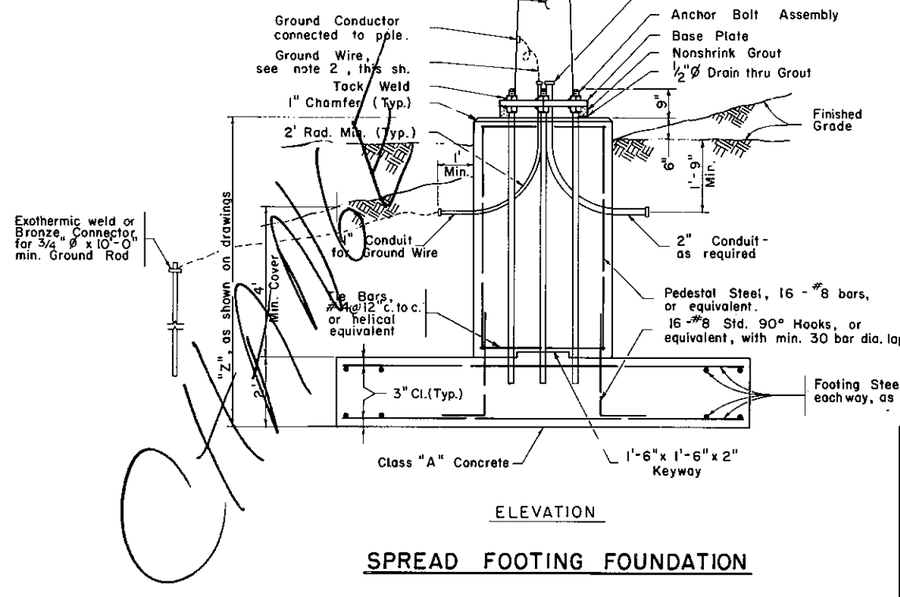


ELEVATION

DRILLED CAISSON FOUNDATION

CHART I

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



ELEVATION

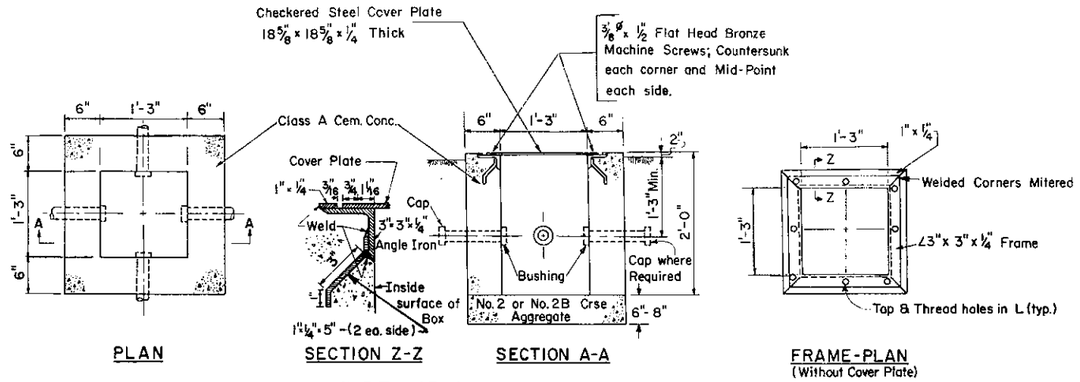
SPREAD FOOTING FOUNDATION

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

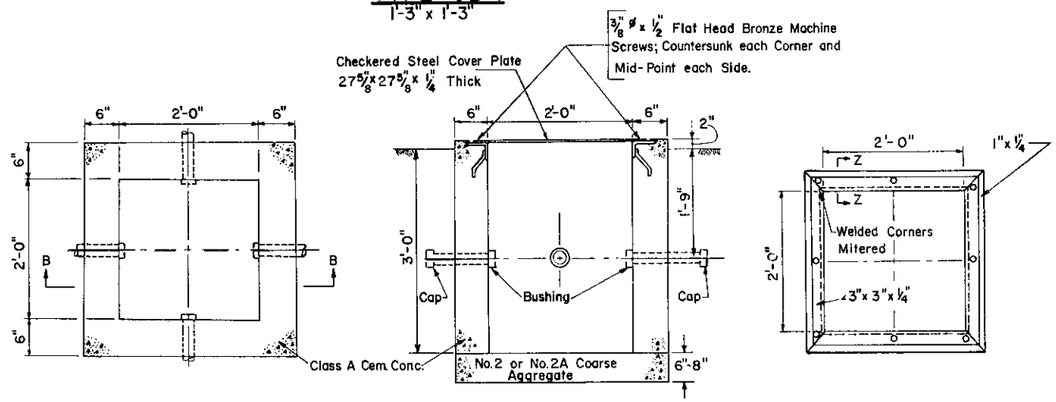
HIGHWAY LIGHTING FOUNDATIONS
HIGH MAST LIGHTING POLE

Recommended June 1, 1976	Approved June 1, 1976	Sht. 2 Of 2
B.O. Rountree	Robert P. Messer	RC-80
Director, Bureau of Design	Deputy Chief Hwy. Engr.	

TRACED BY
FINAL BY



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



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

Notes:

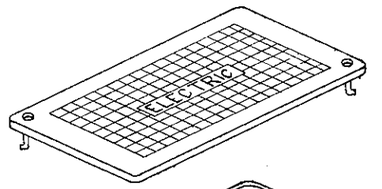
JB-1 and JB-2 shall be used in locations where they will be subject to loads no heavier than pedestrian traffic.

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

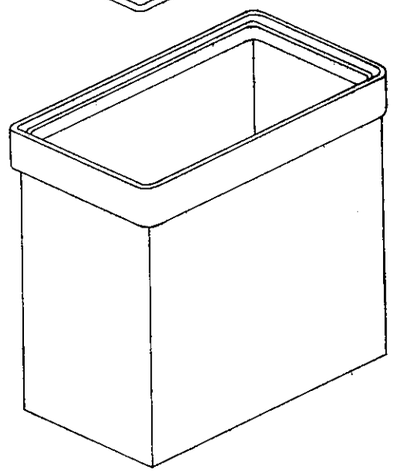
Equivalent approved precast concrete junction boxes may be substituted for JB-1 and JB-2 shown.

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

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

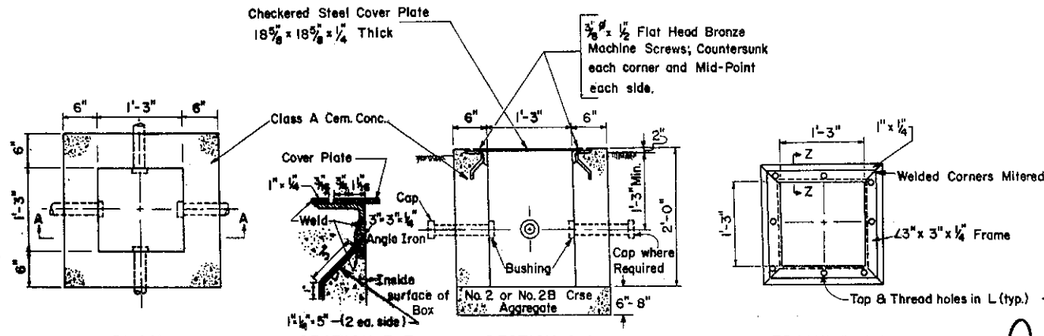
JUNCTION BOXES - LIGHT DUTY

Recommended July 16, 1980
R. D. Gramblin
Director, Bureau of Design

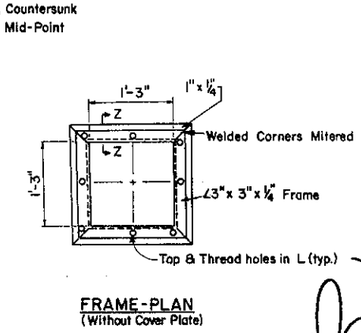
Approved July 16, 1980
David Talmadge
Deputy Sec. for Highway Admin.

Sht. 1 Of 1

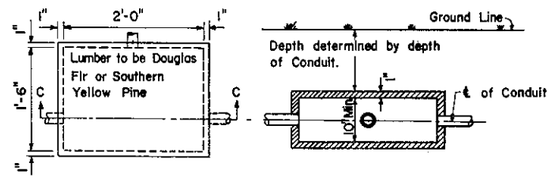
RC-81



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



FRAME-PLAN
(Without Cover Plate)

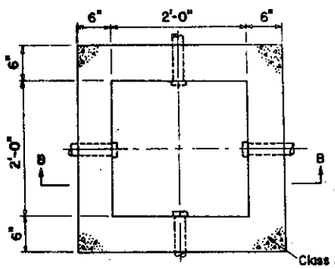


PLAN

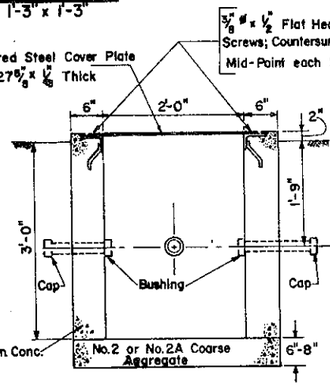
ELEVATION
SECTION C-C

BURIED TREATED WOOD JUNCTION BOX
FOR OFF-SHOULDER LOCATIONS

TYPE JB-4

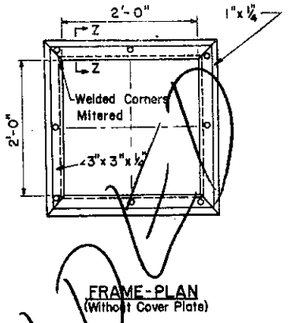


PLAN



SECTION B-B

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



FRAME-PLAN
(Without Cover Plate)

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 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.

VOID
CHANGE

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

HIGHWAY LIGHTING

JUNCTION BOXES - LIGHT DUTY

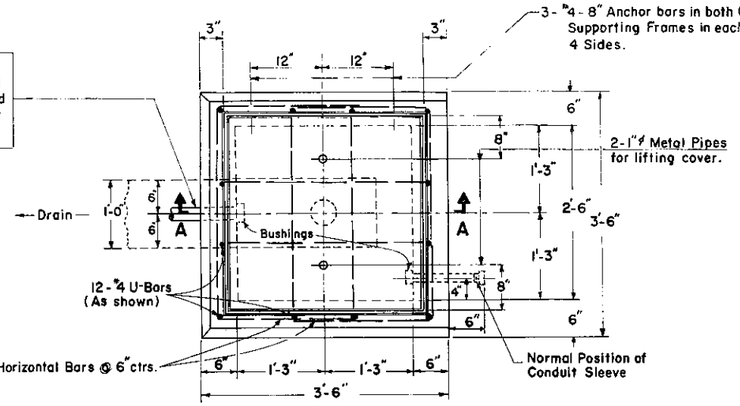
Recommended Dec. 1, 1971
R R Moore
Location & Design Engineer

Approved Dec. 1, 1971
W. J. Reese
Deputy Chief Hwy. Engr.

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.

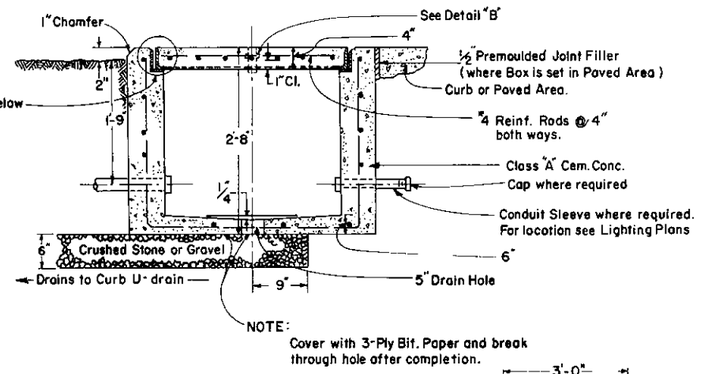


PLAN

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

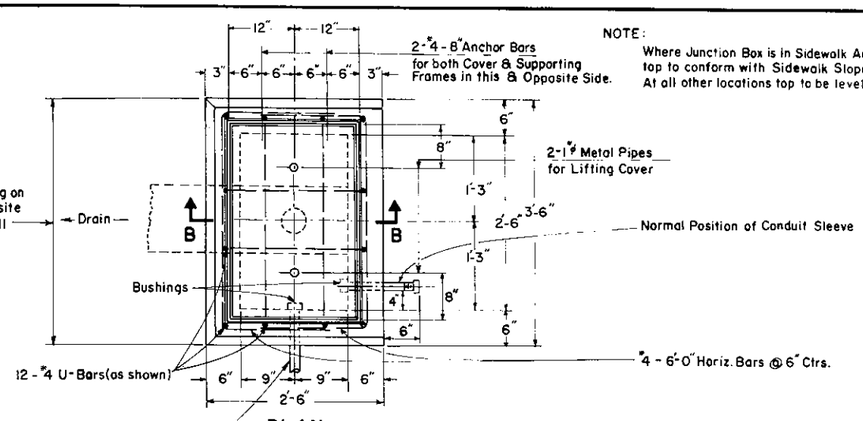
NOTE:
For location, size, and Number of Conduits for each Junction Box see Lighting Plans.

NOTE:
Provide two (2) Cu. Ft. of No. 28 Aggregate for Drain when no Underdrain is available.



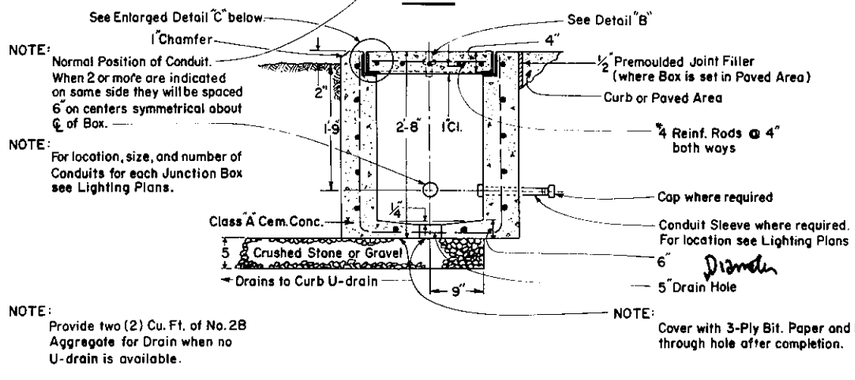
SECTION A-A
JUNCTION BOX JB-11
2'-6" x 2'-6"

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



PLAN

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



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.

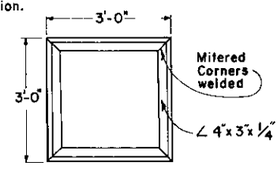
NOTE:
For location, size, and number of Conduits for each Junction Box see Lighting Plans.

NOTE:
Provide two (2) Cu. Ft. of No. 28 Aggregate for Drain when no U-drain is available.

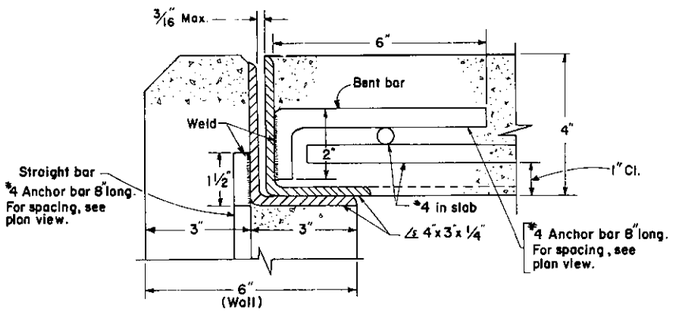
NOTE:
Cover with 3-Ply Bit. Paper and break through hole after completion.

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

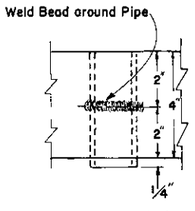
NOTES:
1. JB-11 & JB-12 shall be used in Shoulders or other locations where they will be subject to Vehicular Loads.
2. For other locations, Use JB-1 or JB-2 shown on RC-81
3. Equivalent Approved Precast Junction Boxes may be substituted for JB-11 & JB-12 shown.



∠-FRAME PLAN
(Steel or Aluminum) No Scale



ENLARGED DETAIL "C"
COVER FRAME & SUPPORTING FRAME



DETAIL "B"

- 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
- After installation, all exposed steel shall be painted with one coat of approved primer and one coat of approved bituminous.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

HIGHWAY LIGHTING

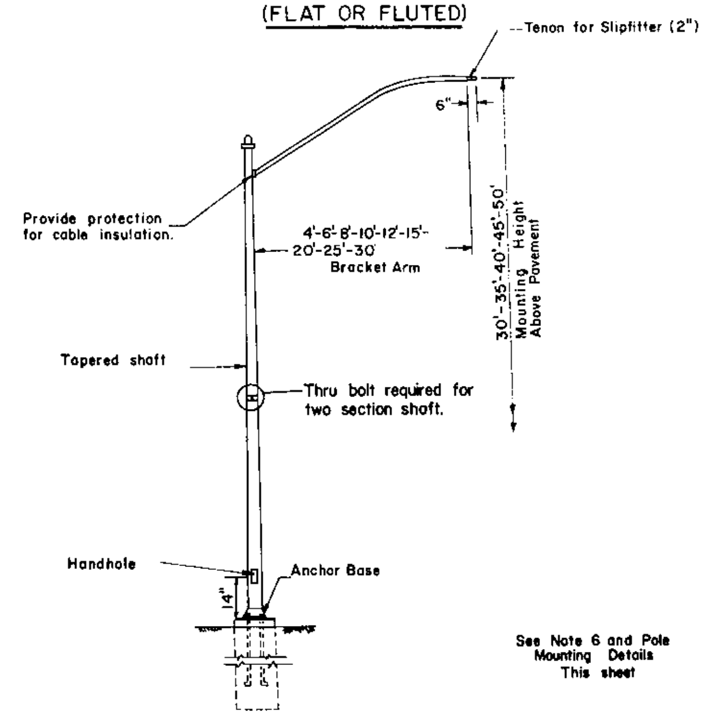
JUNCTION BOXES HEAVY DUTY

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

FORM 4237 REV 3-61

ROUND ALUMINUM and STEEL POLES AND OCTAGONAL STEEL POLES

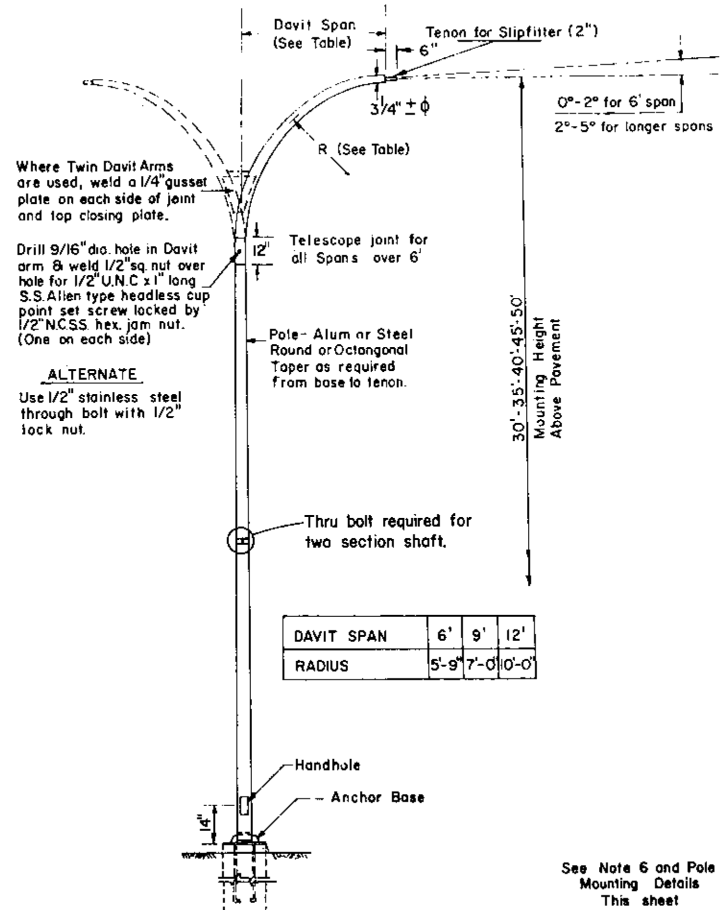
(FLAT OR FLUTED)



See Note 6 and Pole Mounting Details This sheet

TYPE A TYPE S

DAVIT-TYPE POLES



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

See Note 6 and Pole Mounting Details This sheet

TYPE A TYPE S

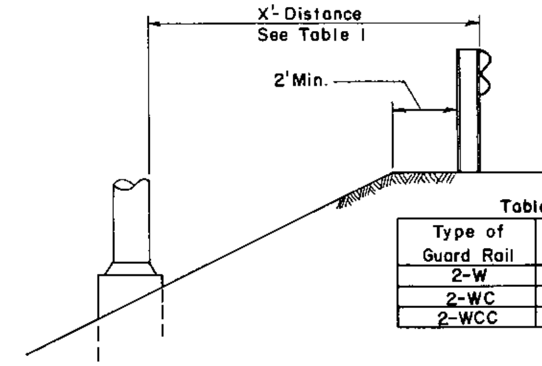


Table I

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

WEAK POST GUARD RAIL

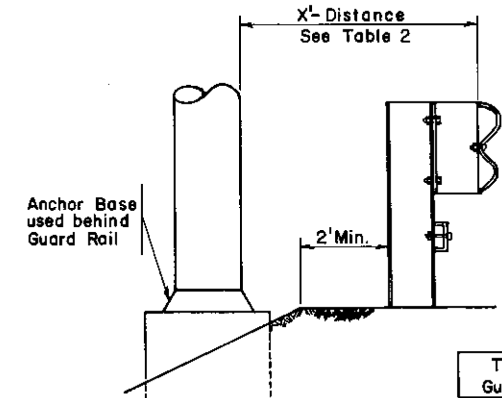


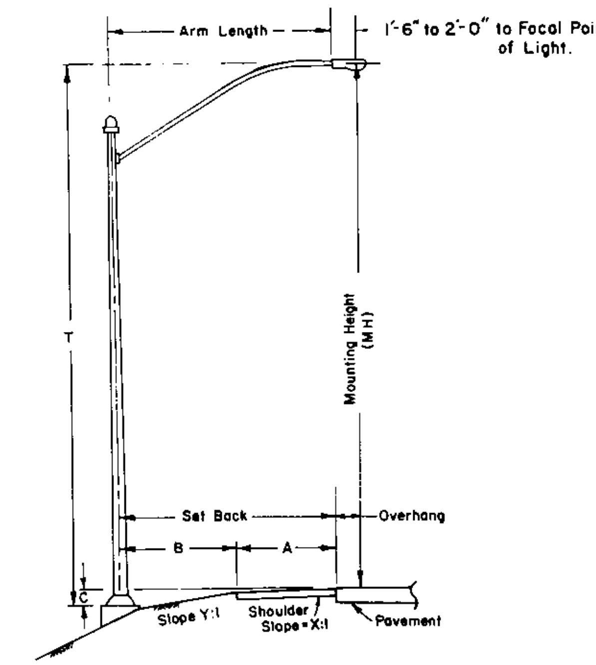
Table 2

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

STRONG POST GUARD RAIL

GUARD RAIL CLEARANCES

TERMINOLOGY



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

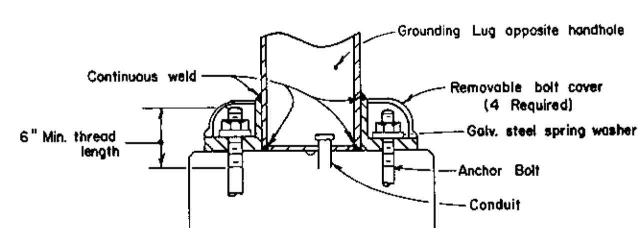
$T = MH + C$

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

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 requirements for breakaway supports. Breakaway bases include slip base, breakaway couplings, frangible bases, rivited sleeve, anchor clips, etc.

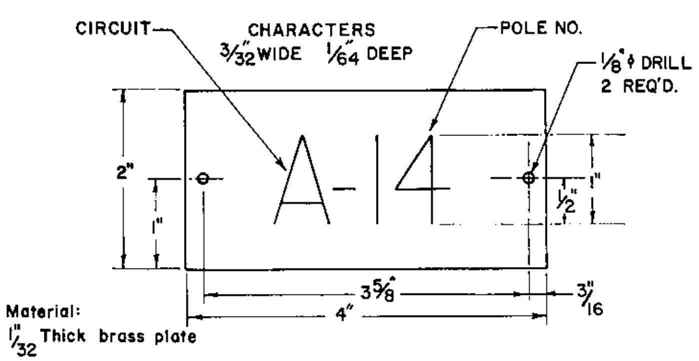
POLE MOUNTING DETAILS



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.

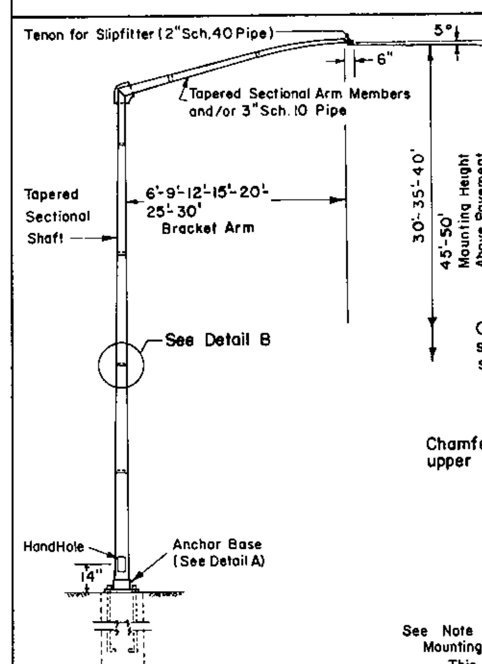
TYPE S, LIGHTING POLE
(See Note 6)



Material:
1/32" Thick brass plate

IDENTIFICATION TAG DETAIL

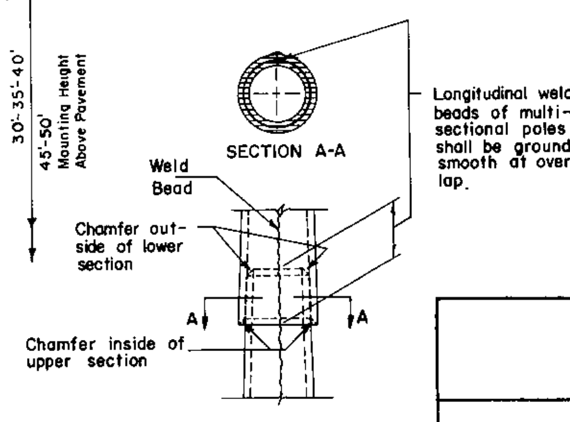
SECTIONAL STEEL POLES



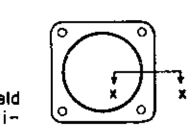
TYPE A

See Note 6 and Pole Mounting Details This sheet

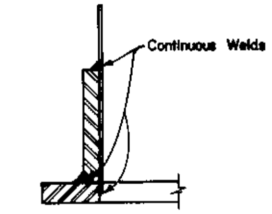
TYPE S



DETAIL B



DETAIL A



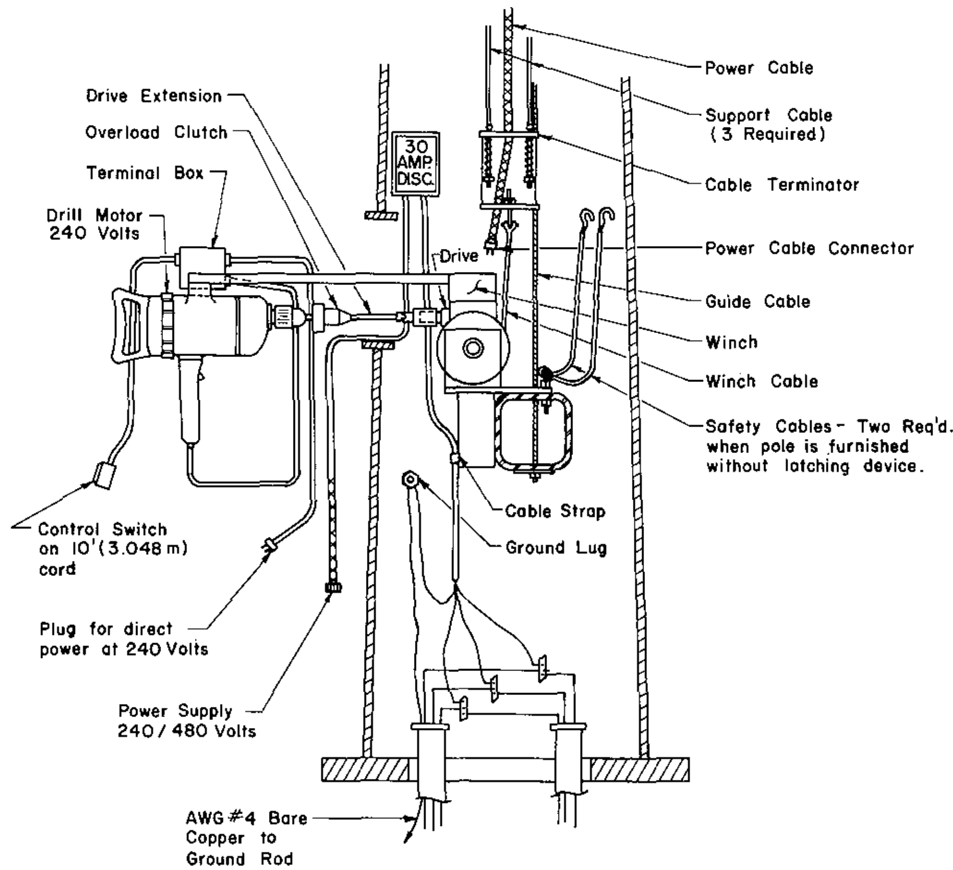
Section X-X Anchor Base

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

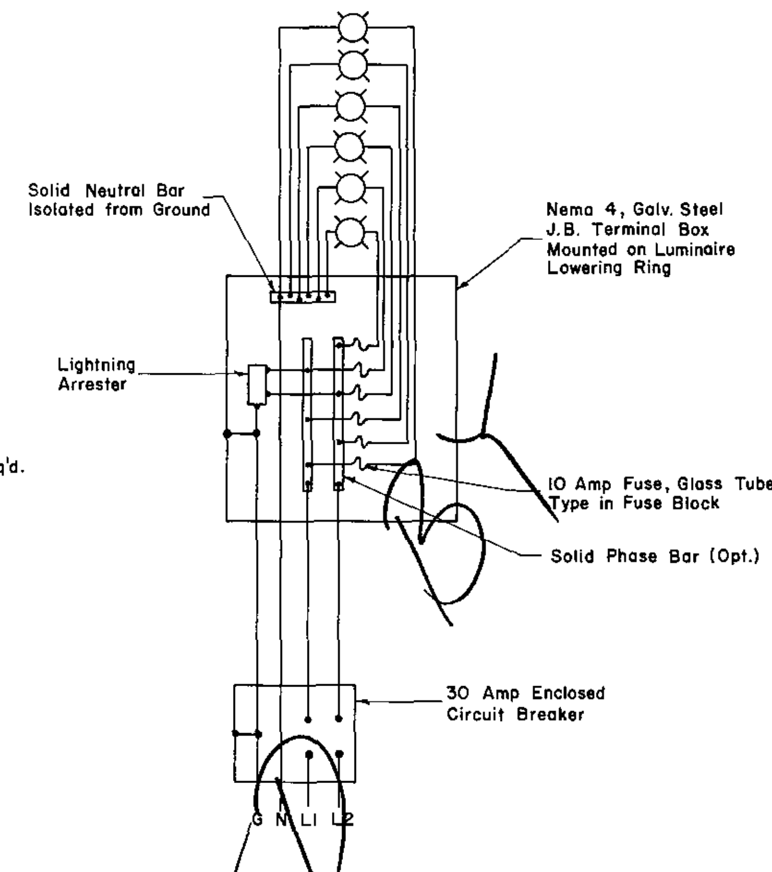
HIGHWAY LIGHTING

CONVENTIONAL LIGHTING POLE DETAILS

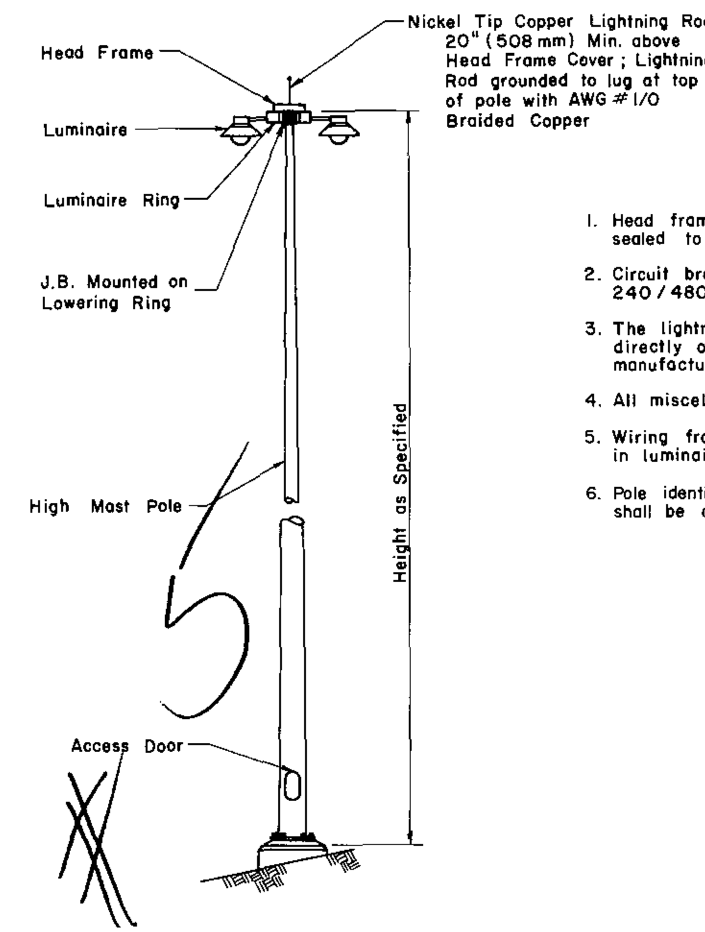
Recommended July 16, 1980 B.O. [signature] Director, Bureau of Design	Approved July 16, 1980 David [signature] Deputy Secretary for Hwy. Admin.	Sht. 1 Of 2 RC-83



TYPICAL LOWER SECTION MECHANISM



TYPICAL CIRCUIT SCHEMATIC



TYPICAL HIGH MAST POLE

VOIDED BY CHANGE 5

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

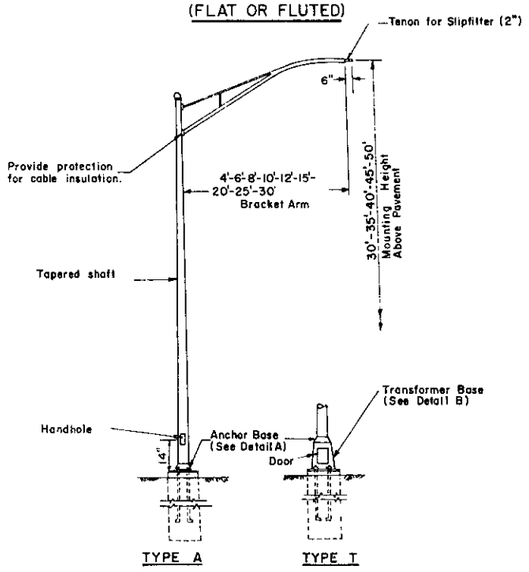
HIGH MAST LIGHTING POLE DETAILS

Recommended May 1, 1978 B.D. Rowakie Director, Bureau of Design	Approved May 1, 1978 James M. Sebastian Deputy Chief Hwy. Engr.	Sht. 2 Of 2 RC-83

FORM 4237 REV 3-61

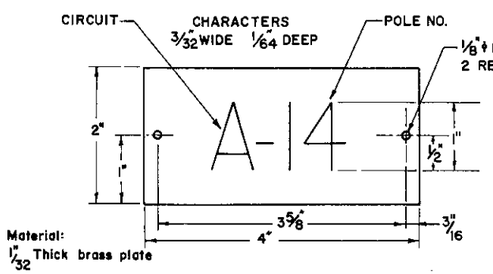
ROUND ALUMINUM and STEEL POLES AND OCTAGONAL STEEL POLES

(FLAT OR FLUTED)



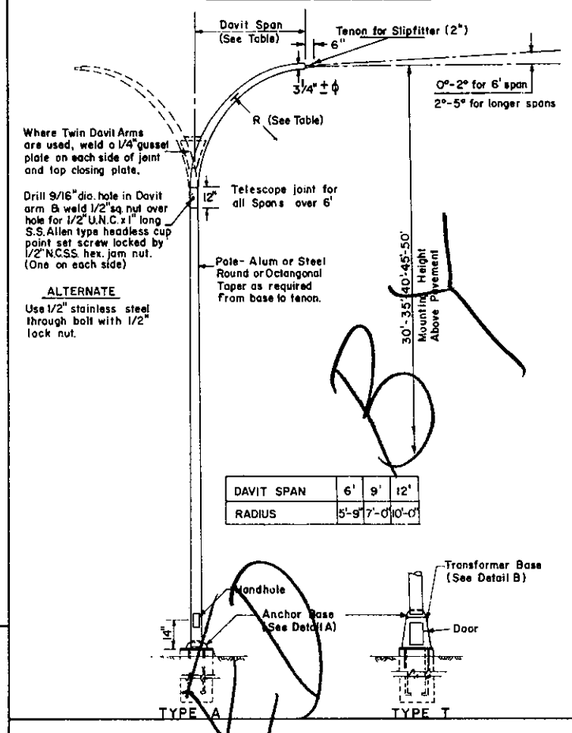
GENERAL NOTES

1. See RC-80 for details on pole foundations and transformer bases.
2. Aluminum Poles – Shaft base diameter may vary from 8"–14" and shaft wall thickness from .188"–.312" depending on mounting height and arm length.
3. Steel Poles – Shaft base diameter may vary from 7.5"–10.0". Nominal shaft wall thickness is 11 gage. (Does not apply to Sectional Steel Poles.)
4. Manufacturers certification of compliance with load tests outlined in Form 408 is required for all poles.
5. Where all steel and aluminum poles or transformer 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).
6. Identification plates shall be provided for all poles.
7. Bolt template for anchor base or transformer base furnished by manufacturer.
8. Approved Materials for Poles:
   Aluminum and Steel as per Form 408.

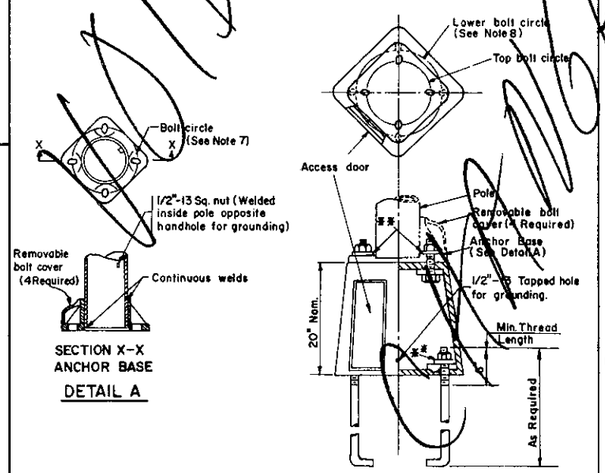


IDENTIFICATION TAG DETAIL

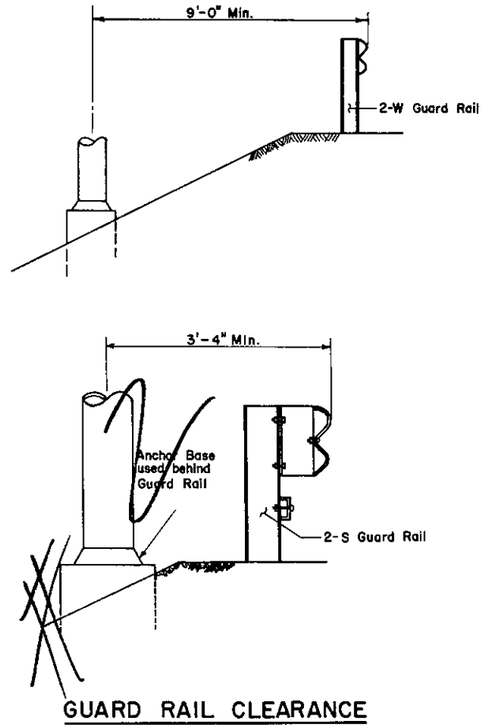
DAVIT-TYPE POLES



POLE BASES

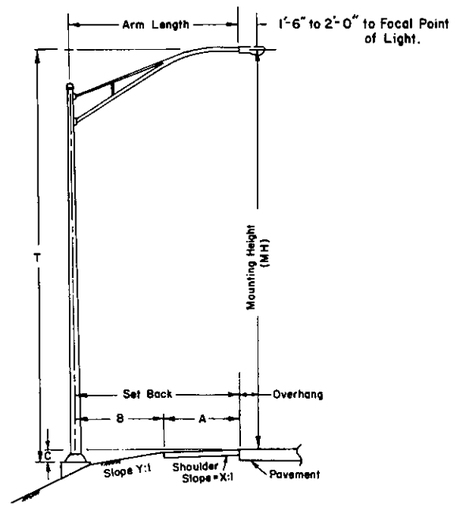


** Galvanized steel spring lock washer.



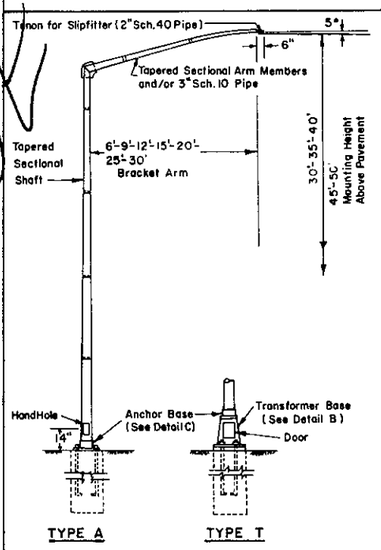
GUARD RAIL CLEARANCE

TERMINOLOGY

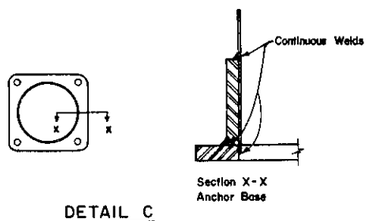


$C = \frac{A}{X} + \frac{B}{Y}$

$T = MH + C$



SECTIONAL STEEL POLES



DETAIL C

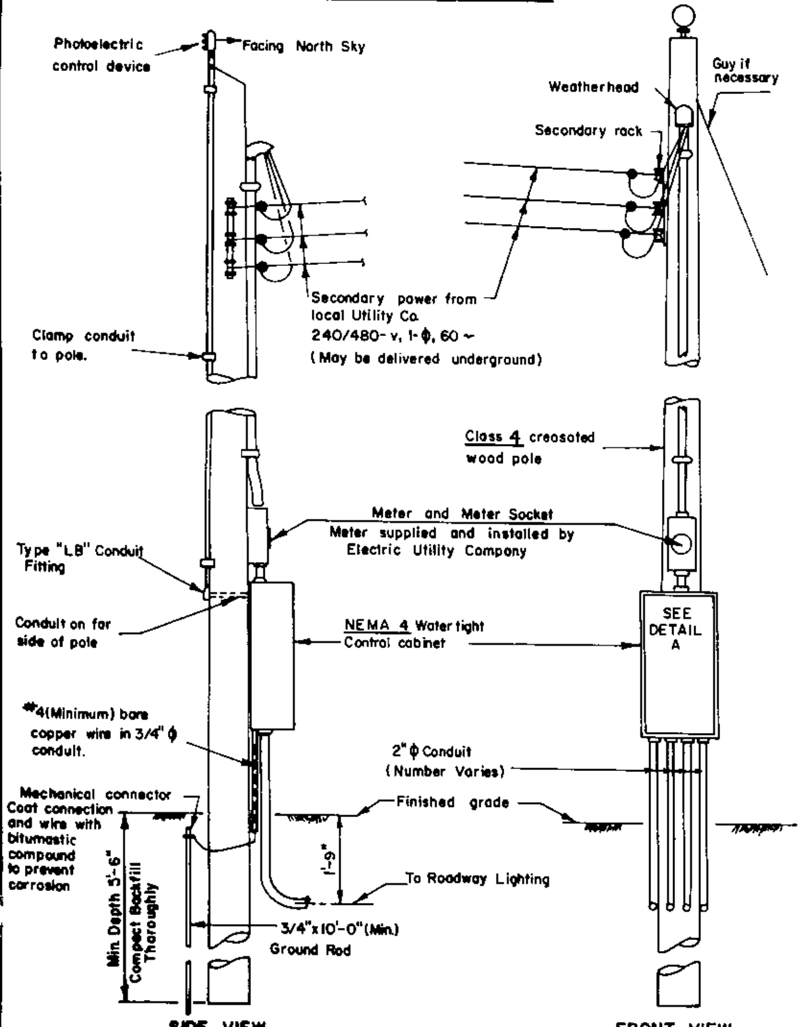
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

HIGHWAY LIGHTING

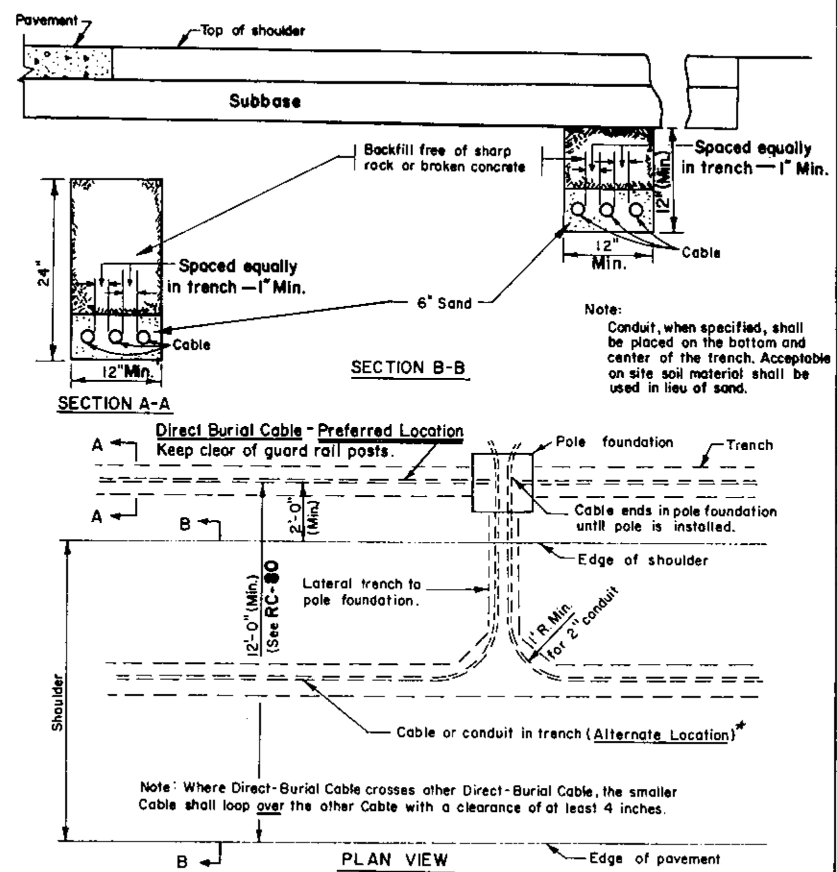
LIGHTING POLE DETAILS

Recommended Mar. 7, 1973	Approved Mar. 7, 1973	Sht. 1 Of 1
Director, Bureau of Design	Deputy Chief Hwy. Engr.	RC-83

TYPICAL TERMINAL POLE EQUIPMENT ARRANGEMENT FOR POWER SUPPLY

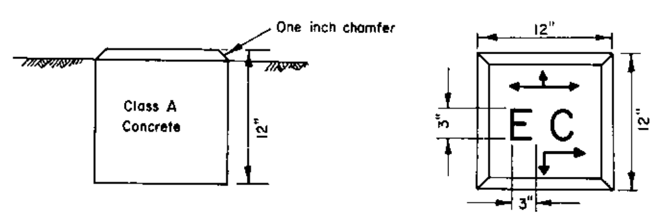


DIRECT-BURIAL CABLE & CONDUIT



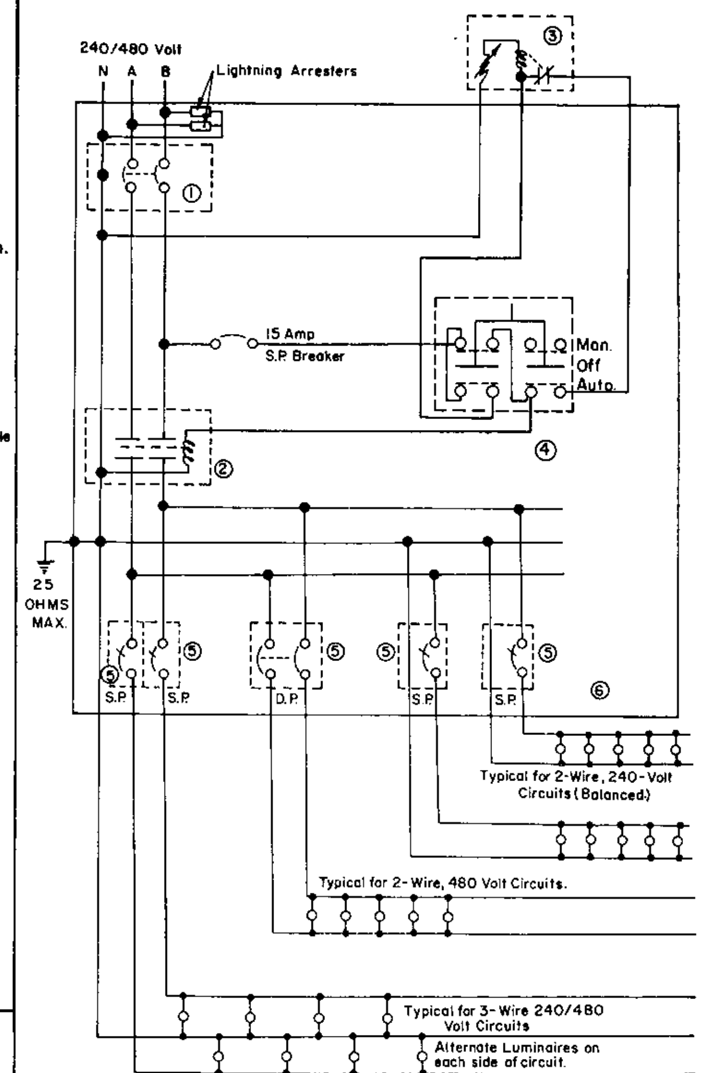
*Alternate location as shown permitted only when approved by the engineer.

CABLE & CONDUIT MARKER



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

CONTROL CABINET SCHEMATIC WIRING DIAGRAM (TYPICAL)

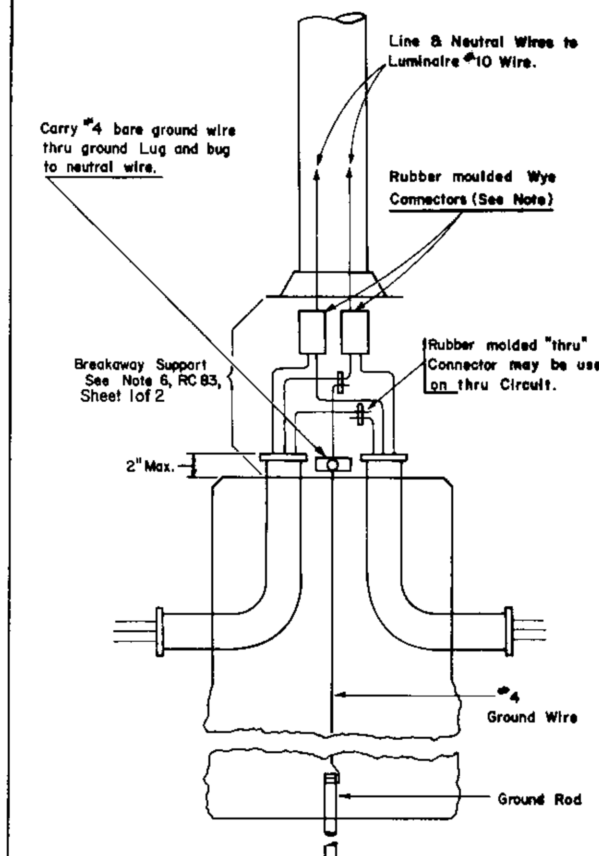


M-Manual
A-Automatic
1-Main Circuit Breaker or Fused Disconnect
2-Control Contactor
3-Photoelectric Cell
4-Selector Switch
5-Distribution Breakers (10,000 A.I.C.)
6-Control Cabinet
SP-Single Pole
DP-Double Pole

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.

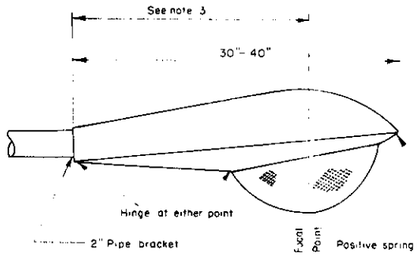
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

HIGHWAY LIGHTING

LIGHTING & ELECTRICAL DETAILS

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

LUMINAIRES FOR MERCURY LAMPS



BALLAST HOUSED IN LUMINAIRE

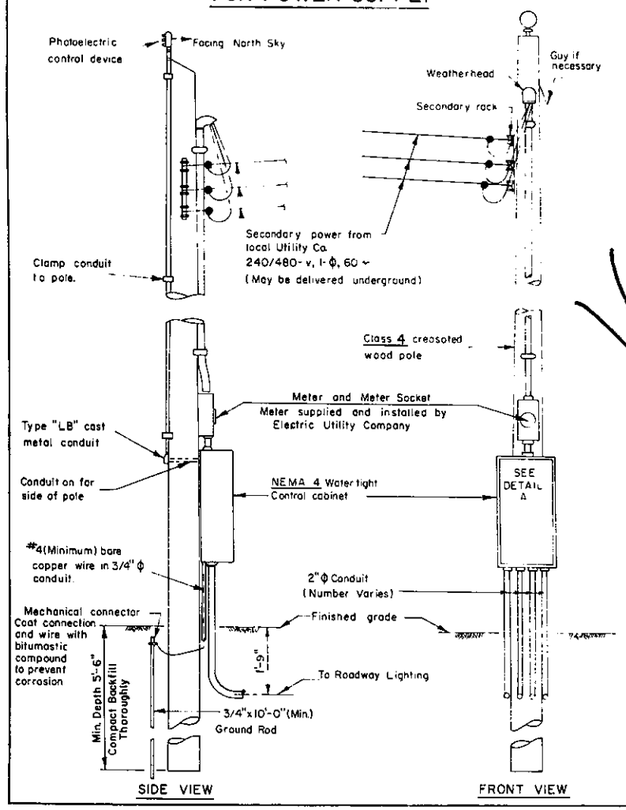
Notes

(1) Luminaires to have Reflector-Refractor Type Optical System, with thermal shock-resisting Glass Prismatic Refractor

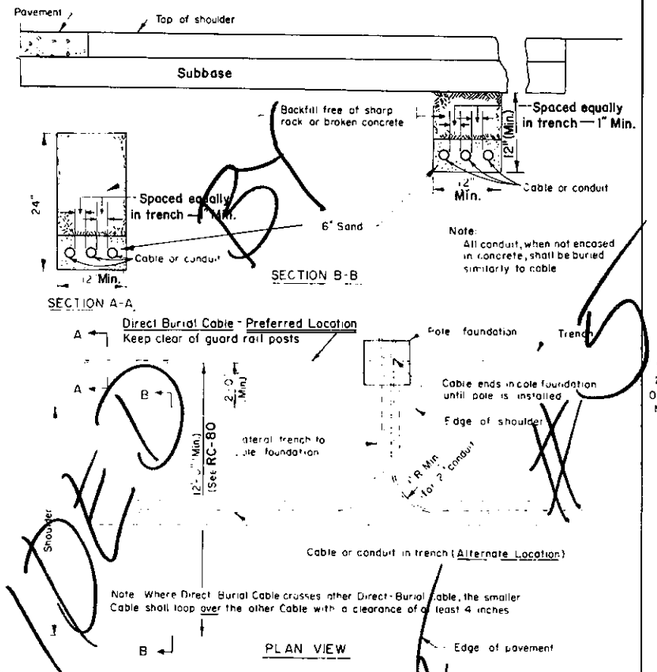
(2) Luminaires to accommodate 250, 400, 700 & 1000-Watt Mercury Lamps, in approximate horizontal position.

(3) Focal distance or light center varies from 1½ to 2 ft - Refer to RC-83

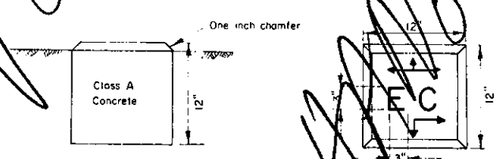
TYPICAL TERMINAL POLE EQUIPMENT ARRANGEMENT FOR POWER SUPPLY



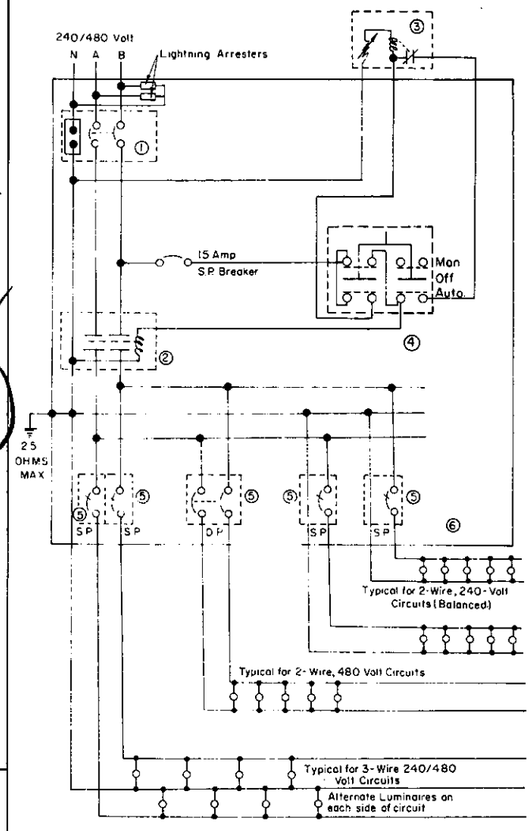
DIRECT-BURIAL CABLE & CONDUIT



CABLE & CONDUIT MARKER



CONTROL CABINET SCHEMATIC WIRING DIAGRAM (TYPICAL)

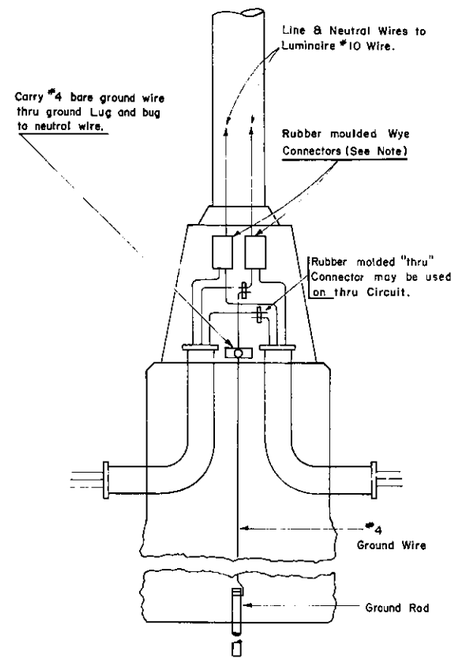


M - Manual
A - Automatic
1 - Main Circuit Breaker
2 - Control Contactor
3 - Photoelectric Cell
4 - Selector Switch
5 - Distribution Breakers
6 - Control Cabinet
SP - Single Pole
DP - Double Pole

Notes:
1 - Items 2, 3, & 4 not required if each Luminaire has photoelectric control element.
2 - Item 5 not required for single circuit.

DETAIL A

WIRING DETAIL TRANSFORMER BASE



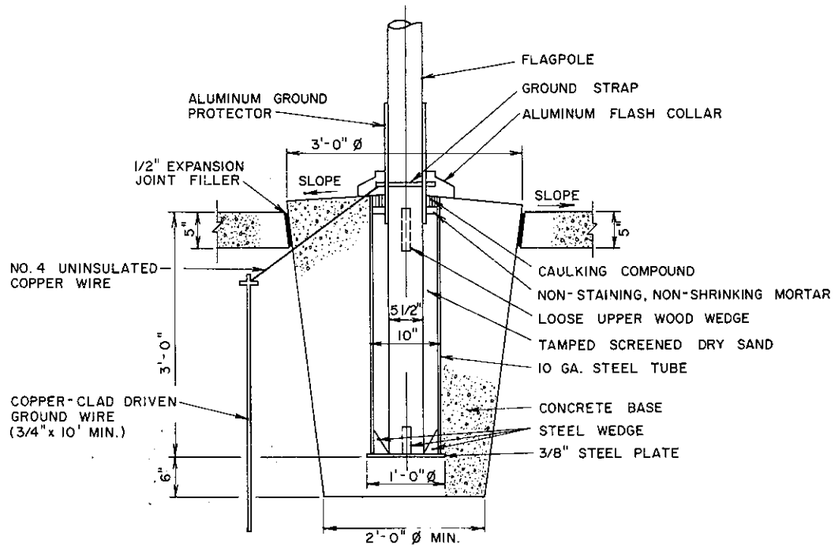
NOTE: Rubber molded connectors optional for use in anchor base poles.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

HIGHWAY LIGHTING

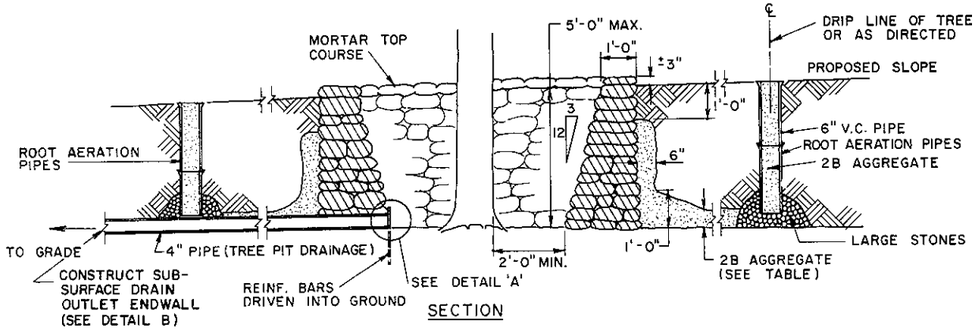
LIGHTING & ELECTRICAL DETAILS

Recommended June 1, 1976	Approved June 1, 1976	Sht. 1 Of 1
B.D. Rourke	R.R. Mauser	RC-84
Director, Bureau of Design	Deputy Chief Hwy. Engr.	



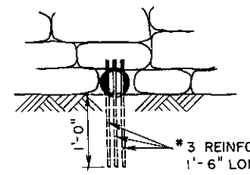
FLAGPOLE SETTING DETAIL

NO SCALE

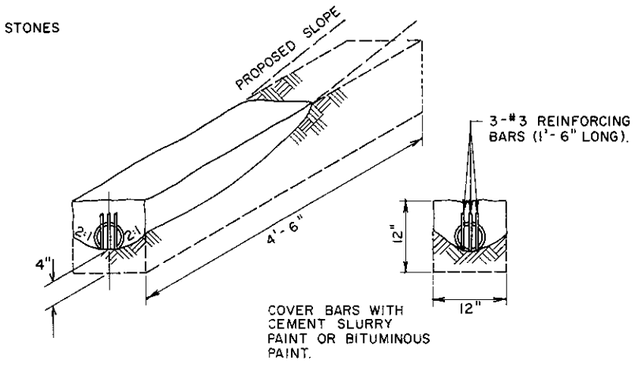


SECTION

TYPE A TREE WALL

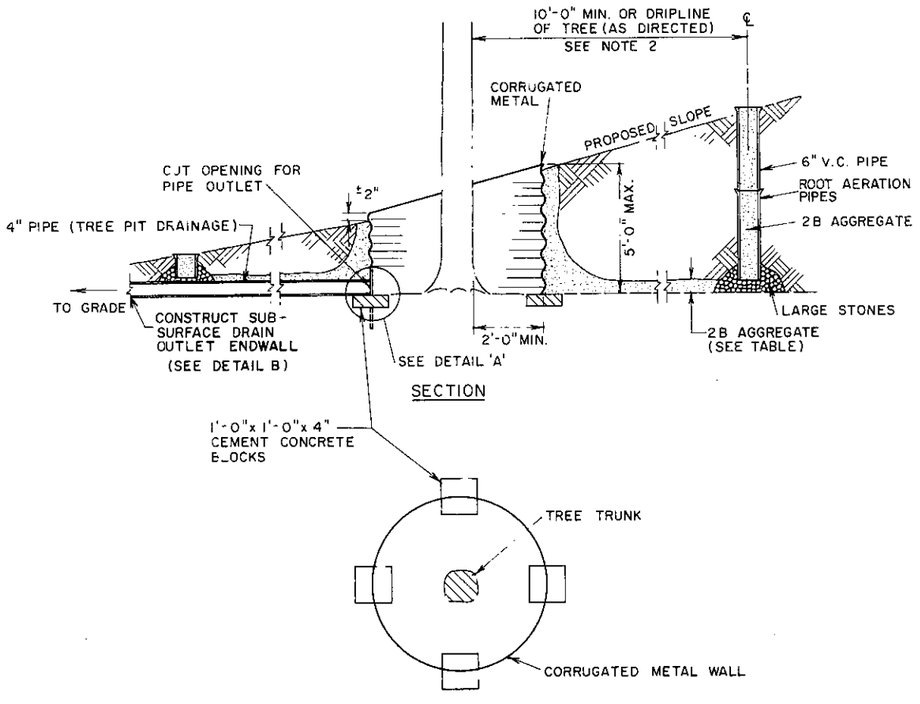


DETAIL 'A'



4" SUBSURFACE DRAIN OUTLET ENDWALL

DETAIL 'B'



SECTION

PLAN VIEW

TYPE C TREE WALL

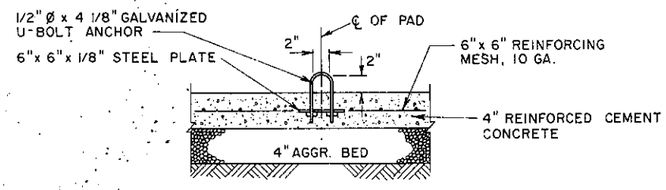
CORRUGATED METAL

NOTES

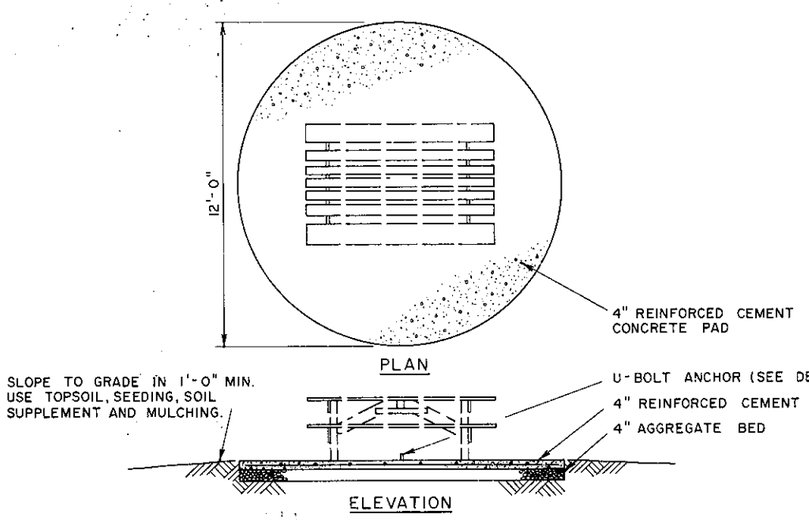
1. TREE GRATES SHALL BE USED WHERE DESIGNATED.
2. TREE DRIPLINE SHALL BE DEFINED AS THE FURTHEREST EXTENSION OF THE TREES BRANCHES.
3. NON-CIRCULAR TYPE A TREE WALLS MAY BE ARRANGED AS DIRECTED IN ORDER TO PROTECT CLOSE GROUPINGS OF TREES OR TREE ROOT AREAS NOT ENTIRELY COVERED WITH EMBANKMENT.

AGGREGATE LAYER TABLE

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



DETAIL OF U-BOLT ANCHOR



PLAN

ELEVATION

TABLE PAD

NO SCALE

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

TREE WALLS & MISC. DETAILS FOR ROADSIDE REST AREAS

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

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

Sht. 1 Of 1

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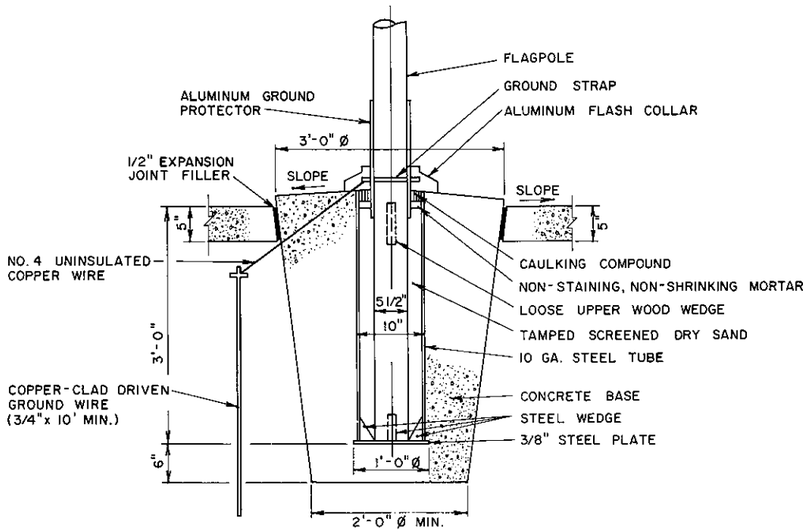
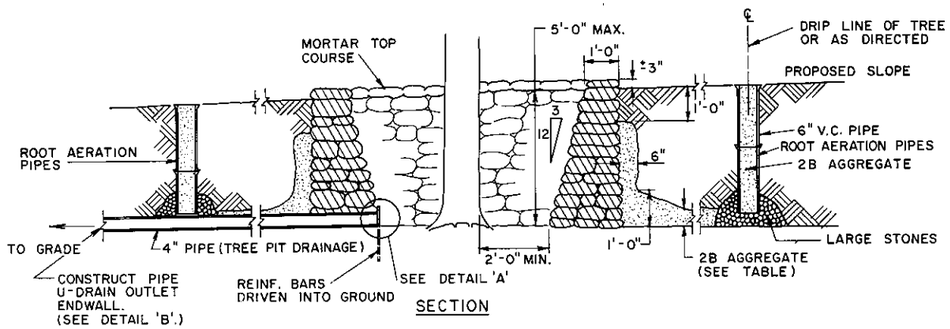
TRACED BY
FINAL BY



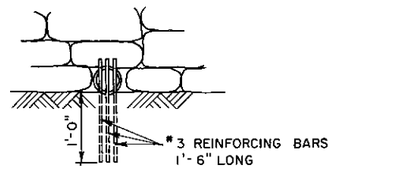
FLAGPOLE SETTING DETAIL

NO SCALE

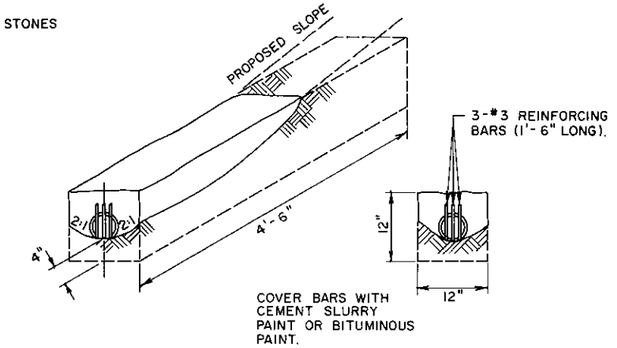


SECTION

TYPE A TREE WALL

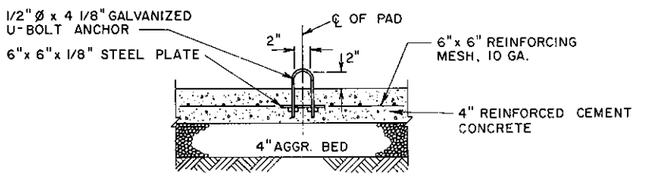


DETAIL 'A'

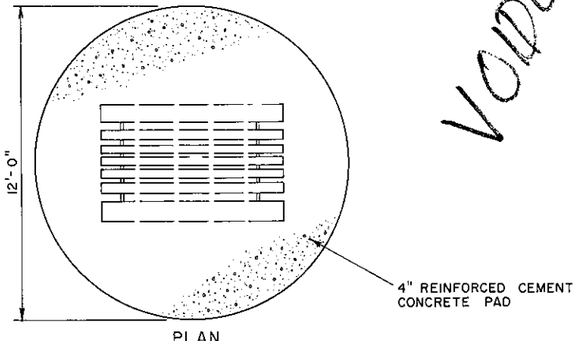


4" PIPE UNDERDRAIN OUTLET ENDWALL

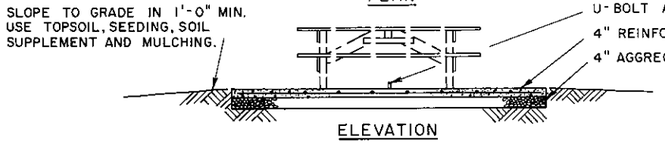
DETAIL 'B'



DETAIL OF U-BOLT ANCHOR



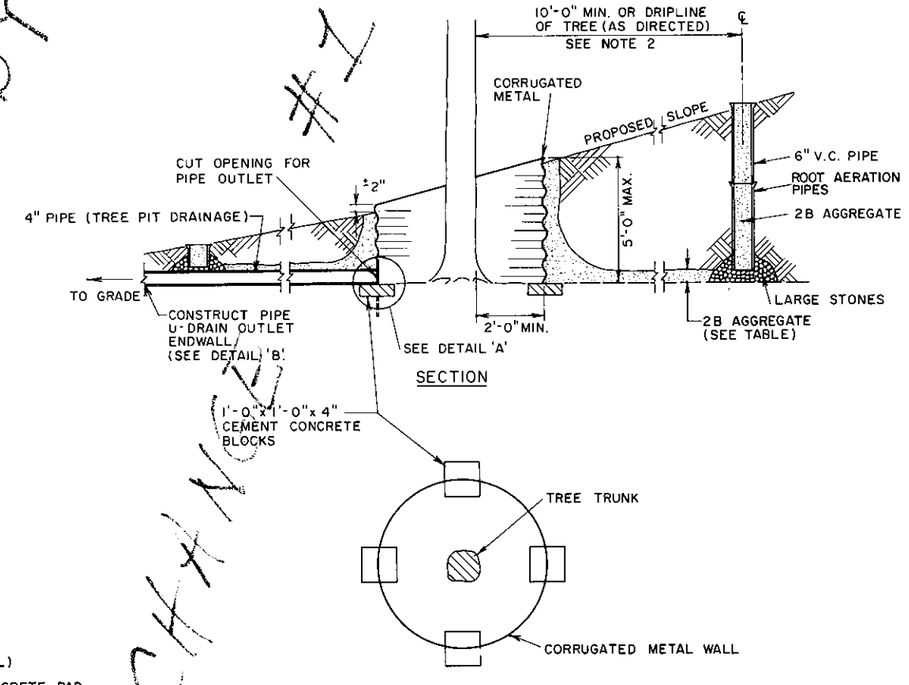
PLAN



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

VOIDED BY CHANGE #1

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

TREE WALLS & MISC. DETAILS FOR ROADSIDE REST AREAS

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

Approved June 1, 1976
Robert R. Mayer
Deputy Chief Hwy. Engr.

Sht. 1 Of 1

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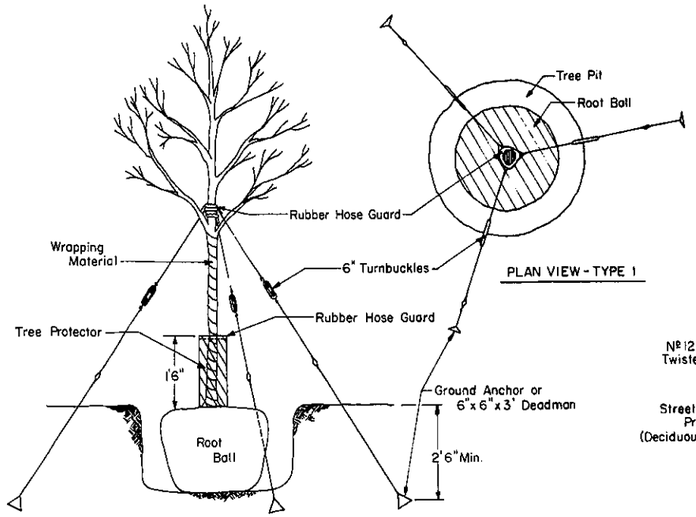
TRACED BY
FINAL BY

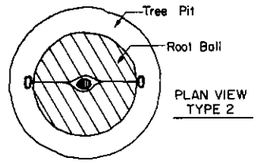
BRACING DETAILS



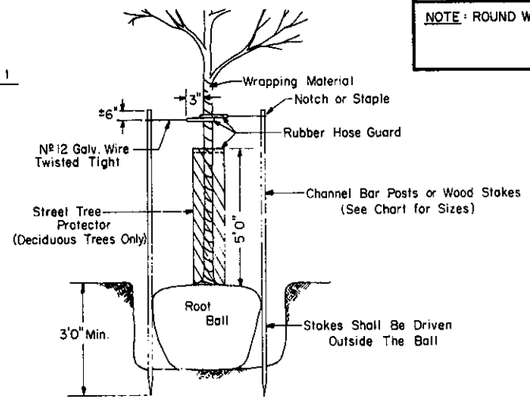
PLAN VIEW - TYPE 1

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

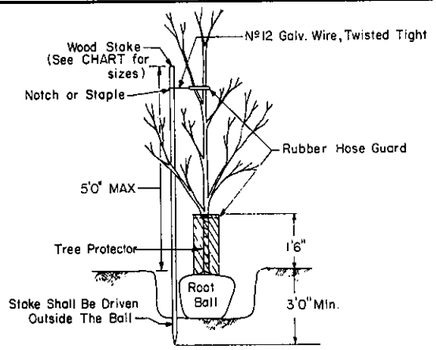


TYPE 2 BRACING

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.

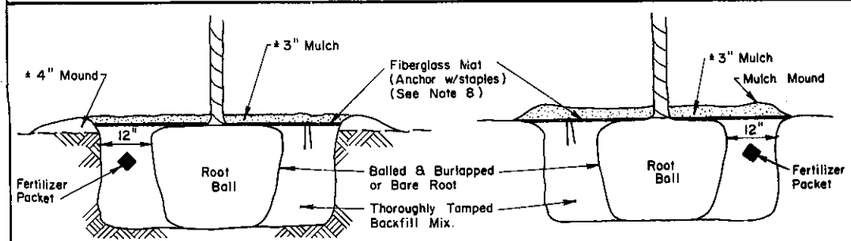
NOTE: ROUND WOOD STAKES MAY BE SUBSTITUTED AS FOLLOWS:
2"x2" = 2" DIA. ROUND STAKE
3"x3" = 3" DIA. ROUND STAKE



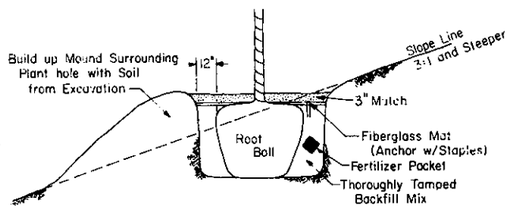
TYPE 3 BRACING

DECIDUOUS TREES
5' HIGH TO 1½" CALIPER

PLANTING DETAILS

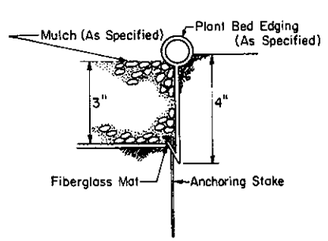


TREE PLANTING DETAILS
(See General Notes)

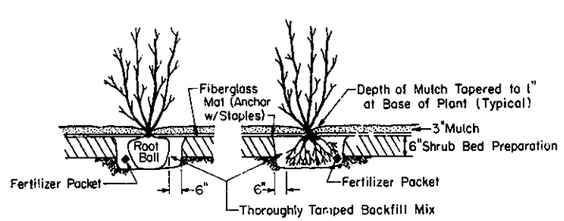


SLOPE PLANTING
DECIDUOUS AND EVERGREEN TREES
(Use Type 2 or Type 3 Bracing As Req'd.)

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



PLANT BED EDGING



BALLED & BURLAPPED OR CONTAINER — BARE ROOT

SHRUB PLANTING AND SHRUB BED PREPARATION

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.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

BRACING & PLANTING DETAILS

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

Approved June 1, 1976
Deputy Chief Hwy. Engr.

Sht. ⊥ of ⊥

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