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

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

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<tr>
<td>RC-57 (1 of 2)</td>
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</table>

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

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

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

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David C. Sims, P. E., Deputy Secretary for Winbou Administration
This is a 1981 printing of the Roadway Construction Standard Drawings. This printing includes all previous changes of the 1977 Edition and the changes and revisions described below:

**STANDARDS FOR ROADWAY CONSTRUCTION RC-0-100**

**INFORMATION AND SPECIAL INSTRUCTIONS:**

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

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<tr>
<td>05-16 (5 of 6)</td>
<td>Changed reference in notes to Materials &amp; Testing Division, Bureau of Contract Quality Control. Changed dates and titles.</td>
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<tr>
<td>05-17 (6 of 6)</td>
<td>Changed dates and titles.</td>
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<tr>
<td>05-18 (1 of 6)</td>
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<tr>
<td>05-19 (2 of 6)</td>
<td>Added BCT Terminal Section with a dia phragramed end section. Changed Post Bolt and Splice Bolt dimensions to be consistent with AASHTO Specification M80-78. Changed dates and titles.</td>
</tr>
<tr>
<td>05-20 (3 of 6)</td>
<td>Moved BCT Terminal Section detail to sheet 3 of 6. Added bolt and nut detail to Anchor Plate Assembly. Changed welded wire fabric specifications to conform to new Concrete Reinforcing Steel Institute designations. Changed dates and titles.</td>
</tr>
<tr>
<td>05-21 (4 of 6)</td>
<td>Added steel diaphragm assembly to detail B for BCT terminal section drawing. Changed dates and titles.</td>
</tr>
<tr>
<td>05-22 (6 of 6)</td>
<td>Changed dates and titles.</td>
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</table>

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

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

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

**CANCEL AND DESTROY THE FOLLOWING:**

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- Sheet 1 of 2 -

REQUEST ADDITIONAL COPIES FROM:

APPROVED FOR ISSUANCE BY:

David C. Sims, P. E.
Deputy Secretary for Highway Administration
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* Change to December 1981 Edition Effective August 5, 1982
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STRUCTURES OVER STREAMS
INCLUDING METAL PLATE ARCH WITH FOOTING
* When right angle span is less than 8' all excavation is Class 3.

GRADE SEPARATION STRUCTURES

TYPICAL STRUCTURE ELEVATION

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

Excavation will be measured and paid for as shown in Section A-A, in Section B-B and in Section C-C. Channel

**CONCRETE CRIBBING**

1'6" Min. when a Structure Foundation Drain is required.

For Metal Plate Pipe-Arch with spans 8' or greater the excavation between the Flow Line and the center line of the pipe shall conform to the area shown as C. The C.3 Excavation quantity shall be measured. It will not be measured and paid for as shown in Section A-A, in Section B-B and in Section C-C.

Note: When deemed necessary, to excavate below the bottom of the Flow Line of excavation within the limits of the proposed Stream Bed, all excavation within the limits of the existing ground will be paid for as shown in Section A-A, in Section B-B and in Section C-C.

**CLASS I 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
1. Backfill and embankment shall be placed in accordance with this Standard Drawing unless otherwise shown on the structure drawings.

2. Structure backfill shall consist of material meeting the requirements of Section 100.2 of Form 429. Such 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 of metal plate arches. Also, regardless of whether it is classified as rock or not, shall not be permitted in structure backfill. Sheet steel shall not be permitted as structure backfill. Structure backfill to be measured and paid for in 'Selected Borrow Excavation - Structure backfill'.

3. Backfill the space behind cribbing and the interior of bins with rock, not to exceed 8 inches in greatest dimension, rock spoils or stone backfill meeting the requirement of Section 613, Form 429, obtained from excavations, which shall be thoroughly compacted in layers having a minimum depth of 12 inches.

4. Backfill limits of existing walls and undergrounds for culverts shall be treated the same as flared abutment wingwalls.

5. Backfill construction on R.C. Box Culverts with the top slab of roadway grade shall be treated the same as abutments.

6. Backfill construction on culverts where the top of the culvert is near subgrade shall be considered as a special case and shall be treated as shown on the structure drawings or as directed by the engineer.

7. Structure backfill and adjacent embankment shall be placed simultaneously unless otherwise permitted by the engineer.

8. Material removed beyond the specified limits of Class I, 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 I, 2, or 3 excavation.

9. Drainage details are not shown. See structural drawings for drainages, weep holes, etc.

10. Structure backfill quantities are shown on the structural drawings.

LEGEND
- Structure Backfill
- Embankment Material

**Notes**

**Commonwealth of Pennsylvania**
**DEPARTMENT OF TRANSPORTATION**
**BUREAU OF DESIGN**

**BACKFILL AT STRUCTURES**

[Diagram of typical cross sections of abutments on fill and in cut]

[Diagram of typical cross sections of cribbing]

[Diagram of plan - abutment with flared wings and u wings]

[Diagram of typical sections - Cribbing]

[Diagram of typical sections - Abutments on fill and in cut]

[Diagram of typical sections - Cribbing]

[Diagram of Typical sections - Abutments on fill and in cut]
Structure backfill shall consist of material meeting the requirements of Section 360.2 of Form 408. Rock which can be plowed and compacted in pieces of 12 inches or less, may be used. However, rock shall not be permitted for structure backfill or metal plate arches. Any mix, regardless of whether it is intended 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 furnaces or by open hearth, shall not be permitted as structure backfill.

Structure backfill will be measured and paid for on selected borrow excavation—Structure Backfill.

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

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

PAY LIMIT OF SUBBASE

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

PAY LIMIT OF SUBBASE
TYPICAL LAYOUT

Type D

- Dowel Bar, See Note 8, this sheet
- Joint Sealing Material, See Note 9, this sheet

Type E

- Joint Sealing Material, See Note 1, this sheet

Type P

- Plastic Foes, See Note 6, this sheet

Type R

- Dowel Bar, See Not8 9, this sheet

NOTE:

1. This standard does not show the details for the load transfer units. Only load transfer units which are approved by an approved manufacturer as listed in Bulletin No. 15 shall be used. Any manufacturer offering an approved load transfer unit shall provide a written guarantee of its performance to the specification of the Pennsylvania Department of Transportation.

2. The requirements for lubricating and bonding the dowel bars do not apply to plastic coated dowel bars.

3. An approved load transfer unit shall be placed over the graphed end of all dowel bars to be used in Type D and Type E joints and shall provide a minimum 1/2" (12.7 mm) clearance pocket obtained 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 to strike equal to the width of the pavement strip. The top surface shall be smooth and hard enough for the load transfer unit to support the dowel bars in correct horizontal and vertical position and prevent it from being displaced or bent during construction.

5. All transverse joints shall be constructed on a 0.1:1 cross slope.

6. Dowel bars for pavement depths of 1/2" (12.7 mm) or less shall be 1/4" (6.35 mm) diameter and 1/8" (6.35 mm) long. Dowel bars for pavement depths of greater than 1/2" (12.7 mm) shall be 3/8" (9.52 mm) diameter and 1/8" (6.35 mm) long.

7. Dowel bars shall be placed parallel to the centerline and surface of the slab. The vertical or horizontal slant from end to end of the dowel bar to the other end shall not exceed 1/16" (1.58 mm).

8. Expansion joint filler material shall be used to a uniform depth. The top of the material shall not be less than 1/2" (12.7 mm) below the level of the pavement surface. The top edges of the material shall be at the same elevation.

9. The top of the joint sealing material shall be not less than 1/8" (3.17 mm) nor more than 3/8" (9.52 mm) below the surface of the pavement.

10. The initial saw cut for Type D and Type P joints is not required for construction joints.

11. The initial saw cut for Type D and Type P joints is not required for construction joints.

12. Width of the second saw cut shall be adjusted according to the pavement temperature at the time of sawing, according to the following:

<table>
<thead>
<tr>
<th>Width of Second Saw Cut</th>
<th>Pavement Surface Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/8&quot; (3.17 mm)</td>
<td>60 to 70</td>
</tr>
<tr>
<td>3/32&quot; (2.38 mm)</td>
<td>70 to 90</td>
</tr>
<tr>
<td>1/32&quot; (0.81 mm)</td>
<td>90 to 100</td>
</tr>
</tbody>
</table>

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN
CEMENT CONCRETE
PAVEMENT JOINTS

Revised: Sept. 3, 1966
Approved: Oct. 9, 1966

Chief Highway Engineer
Oil Bureau of Highway Design

RC-20
TIEBOLT DETAIL

Tiebolts shall be 9/32" (7.68 mm) or bar with rolled threads or 5/16" (7.94 mm) or 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

TRANSVERSE JOINT

SHOULDER JOINTS
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:

<table>
<thead>
<tr>
<th>Min. Depth</th>
<th>Min. Long. Wire Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>8&quot;(203mm)</td>
<td>W 5.5 or D 5.5</td>
</tr>
<tr>
<td>9&quot;(229mm)</td>
<td>W 6.0 or D 6.0</td>
</tr>
<tr>
<td>10&quot;(254mm)</td>
<td>W 6.6 or D 6.6</td>
</tr>
<tr>
<td>11&quot;(279mm)</td>
<td>W 7.0 or D 7.0</td>
</tr>
<tr>
<td>12&quot;(305mm)</td>
<td>W 7.5 or D 7.5</td>
</tr>
</tbody>
</table>

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 adding [and spacing is more than 46.5 ft (14.2m)], the longitudinal wire size shall be a minimum of W 6 or D 5.5.

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 (0.5" or 12.7mm) to a maximum of one half the pavement depth minus 0.625" (16mm).
C.3, N

40' Min. Length - Longitudinal Bars
18" or 25 Dia. (914mm)

Transverse Construction Joint
See Note 6 - Sheet 2 of 4

Type L Joint
See Note 5 - Sheet 2 of 4

Direction of Construction

PLAN

LOOSE BARS

TABLE 1

<table>
<thead>
<tr>
<th>No. of Bars</th>
<th>Dia. (in.)</th>
<th>S (in)</th>
<th>K (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>7/8</td>
<td>6 1/2</td>
<td>4</td>
</tr>
<tr>
<td>7</td>
<td>5/8</td>
<td>7 1/16</td>
<td>2 1/8</td>
</tr>
<tr>
<td>8</td>
<td>5/8</td>
<td>5 1/4</td>
<td>3 3/16</td>
</tr>
<tr>
<td>9</td>
<td>7/8</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>10</td>
<td>7/8</td>
<td>5</td>
<td>3 5/16</td>
</tr>
</tbody>
</table>

ALTERNATE PLAN
LOOSE BARS

TYPICAL CROSS SECTION
LOOSE BARS

NOTES

1. All Longitudinal Bars shall have a minimum lap of 18" (457mm) or 25 diameters whichever is greater.
2. Bars of high yield strength shall not be bent.
3. Other lapping patterns may be used as approved by the engineer provided that no more than one-third of the longitudinal bars are lapped within the same transverse plane.
4. For Type L joints see Standard Drawing RC-20. For 48' (14.630m) pavement widths 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 length for 24' (7.315m) and 36' (10.973) pavement widths, and tie bars shall 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) 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 top of bar shall be as indicated below:
7. For pavement depths of 6" (152mm) and 7" (178mm) the tie bar and tiebolt locations given in RC-20 will conflict with the longitudinal bars. In these cases the tie bars and tiebolts shall be placed directly under the longitudinal bars.
Notes:

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

2. All longitudinal bars shall have a minimum top of 4" or 25 Diameters which ever is greater.

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

4. The target depth for longitudinal bar placement measured from top of pavement to the midpoint of bar shall be as indicated below with a tolerance of ±1/4":

<table>
<thead>
<tr>
<th>Depth</th>
<th>Target Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>4&quot;</td>
<td>3 1/4&quot;</td>
</tr>
<tr>
<td>5&quot;</td>
<td>4 1/4&quot;</td>
</tr>
<tr>
<td>6&quot;</td>
<td>5 1/4&quot;</td>
</tr>
</tbody>
</table>

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

6. At all end laps occurring within 2 feet beyond the limits of the Transverse Construction Joint, the length of lap shall be double that normally specified.

7. Bar mats shall have a nominal width of 4", 6", or 8".

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

9. When bar 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.
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 side is being constructed in conjunction with a Pavement Relief Joint, see RC-24.

3. The standard Bridge Approach Slab shall be constructed in 2 lane widths; for 3 lane construction an additional single lane Bridge Approach Slab shall be connected to the standard Bridge Approach Slab using a tied longitudinal construction joint; for 4 lane construction, 2 standard Bridge Approach Slabs shall be connected by a tied longitudinal construction joint.

4. The end of the approach slab shall be constructed at full 16" depth when constructed in conjunction with a Pavement Relief Joint, see RC-24.

NOTES

Bridge Approach Slab shall be constructed in accordance with this standard drawing, unless otherwise modified or shown on the structure drawings.

The skewed Type E joint does not apply when approach side is being constructed in conjunction with a Pavement Relief Joint, see RC-24.

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.

The end of the approach slab shall be constructed at full 16" depth when constructed in conjunction with a Pavement Relief Joint, see RC-24.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

BRIDGE APPROACH SLAB

Recommended: May 6, 1982
Reapproved: May 6, 1982

Director, Bureau of Highways Design

RC-23
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 shown 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 connected 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

TO APPLY ONLY WHEN INDICATED ON STRUCTURE DRAWINGS
Notes for Construction Revisions

- When making 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.
- * Increase in field, providing overhang, if required.

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

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

SPREAD BOX BEAMS WITH APPROACH SLAB NOTCH 111/2" OR DEEPER

PLAN - T-BEAMS
SCHEDULE OF REINFORCEMENT STEEL

<table>
<thead>
<tr>
<th>MARK</th>
<th>SIZE</th>
<th>SPACING</th>
<th>NO.</th>
<th>LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>4</td>
<td>4&quot; (102mm)</td>
<td>4</td>
<td>4' (1219mm)</td>
</tr>
<tr>
<td>B</td>
<td>4</td>
<td>4&quot; (102mm)</td>
<td>4</td>
<td>4' (1219mm)</td>
</tr>
<tr>
<td>C</td>
<td>6</td>
<td>6&quot; (152mm)</td>
<td>6</td>
<td>6' (1829mm)</td>
</tr>
<tr>
<td>D</td>
<td>4</td>
<td>4&quot; (102mm)</td>
<td>4</td>
<td>4' (1219mm)</td>
</tr>
</tbody>
</table>

GENERAL NOTES

1. Concrete in subslob to be0.600 x 300 mm except on sections where concrete may be in TCS.
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 toward the bridge, a Subgroove Drain (See RC-30) shall be placed under the 6" portion of the subslob and will be measured and paid for as provided in Section 612 of Permit 408.
4. When bridges are located less than 1000 ft. (304.800 m) measured from the face of the nearest abutments, no relief joints will be used.
5. Where bridges are located between 1000 ft. (304.800 m) and 1500 ft. (457.200 m) apart, one relief joint shall be placed midway between the bridges. In these cases the subslob shall be a uniform 6" (152mm) thick and 8 ft. (2.438 m) 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

Recommenced, Sept. 8, 1981
Approved, Sept. 8, 1981
Jan. 1, 1982

R. C. Gomez
Chief Highway Engineer

RC-24
NOTES

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

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

3. Depth of shoulder to be the combined depth of surface and base courses.

4. Slope shoulder at 0.04 F/Ft. for effective shoulder widths > 8 Ft.

5. For effective shoulder widths 6 Ft. and less, paves cut-to-cut of shoulders with full-depth roadway pavement.

SHOULDER ROUNDOING ON HIGH SIDE OF SUPERELEVATED CURVES

* For superelevations under 0.00 F/Ft., eliminate the 4" rounding and use the 0.02 F/Ft. shoulder slope beginning from the edge of pavement.
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. Shoulder or 0.06% (0.04%) for effective shoulder widths ≤ 8'(2.438m).

5. For effective shoulder widths > 8' (2.438m) and less, pave out to out of shoulders with full depth roadway pavement.

SHOULDER ROUNING ON HIGH SIDE OF SUPERELEVATED CURVES

NOTE: Shoulder rounding is to be used only on Interstate & Other Freeways and Arterial unless otherwise shown in the typical sections.
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN
RECONSTRUCTED SHOULDERs

NOTEs
1. For Type 4, Type 5, and Type 6 Shoulders, a properly prepared pavement 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 edge base course 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 materials at directed, excavate, and backfill with material meeting the requirements of Section 350 or 351, Form 408. 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, graded material meeting the requirements of Section 350 or 351, Form 408, shall be used and will be paid for as Tons of Selected Borrow Excavation. Where there is an excess of material from the grading operation, removal of this material shall be made as soon as possible and will be incidental to the shoulder pay item.
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 materials 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 type base course materials. 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 may vary, but when the height from the top of the rail to the proposed surface becomes less than 24" (610 mm), the guard rail shall be removed, replaced and/or reset in accordance with current guard rail standards. When guard rail has rubbing rail attached, the rubbing rail shall be removed when the height of guard rail becomes less than 27" (686 mm).

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

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

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

RECONSTRUCTED SHOULders
CONCRETE SHOULDERS ADJACENT TO R.C.C. PAVEMENT AND P.L.C.C. PAVEMENT (RAMP)

CONCRETE SHOULDERS ADJACENT TO R.C.C. PAVEMENT

CONCRETE SHOULDERS ADJACENT TO P.L.C.C. PAVEMENT

CONCRETE SHOULDER EXPANSION JOINTS

NOTES
1. The Aggr. Base shall be as specified in Section 300.3, Form 408, and shall be considered part of the shoulder.
2. All shoulder parts shall be selected in accordance with Section 50.3(a), Form 408.
3. For joint details, see RC-20.
4. See RC-25, Sheet 1 of 3, for shoulder. mounting details on high side of super-elevations.
5. At the connec tors system, Type 1 concrete shoulders may be constructed as shown or at an altitude 6" depth and or constructed at the same depth as the pavement, or no additional expense to the Department.
6. At the connectors system, Type 2 concrete shoulders may be constructed on a slope, with a 6" minimum depth, or at the same depth as the pavement, or no additional expense to the Department.
7. Start rumble corrugations 6" from the edge of the roadway pavement. Where a curb is used at the outside edge of the shoulder, the corrugations should be terminated at the gutter or a minimum of 1' from the curb.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DESIGN

SHOULders (Concrete)
CONCRETE SHOULDERS ADJACENT TO
R.C.C. PAVEMENT AND P.L.C.C. PAVEMENT (RAMP)

CONCRETE SHOULDERS ADJACENT TO
C.R.C. PAVEMENT

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

CONCRETE SHOULDER EXPANSION JOINTS
TYPICAL GUIDE FOR SLABJACKING

HOLE ARRANGEMENT

SLAB JACKETING 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. Drills left from drilling shall be removed from holes.

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 1/2 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 68.1. 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 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 reopened 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.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

CONCRETE PAVEMENT
MAINTENANCE
SLABJACKING

NOTES

1. All materials and workmanship shall be in accordance with the requirements of Section 68, Form 408, Volume I.

2. Holes 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 may 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 occurring to the pavement slab, shoulders, guard rail, curb, structures, drainage and underground utilities due to his operation.
TYPICAL GUIDE FOR SLABJACKING
HOLE ARRANGEMENT

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 the hole 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 1/2 hour).

D. Develop a thicker mix similar in consistency to that which is produced from a caulking gun and in accordance with Section 681, Form 408. Do not pump the hole until the mix being forced out 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. Pumping shall be alternated between the holes generally beginning with the lowest hole in the center of the hopped and working outward, or as directed by the engineer in the field.

F. All holes shall be plugged with teflon left off the crown side for a minimum of three (3) hours or as directed by the engineer in the field. The wooden plugs may be broken off flush to the pavement if it is necessary to have the road opened to traffic before the required time.

G. All materials and workmanship shall be in accordance with the requirements of Section 681, Form 408.

H. Holes shall be drilled outside the settled area to allow for pressure relief during pumping in the holes of the settled area.

I. The contractor is responsible for damage occurring to the pavement slab, shoulders, guard rail, curb, structures, drainage and underground utilities due to his operation.

NOTES
1. All materials and workmanship shall be in accordance with the requirements of Section 681, Form 408.
2. Holes 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 occurring 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

Revised Sept 8, 1981
Approved Sept 9, 1981

[Signature]

Director, Bureau of Design

RC-26
REMOVE EXISTING SUBBASE MATERIAL AND REPLACE AND COMPACT WITH NEW SUBBASE MATERIAL MEETING THE REQUIREMENTS OF SECTION 350, FORM 408. SEE NOTE 4 AND NOTE 12, THIS SHEET.

1. The area to be patched shall be outlined normal to the center line of the road.
2. A 3/8" depth cut shall be made with approved equipment along each side that is not bound by a joint. The edge of the existing pavement shall be made reasonably vertical for the full depth of the patch.
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. The depth of existing concrete shall be removed not more than 200' apart. The type of drain shall be as specified in proposal.

General Notes for Patching

- When this distance becomes less than 10', remove this area of pavement, the existing subbase, and the unsuitable additional excavation will be paid for according to the manufacturer, as listed in Bulletin No. 15, unless permitted. The expansion tiebolts shall have a minimum pull-out strength of 15,000 pounds.

- Only expansion tiebolts which are supplied by an approved manufacturer, as listed in Bulletin No. 15, will be permitted. The expansion tiebolts shall have a minimum pull-out strength of 15,000 pounds.

- Expansion tiebolts shall be bonded to the old concrete, new pavement, or subbase by welding wire fabric style 6x12-0.85x0.4 or 8x12-0.85x0.4, placed in accordance with RC-31.

- For pavement widths other than 10', these dimensions shall be adjusted so that the expansion tiebolts are evenly spaced, with a maximum spacing of 12' c.c. to 24' c.c. For long patches, the expansion tiebolts shall be placed not more than 200' apart. The type of drain shall be as specified in proposal.

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

- When placing new concrete the subbase shall be conditioned as specified in Section 501.3(g), Form 408.

- Reinforcement shall be welded wire fabric style 6x12-0.85x0.4, placed in accordance with RC-31.

- Existing subbase material is not from edges of pavement patch shall not be removed.

- Depth of Existing Pavement (D)

- Reinforcement shall be welded wire fabric style 6x12-0.85x0.4, placed in accordance with RC-31.

- Expansion tiebolts, see Detail A, this sheet.

- Existing subbase material is not from edges of pavement patch shall not be removed.

- Depth of Existing Pavement (D)

- Reinforcement shall be welded wire fabric style 6x12-0.85x0.4, placed in accordance with RC-31.

- Expansion tiebolts, see Detail A, this sheet.

- Existing subbase material is not from edges of pavement patch shall not be removed.

- Depth of Existing Pavement (D)

- Reinforcement shall be welded wire fabric style 6x12-0.85x0.4, placed in accordance with RC-31.

- Expansion tiebolts, see Detail A, this sheet.

- Existing subbase material is not from edges of pavement patch shall not be removed.

- Depth of Existing Pavement (D)

- Reinforcement shall be welded wire fabric style 6x12-0.85x0.4, placed in accordance with RC-31.

- Expansion tiebolts, see Detail A, this sheet.

- Existing subbase material is not from edges of pavement patch shall not be removed.

- Depth of Existing Pavement (D)

- Reinforcement shall be welded wire fabric style 6x12-0.85x0.4, placed in accordance with RC-31.

- Expansion tiebolts, see Detail A, this sheet.

- Existing subbase material is not from edges of pavement patch shall not be removed.

- Depth of Existing Pavement (D)

- Reinforcement shall be welded wire fabric style 6x12-0.85x0.4, placed in accordance with RC-31.

- Expansion tiebolts, see Detail A, this sheet.

- Existing subbase material is not from edges of pavement patch shall not be removed.

- Depth of Existing Pavement (D)

- Reinforcement shall be welded wire fabric style 6x12-0.85x0.4, placed in accordance with RC-31.

- Expansion tiebolts, see Detail A, this sheet.

- Existing subbase material is not from edges of pavement patch shall not be removed.
When this distance becomes less than 10', remove this area of pavement in the transverse joint. Use the existing dowel bars of the transverse joint by thoroughly cleaning the dowel tips of existing concrete.

When placing new concrete the subbase shall be conditioned as specified in Section 501.3(g), with joint sealing material meeting the requirements of Section 705.5(0), Form 408.

Remove existing subbase material and replace and compact with new subbase material meeting the requirements of Section 350, Form 408. See Note 4.

A full depth saw cut shall be made with approved equipment along each side of the original to be patched shall be outlined normal to the center line of the road. 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 10,000 points.

The Expansion Tiebolts shall have a minimum pull-out strength of 5,000 pounds.

The Expansion Tiebolts shall be inserted anchor portion shall accommodate a hook bolt of 7/16" diameter. The Expansion Tiebolts shall be removed if pavement patch shall not be removed.

For pavement widths other than 12', these dimensions shall be adjusted so that the Tiebolts are placed at a minimum of 12" from the edge of the lane.

When this distance becomes less than 10', remove this area of pavement in the transverse joint. Use the existing dowel bars of the transverse joint by thoroughly cleaning the dowel tips of existing concrete.

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 10,000 points.

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 10,000 points.

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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 10,000 points.
NOTES

1. The existing steel plate is either H Gauge with a lapped top, or a flat
gauge 1/8" thick.

2. Where an existing joint contains a steel plate, it shall be removed to
the bottom of the new sealant reservoir.

3. If the slab is being replaced adjacent to an existing joint, the
removal of the steel plate or preformed expansion material below
the new saw cut is optional.

4. When the existing joint spacing is less than 50', W shall be 1/4".
   When the existing joint spacing is 50' or more, W shall be 2".

5. Where the existing pavement has been replaced at a transverse joint,
the joint sealant reservoir shall be constructed in two stages. The
first stage shall consist of sawing the initial cut to the width and
depth indicated in accordance with the applicable requirements of
Section 501.3(j), Form 408. The second stage shall consist of
sawing the sealant reservoir to the width and depth indicated.
This second stage sawing shall not be performed until the concrete
has hardened sufficiently to permit sawing without damage by
blade action to the concrete adjacent to the joint. No sawing is
permitted.

---

Joint Rehabilitation

When the existing joint is replaced full depth
See Note 5, This Sheet.

*See Note 4, This Sheet.
NOTES
1. The existing steel plate is either 14 gage with a lapped tab or a flat plate by Crown Bolt.
2. Where an existing joint contains a steel plate it shall be removed to the bottom of the new sealant reservoir.
3. If the side 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 opening is less than 50' (1524mm), width be 1/4" (6.35mm), when the existing joint opening is 50' (1524mm) or more, it shall be 1" (25.4mm).
5. Joint Limits for Type 2 Repair to be adjacent between existing sawed slots which are 12" (305mm) apart.
6. Where the existing pavement has been replaced or a transverse joint the joint sealant reservoir shall be constructed using the following procedure. It is not required to be sawed open to the width and depth indicated in accordance with the applicable requirements of Section 505.9(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. It will not be necessary to remove more than 1/8" (3.17mm) of the joint no recover is permitted.
7. Where more than 60% of the joint width requires a Type 2 Concrete Joint Spall Repair the entire joint shall be repaired in accordance with RS-26 Sheet 2 of 3 and paid for as Pavement Patching.

DETAIL B
When the existing joint is replaced full depth

See Note 5

CONCRETE JOINT SPALL REPAIR
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 5°-1 counter-clockwise skew. On curves, the skew will be measured from a perpendicular to a tangent on the long radius side of the curve.

4. When ramp width exceeds 14 feet, a Type L Joint is required at mid-point.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

PLAIN CEMENT
CONCRETE PAVEMENT

SECTION A-A
TERMINAL SLAB
NOTES
1. Construction joints, for P.C.C. Pavements constructed on subbase, shall be skewed and must 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 45° 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' (4.267 m), a Type L Joint is required at mid point.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

PLAIN CEMENT
CONCRETE PAVEMENT
RAMP CONNECTIONS WITH R.C.C. MAINLINE PAVEMENT

Reinforced Cement Concrete Mainline Pavement
Concrete Traffic Separator
Reinforced Cement Concrete Mainline Pavement - Ramp
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.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN
PLAIN CEMENT CONCRETE PAVEMENT RAMPS

Director: Bureau of Design
Chief Hwy. Eng.

Revised: May 31, 1973
Approved: May 31, 1973

RC-27
RAMP CONNECTIONS WITH R.C.C. MAINLINE PAVEMENT

NOTES
1. Actual joint locations to be determined in the field.
2. The change of pavement type on ramps shall occur at the first joint beyond the shoulder gore.
**COARSE AGGREGATE FOR PIPE TRENCH BACKFILL:**

- Class A
- Class B
- Class C

**FINITE COMPRRESSIBLE MATERIAL** or when directed COARSE AGGREGATE

**LOOSE, HIGHLY COMPRRESSIBLE EARTH** or other APPROVED MATERIAL.

- 0.0.
- 0.0.

**SELECTED FINE COMPRESSIBLE MATERIAL** or when directed.

**TRENCH BEDDING**

- Class C Bedding for Pipe-Arch
- Imperfect Trench
- Trench thru rock or hard shale

**PAVEMENT BASE DRAIN**

- Typical Placement
- Placement at curb section

**SUBSURFACE DRAIN OUTLETS**

- No. 2B Aggregate tamped in 6” layers, starting at the lowest rows of perforations or start of the open joints of perforations in the open joint (3/4”) lagdiscussions shall be placed symmetrically about the vertical center line.

**COMBINATION STORM SEWER AND UNDERDRAIN**

**SUBSURFACE DRAINS**

**Commonwealth of Pennsylvania DEPARTMENT OF TRANSPORTATION**

**BUREAU OF DESIGN**

**SHEET L оф L**

**DETAILED IT**

**RC-30**


**PIPE UNDERDRAIN**

- **Pipe Underdrain and Pavement Base Drain**
- **SUBSURFACE DRAIN OUTLETS**
- **COMBINATION STORM SEWER AND UNDERDRAIN**
- **SUBSURFACE DRAINS**

---

**Commonwealth of Pennsylvania**

**DEPARTMENT OF TRANSPORTATION**

**BUREAU OF DESIGN**

---

**Typical Placement**

- **Pavement Base Drain**
- **Placement at Curb Section**

---

**Bedding & Backfill for Pipe Culverts & Metal Pipe-Arch Culverts**

---

**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 (e).

---

**Subgrade Drain**

- **Treatment Under Subbase**
- **Subbase**
- **Subgrade Drain**

---

**Voided by Change #1**

---

**Finished Subgrade**

- **H** - Height of fill over top of pipe.
- **d** - 1.0 ft. (305 mm) minimum, where practicable.

---

**CLASS A**

- Slope pipes in cut or fill.
- Pipes located in medians.
- Pipes located under swales or ditch lines.

---

**CLASS B**

- Storm sewer outside shoulder area.

---

**CLASS C**

- Storm sewer outside shoulder area.

---

**FINISHED SUBGRADE**

- **O.D.** - Outside diameter of pipe barrel or shell.
- **D.O.** - Inside diameter of pipe barrel or shell.
- **H.D.** - Hub Diameter - Outside diameter of pipe at bell or bond.
- **L.D.** - Length of pipe barrel or shell.
- **T.L.** - Total Lust of pipe barrel or shell.

---

**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 (e).
SLOPE PIPE FITTING - TYPE A

**NOTE:** Pipe sizes shown are for 2:1 slopes. Drainage pipes larger than 33\(\frac{3}{8}\)" should be shown on the drawings.

**LIMITS:** Pipe sizes shown are for 2:1 slopes. Drainage pipes larger than 33\(\frac{3}{8}\)" should be shown on the drawings.

**NOTES:**
1. Pipe sizes shown are for 2:1 slopes. Drainage pipes larger than 33\(\frac{3}{8}\)" should be shown on the drawings.
2. Pipe sizes shown are for 2:1 slopes. Drainage pipes larger than 33\(\frac{3}{8}\)" should be shown on the drawings.
SLOPE PIPE FITTING - TYPE A

Dimensions (Inches) for All Slopes

<table>
<thead>
<tr>
<th>Diameter of Pipe</th>
<th>A</th>
<th>B</th>
<th>C</th>
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<td>30</td>
<td>16</td>
<td>14</td>
</tr>
<tr>
<td>18&quot;</td>
<td>30</td>
<td>18</td>
<td>17</td>
</tr>
</tbody>
</table>

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

OUTLET PIPE THROUGH EMBANKMENT SLOPE

Pavement - Concrete Curb

LIMITS OF COARSE AGGREGATE FOR PIPE Trench, Backfill

PORTLAND CEMENT CURB

SLOPE PIPE FITTINGS AND CONNECTORS
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

Each type of inlet shown is suited for a particular situation.

- Type C Inlet is designated for installation in non-mountable curbs.
- Type M Inlet is designated for installation in median areas and mountable curbs.
- Type S Inlet is designated for installation in shoulder swale areas.

The selection of components to achieve a specified inlet type is the contractor's responsibility.

- Pipes will be located as required.
- Grate Adjustment Rings may be of masonry or precast concrete construction.
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

INLETS
CONCRETE TOP UNITS

NOTES:
1. All Inlet Types 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 modified with the written consent of the Engineer.
2. Concrete Top Units which cast the grate directly within the unit shall utilize 3/4 in. angles embedded in the concrete as a bearing area for the grate.
3. This standard describes the shape and dimensions required for uniformity and compatibility. It is not intended to show the details required for manufacturing and handling present units. Only those items which are approved 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 20 x 36 in. drawing, show drawings to the dimensions and Testing Standards. Bureau of Product Design. Copies of this drawing should be submitted to the Engineer for his approval. Any variation in the size, location, handling, reinforcement, and any manufacturing details.
4. Whenever an inlet is required within a Mountainous Curb Section, a Type M Inlet will be located adjacent to the curb 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 - 3/8 X 1/2 in. dowel bars and 3/8 in. preformed 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.

SECTION A-A
SECTION B-B
SECTION A-A
SECTION B-B
SECTION A-A
SECTION B-B
NOTES
1. Grates shall be ductile or malleable cast iron or structural steel grates manufactured from gray cast iron shall be submitted for approval.
2. All welding required for the fabrication of structural steel grates shall be accomplished in accordance with Section 1053.2, Form 406 Specifications. Welding shops fabricating structural steel grates will not be required to be American Institute of Steel Construction (AISC) certified.
3. This standard depicts the dimensions required for uniformity and interchangeability. It is not intended to show the various details required for fabrication or manufacturing. Only those items supplied by an approved manufacturer, as listed in Bulletin No. 15, will be permitted. Any manufacturer desiring to be listed in Bulletin No. 15, must submit and publish a shop drawing to the Bureau of Highway Design for approval.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DESIGN

Revised Sept 1981

INLETS
GRATES
Ferrose Cast Material  Structural Steel Fabrication

**TYPE C FRAME**

- Corner configuration details are fabrication responsibility & shall be approved.

- Welding shops fabricating structural steel inlet frames will not be required to be American Institute of Steel Construction (AISC) certified.

**TYPE M FRAME**

- Frames shall be either gray, ductile or malleable cast iron or structural grade steel.

- All welding required for the fabrication of structural steel gates shall be accomplished in accordance with Section 0655.31, Form 409 Specifications.

1. 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 shall submit a shop drawing to the Materials and Testing Division, Bureau of Contract Quality Control for approval. The shop drawing must show all details including dimensions, tolerances, welding symbols, casting finish, etc.

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Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

INLETS FRAMES

Reconstructed, Sept. 6, 1979
Approved, Sept. 7, 1979
By: C. D. Allardis
Chief, Highway Design

RC-34
1. Material and construction shall comply with the requirements of Specifications Form 408, Section 405 for Cast-In-Place, and Section 713.2 for Precast Cement Concrete Units.

2. Inlets that exceed the maximum depth shown shall require a special detail and design for the inlet walls and base.

3. When a situation cannot 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 Box 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

5 1/2" min - variable 4" max.
GRADE ADJUSTMENT RING (PRECAST)
NOTES

1. The drainage dikes shall not be constructed to a

   height to cause flooding of the roadway.

2. Construction of the drainage dikes shall be considered

   incidental to the Class I Excavation.

SECTION A-A

Height - 3'-0" for Swaps, 0'-0" for Medians,

unless otherwise directed

Limit of 6' Drainage Swaps

SECTION B-B

Flow line or swale invert

SECTION C-C

Rounding Required

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

DRAINAGE DIKE

RC-35

Date: 6/2/87

Received: 6/11/87

Deputy Chief Eng. Exp.
For frame and cover casing details, refer to RC-39, Sheet 2 of 2.

**Grode SS Sewer Brick**
(AASHTO M-91)

**Type A**
(*in-place construction*)

**Type B**
(*in-place construction*)

**Foundation Detail for Concrete Manhole, Type A**

**Recommended Grade**
Cone A Class

**Recommended Rings**
Cone B Class

**Recommended Mortar**

---

**Type A**

- Min. to Max. I.D.: 27" to 30.5" Max. I.D.
- Manhole Steps
  - Refer to RC-39, Sheet 2 of 2.

**Type B**

- Min. to Max. I.D.: 27" to 30.5" Max. I.D.
- Manhole Steps
  - Refer to RC-39, Sheet 2 of 2.

**Precast or Cast-in-Place Bosse Section**

- H=0'-30" or 0.18 in 2/ft.
- H=30'-60' or 0.15 in 2/ft.
- H=30'-30' or 0.25 in 2/ft.
- H=0'-30' or 0.28 in 2/ft.

**Welded wire fabric shaliform to the requirements of Section 703.3 of Form 408.**

---

**PRECAST**

- Precast Manholes shall meet the requirements of Section 703.2(c) of Form 408, and may be substituted for Types A and B Manholes.
- Welded wire fabric shall conform to the requirements of Section 703.3 of Form 408.

---

**Commonwealth of Pennsylvania**
**DEPARTMENT OF TRANSPORTATION**
**BUREAU OF DESIGN**

**STANDARD MANHOLES**

**Recommended Grade**
Cone A Class

**Recommended Rings**
Cone B Class

**Recommended Mortar**

---

**Foundation Detail for Concrete Manhole, Type A**

**Recommended Grade**
Cone A Class

**Recommended Rings**
Cone B Class

**Recommended Mortar**

---

**Type A**

- Min. to Max. I.D.: 27" to 30.5" Max. I.D.
- Manhole Steps
  - Refer to RC-39, Sheet 2 of 2.

**Type B**

- Min. to Max. I.D.: 27" to 30.5" Max. I.D.
- Manhole Steps
  - Refer to RC-39, Sheet 2 of 2.

**Precast or Cast-in-Place Bosse Section**

- H=0'-30" or 0.18 in 2/ft.
- H=30'-60' or 0.15 in 2/ft.
- H=30'-30' or 0.25 in 2/ft.
- H=0'-30' or 0.28 in 2/ft.

**Welded wire fabric shaliform to the requirements of Section 703.3 of Form 408.**

---

**Commonwealth of Pennsylvania**
**DEPARTMENT OF TRANSPORTATION**
**BUREAU OF DESIGN**

**STANDARD MANHOLES**

**Recommended Grade**
Cone A Class

**Recommended Rings**
Cone B Class

**Recommended Mortar**

---

**Foundation Detail for Concrete Manhole, Type A**

**Recommended Grade**
Cone A Class

**Recommended Rings**
Cone B Class

**Recommended Mortar**

---

**Type A**

- Min. to Max. I.D.: 27" to 30.5" Max. I.D.
- Manhole Steps
  - Refer to RC-39, Sheet 2 of 2.

**Type B**

- Min. to Max. I.D.: 27" to 30.5" Max. I.D.
- Manhole Steps
  - Refer to RC-39, Sheet 2 of 2.

**Precast or Cast-in-Place Bosse Section**

- H=0'-30" or 0.18 in 2/ft.
- H=30'-60' or 0.15 in 2/ft.
- H=30'-30' or 0.25 in 2/ft.
- H=0'-30' or 0.28 in 2/ft.

**Welded wire fabric shaliform to the requirements of Section 703.3 of Form 408.**

---

**Commonwealth of Pennsylvania**
**DEPARTMENT OF TRANSPORTATION**
**BUREAU OF DESIGN**

**STANDARD MANHOLES**

**Recommended Grade**
Cone A Class

**Recommended Rings**
Cone B Class

**Recommended Mortar**

---

**Foundation Detail for Concrete Manhole, Type A**

**Recommended Grade**
Cone A Class

**Recommended Rings**
Cone B Class

**Recommended Mortar**

---

**Type A**

- Min. to Max. I.D.: 27" to 30.5" Max. I.D.
- Manhole Steps
  - Refer to RC-39, Sheet 2 of 2.

**Type B**

- Min. to Max. I.D.: 27" to 30.5" Max. I.D.
- Manhole Steps
  - Refer to RC-39, Sheet 2 of 2.

**Precast or Cast-in-Place Bosse Section**

- H=0'-30" or 0.18 in 2/ft.
- H=30'-60' or 0.15 in 2/ft.
- H=30'-30' or 0.25 in 2/ft.
- H=0'-30' or 0.28 in 2/ft.

**Welded wire fabric shaliform to the requirements of Section 703.3 of Form 408.**
TABLE OF BASE SLAB DIMENSIONS

<table>
<thead>
<tr>
<th>Maximum Type Depth from Top of Manhole to Tons Min.</th>
<th>Minimum of Pipe per Sq. ft.</th>
<th>Minimum of Pipe Invert of Pipe</th>
<th>Minimum Base Thickness of Tons below the bottom of the pipe</th>
</tr>
</thead>
<tbody>
<tr>
<td>30° A Max. 10'-0&quot; 0.65 6'-0&quot; 0'-0&quot;</td>
<td>7'-0&quot;</td>
<td>4'-0&quot;</td>
<td>2'-0&quot;</td>
</tr>
<tr>
<td>30° A Max. 20'-0&quot; 0.92 7'-0&quot; 0'-0&quot;</td>
<td>8'-0&quot;</td>
<td>5'-0&quot;</td>
<td>2'-0&quot;</td>
</tr>
<tr>
<td>30° B Max. 40'-0&quot; 1.88 4'-0&quot; 0'-0&quot;</td>
<td>6'-0&quot;</td>
<td>3'-0&quot;</td>
<td>2'-0&quot;</td>
</tr>
<tr>
<td>30° B Max. 50'-0&quot; 2.00 6'-0&quot; 0'-0&quot;</td>
<td>5'-0&quot;</td>
<td>4'-0&quot;</td>
<td>2'-0&quot;</td>
</tr>
<tr>
<td>30° B Max. 60'-0&quot; 2.50 5'-0&quot; 0'-0&quot;</td>
<td>6'-0&quot;</td>
<td>5'-0&quot;</td>
<td>2'-0&quot;</td>
</tr>
</tbody>
</table>

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

---

CAST IRON COVER

Material meeting the requirements of Section 714.1(C) of Form 408.

CAST IRON FRAME

All rounds and fillets to be 3/4 R. unless otherwise noted.

SECTION

MODIFIED MANHOLE

(For pipes 36" dia. and greater)

A for pipes 36" to greater than 42" (because the box size to keep the sides of the manhole box equal to the inside dia. of the pipe minus the required wall thickness of 2" for the modified box section. Alternate designs for obtaining larger sizes shall be submitted for approval.)

MANHOLE STEPS

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

---

STRUCTURAL STEEL COVER

---

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.

---

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

STANDARD MANHOLES
TABLE OF BASE SLAB DIMENSIONS

<table>
<thead>
<tr>
<th>Diameter of Manhole to Invert of Pipe</th>
<th>Minimum Thickness</th>
<th>Minimum Width of Base below the invert of the pipe</th>
</tr>
</thead>
<tbody>
<tr>
<td>30'-6&quot; Min. 6'-0&quot;</td>
<td>0.65 ft</td>
<td>7'-0&quot; Min. 7'-0&quot;</td>
</tr>
<tr>
<td>30'-0&quot; Min. 5'-0&quot;</td>
<td>0.85 ft</td>
<td>7'-0&quot; Min. 7'-0&quot;</td>
</tr>
<tr>
<td>30'-6&quot; Min. 4'-0&quot;</td>
<td>0.95 ft</td>
<td>7'-0&quot; Min. 7'-0&quot;</td>
</tr>
<tr>
<td>30'-6&quot; Min. 3'-0&quot;</td>
<td>1.05 ft</td>
<td>7'-0&quot; Min. 7'-0&quot;</td>
</tr>
</tbody>
</table>

A safe bearing capacity of 1000 psi is assumed to determine the base size. When the soil is extremely poor, the contractor shall proceed with the construction only after the engineer approves the proposed base design.

SECTION MODIFIED MANHOLE (For pipes 36" Dia. and greater)

For pipes 36" Dia. and greater, increase the box size to keep the walls of the manhole box section flush with the inside edge of the pipe. Maintain the required wall thickness of 7'-0" for the manhole box section.

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

CAST IRON COVER

All round and fillets to be 1/2" unless otherwise noted.

CAST IRON FRAME

All round and fillets to be 1/2" unless otherwise noted.
CEMENT CONCRETE SPILLWAYS

MORTARED STONE SPILLWAYS

Cement Concrete Paving for Stream Beds (Paved Parallel Ditch)

Installation Detail for Half-Circle Pipe

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

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

SLOPE PROTECTION
NOTE:

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

Corresponding ends of reinforcement bars shall be fitted with an approved metal cap providing a 1/2" minimum clearance pocket (typ).

Fine aggregate Filter Blanket (Min 4" depth)

Grid Detail

Corresponding ends of reinforcement bars shall be fitted with an approved metal cap providing a 1/2" minimum clearance pocket (typ).

Approx. 1/2 C.Y. of No. 2B Coarse Aggr. at each Weephole (Typ.)

* Weepholes shall not exceed 15 ft. C to C

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

SPECIAL MORTARED STONE SLOPE WALL
DESIGN HIGH WATER CHANNEL LINING

DIAPHRAGM END

SIDE LID

SLOPE WALLS

MATTRESS TYPE

WIRE MESH BASKETS

GABIONS

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN
GABIONS

Recommended: July 20, 1977
Approved: July 21, 1977
Rev. 1 of 1
Director, Bureau of Design
Chief Hwy Engr.
RC-43
APPROACH END GUARD RAIL TRANSITION AT SLOPED CURB PARAPET

- 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

- Transition Curb block details shown on the structure design drawings.

TRAILING END GUARD RAIL AT STRUCTURE PARAPET FOR DIVIDED HIGHWAY WHERE REQUIRED

- Details for Type 2-W Guard Rail will conform to the requirements of Type 2-W with post spacing of 3'-10".

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

GUARD RAIL TRANSITION AT END OF STRUCTURES
1. All materials shall conform to the requirements of Form 408.
2. The 3\(\frac{3}{8}\) x 2\(\frac{3}{8}\) cold formed channel post, 53 x 5.7 post, and aluminum alloy post may be bid as alternatives for Type 1 Weak Post Guard Rail System. However, mixing of different posts will not be acceptable within a project.
# Commonwealth of Pennsylvania
## DEPARTMENT OF TRANSPORTATION
### BUREAU OF DESIGN

## TYPE I WEAK POST GUARD RAIL

**Notes:**
1. The following criteria shall apply for arrangement of Spring Cable End Assembly and Turnbuckle Cable End Assemblies:
   - Length of Cable Run:
     - To 1000'- Use Compensating Device on one end, and Turnbuckles on other end of each individual cable.
     - Over 1000' to 2000'- Use Compensating Device & Turnbuckles on each end of each individual cable.
     - Over 2000'- Use new Stretch by overlapping 10 feet parallel post (See Typical Layout Details).
2. Fittings:
   - All fittings shall be so designed and be of such material as to develop the full strength of a single cable or cable assembly, on the post may be.
   - Single Cable End Assembly: Min. Tensile Strength = 63,000 Lbs.
   - All fittings shall be galvanized according to ASTM-A153.
   - Material indicated as "Cost Steel" shall conform to AASHTO-M103, or ASTM-A25, that indicated as "Malleable Iron" shall conform to A16-800 or ASTM-A647. Refer to for details.
3. Designs for a combination or single post compensating device and turnbuckle assembly may be submitted for approval.
4. Hook bolts, as installed, shall develop an ultimate pull open strength of from 500 Lbs. to 1000 Lbs. applied in any direction normal to the longitudinal axis of the post.
5. At all locations where the cable is connected to a cable socket with a wedge type connection, use of the wire rope shall be crimped over the base of the wedge to hold it firmly in place.
6. Compensating devices must have a spring rate of 450 to 500 lfs per inch and a total available "throw" of 6" min.
7. Compensating devices shall have a spring rate of 450 to 500 lfs per inch and a total available "throw" of 6" min.
8. The cable tension shall be controlled by the following table:

<table>
<thead>
<tr>
<th>Temp range</th>
<th>Spring Compress. Force</th>
<th>Spring Compress. Force</th>
</tr>
</thead>
<tbody>
<tr>
<td>-20°F</td>
<td>0.55</td>
<td>0.75</td>
</tr>
<tr>
<td>-10°F</td>
<td>0.55</td>
<td>0.75</td>
</tr>
<tr>
<td>0°F</td>
<td>0.65</td>
<td>0.85</td>
</tr>
<tr>
<td>+10°F</td>
<td>0.65</td>
<td>0.85</td>
</tr>
<tr>
<td>+20°F</td>
<td>0.65</td>
<td>0.85</td>
</tr>
<tr>
<td>+30°F</td>
<td>0.65</td>
<td>0.85</td>
</tr>
<tr>
<td>+40°F</td>
<td>0.65</td>
<td>0.85</td>
</tr>
</tbody>
</table>

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-1709, sheet 3 of 4.
11. Guard Rail over underground structures shall be constructed as shown on RC-52, sheet 1 of 2.

**Commonwealth of Pennsylvania**

**DEPARTMENT OF TRANSPORTATION**

**BUREAU OF DESIGN**

**Type I Weak Post Guard Rail**

**Revised:** 1-19-10

**Approved:** 2-1-09

**Ground Cover then Post:**

**Typical Layout Sketch**
OFFSET BRACKET

Rubbing Rail, see details, RC-52, sheet 2 of 6

All holes are \( \frac{3}{8} \) in. unless otherwise noted.

OFFSET BRACKET

Rubbing Rail, see details, RC-52, sheet 2 of 6

All holes are \( \frac{3}{8} \) in. unless otherwise noted.

POST & OFFSET BRACKET

Rubbing Rail, see details, RC-52, sheet 2 of 6

All holes are \( \frac{3}{8} \) in. unless otherwise noted.

TYPICAL SECTION

POST

Post Bolt, with steel plate and nut, see details, RC-52, sheet 3 of 6

W-Beam Rail Element, see detail, RC-52, sheet 2 of 6.

3' Post Bolt, see detail, RC-52, sheet 3 of 6.

OFFSET BRACKET

Offset Bracket

See Note 2.

TYPE 2-S & 2-SC GUARD RAIL

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

Offset Bracket

See Note 2.

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

Offset Bracket

See Note 2.

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, or 2-SC Modified shall conform to the details of the 2-s Special, 2-sc Special, but without rubbing rail.
3. The \( \frac{5}{8} \) Cold Formed C-Posts, W6 x 9 Posts and Wood Posts with matching offset brackets may be bid as alternatives to the Strong Post Guard Rail System. However, mixing of different posts and offset brackets will not be acceptable within a project.

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

**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.

6'-3" for 2-SC (Typ.)

3'-11/2" for 2-SC (Typ.)

4" Min.

8" Min.

10'-8"

6'-6"

W-Beam Rail Element

**DETAIL B**

All holes 1" unless otherwise noted. See some base plate details for 5-1/8" Cold Formed C-Post and W6 x 9 Post.

2'-9" Min.

4' Min.

Steel Post

See Detail B, this sheet.

STEEL POSTS

**OVER UNDERGROUND STRUCTURES**

See Note 1, this sheet.

**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 rods, dimensions noted for hole spacing should be adjusted to allow splices to occur only at posts.

3. W-Beam and rubbing rails shall be attached to each post. Splices shall only occur at posts and be topped in the direction of traffic.

4. The 12" backing plate for the W-Beam Rail Elements shall be used on all intermediate posts and shall be the same section as the W-Beam Rail Elements.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

**TYPE 2 STRONG POST GUARD RAIL**

Recommended Sept. 8, 1981 Sheet 5 of 5

Director Bureau of Highway Design
RC-52

OFFICIAL

A.D. Rommelaere

DEFEK

3/4" x 1/2" Slotted Holes for Post Bolts

6" x 3" x 1/16" COLD FORMED CHANNEL RUBBING RAIL

- See Note 2
**TYPE 2 STRONG POST GUARD RAIL**

**TERMINAL SECTION-B.C.T.**

- Splice bolts shall be provided with a lock nut or double nut and shall be tightened only to a point that will allow guard rails to be free to move.
- Splice bolts shall be centered in the slotted holes. See detail A, sheet 5 of 6.

**NOTES**

1. Splice bolts shall develop 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 wells.
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.

**TECHNICAL SPECIFICATIONS**

- **Post Bolt Lengths - L**

<table>
<thead>
<tr>
<th>Post Type</th>
<th>B.C. Post Bolt Diameter</th>
<th>B.C. Post Bolt Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wood Post</td>
<td>12&quot; Post Bolt</td>
<td>16&quot; Post Bolt</td>
</tr>
</tbody>
</table>

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

- **Recommended** - Sept. 8, 1981 Sht. 6 of 6
- **Approved** - Sept. 9, 1981
  - **Dir. Bureau of Highway Design** RC-52
  - **Chief Highway Mgr.**

**CONTACT**

- **For Bureau of Highway Design**
- **For Bureau of Design**
- **For Bureau of Engineering**
1. Breakaway Cable Terminal End Treatment shall be used for Type 2-2, Type 2-5, Type 2-S Special, and Type 2-6 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, 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).
**Rotating Bracket Requirements**

**Steel Posts**

**Typical for 15° thru 75° Positions**

**Wood Posts**

**Typical for 15° thru 75° Positions**

**Positioning of Rotating Bracket on Posts of the End Treatment**

<table>
<thead>
<tr>
<th>Rotation Bracket</th>
<th>WS x 8.5 Post</th>
<th>5½ C-Post</th>
<th>6½ x 6½ Wood Post</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th><strong>Type 2 Strong Post End Treatment</strong></th>
</tr>
</thead>
</table>

**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.

<table>
<thead>
<tr>
<th><strong>Rotation Angle</strong></th>
<th><strong>Height of Post</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>15°</td>
<td>10°</td>
</tr>
<tr>
<td>30°</td>
<td>14°</td>
</tr>
<tr>
<td>45°</td>
<td>12°</td>
</tr>
<tr>
<td>60°</td>
<td>10°</td>
</tr>
<tr>
<td>75°</td>
<td>9°</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>2-S, 2-S Modified, 2-SC, 2-SC Modified</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>2-S, 2-S Special, 2-SC Special</td>
</tr>
</tbody>
</table>

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

**Notes**

1. Payment for Type 2 Strong Post End Treatment will include the last 57'-6" of sloping rail, terminal section, hardware, and concrete.
2. This length of sloping rail is to be included in all types of the end treatment. The offset treatment should be done under a separate pay item or contract. See Traffic Standard TC-7709 for additional details.
3. The offset dimension shall be done under a separate pay item or contract. For additional details, see Traffic Standard TC-7709.
4. This standard depicts only the necessary dimensions for uniformity and interchangeability of sloping brackets. It does not show details of the rotating bracket for supporting the rotated portion of the end treatment. Only rotating brackets 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.
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.

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

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

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

Terminal Section Bridge Connector
See Detail, RC-52, sheet 3 of 5.

Terminal Section Bridge Connector
See Detail, RC-52, sheet 3 of 5.

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

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

TYPE 2 WEAK POST
GUARD RAIL

Director, Bureau of Design
Hwy. Engr.
TREATMENT WHEN EDGE OF SHOULDER TO FACE OF OBSTRUCTION IS 3' OR GREATER WHERE CONTINUOUS GUARD RAIL IS NOT USED

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

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

**End Treatment when guard rail is not needed further.

Minimum Treatment:
- Type 2-W Guard Rail and a

Breakway Cable Terminating End Treatment (25')

See Note 5, this sheet

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

Minimum Treatment:
- Type 2-W Guard Rail
- Spacing = 25'

Traffic Direction

Minimum Treatment:
- Type 2-W Guard Rail
- Spacing = 25'

See Note 5, this sheet

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

Director, Bureau of Design: T. R. Koonce
Approved: J. E. H. Liston
Amended: 7/22/54

NOTES

1. The treatments shown are for four lane divided highways. The approach and type of the treatments shown is based on location 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-wc Guard Rail and should be incidental to the Type 2-S Guard Rail pay item.

3. The approach 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 provided on the tabulation. Where calculations show a distance less than 125', use 125' as 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 2-wc guard rail which is required at the obstruction.

TABLE 1

<table>
<thead>
<tr>
<th>Type of Guard Rail</th>
<th>Type of Back of Rail</th>
<th>Required (L) from Guard (Dist. to Back of Rail)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-W</td>
<td>2-W</td>
<td>3' up to 6' 4'</td>
</tr>
<tr>
<td></td>
<td>2-Wc</td>
<td>3' up to 6' 4'</td>
</tr>
<tr>
<td></td>
<td>2-Wc</td>
<td>6' up to 12' 6'</td>
</tr>
<tr>
<td></td>
<td>2-wc</td>
<td>6' up to 12' 6'</td>
</tr>
<tr>
<td></td>
<td>2-wc</td>
<td>12' up to 25' 10'</td>
</tr>
</tbody>
</table>

TABLE 2

<table>
<thead>
<tr>
<th>Minimum Treatment</th>
<th>Type of Guard Rail</th>
<th>Type of Back of Rail</th>
<th>Required (L) from Guard (Dist. to Back of Rail)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-W</td>
<td>Breakaway Cable</td>
<td>2-Wc</td>
<td>3' up to 6' 4'</td>
</tr>
<tr>
<td>2-Wc</td>
<td>2-Wc</td>
<td>3' up to 6' 4'</td>
<td></td>
</tr>
<tr>
<td>2-wc</td>
<td>2-Wc</td>
<td>6' up to 12' 6'</td>
<td></td>
</tr>
<tr>
<td>2-wc</td>
<td>2-Wc</td>
<td>12' up to 25' 10'</td>
<td></td>
</tr>
</tbody>
</table>

Note: The required clearance (L) from Guard (Dist. to Guard) shall be incidental to the Type 2-S Guard Rail pay item.
TREATMENT AT OBSTRUCTION FOR MEDIAN WIDTHS UP TO 16' WHERE CONTINUOUS BARRIER IS USED

- Details for Type 2-WC Guard Rail shall conform to the requirements of Type 2-W with post spacing of 3'-11½".
- This treatment is intended for median widths up to 16'. In special instances where median widths exceed 16' use appropriate type guard rail.

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

- Type and length of guard rail and end treatment beyond the obstruction shall be as indicated on the construction drawing and determined by the design requirement.

TREATMENT FOR TYPE 2-WM MEDIAN BARRIER CROSS-OVER

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

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

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

MEDIAN TREATMENT AT DUAL STRUCTURES

PARABOLIC FLARE LAYOUT

TREATMENT - CUT TO FILL CONDITIONS

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

GUARD RAIL AND
MEDIAN BARRIER PLACEMENT

Director, Bureau of Design
Chief Engineer
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)

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 ensure removability. Lifting holes will be required and shall be plugged with concrete or other approved type plugs.
4. The material used for the plates in the joints shall conform to the requirements of AASHTO Designation M 183 or ASTM A 36, structural steel. Plates shall be galvanized in accordance with AASHTO Designation M 111, or cooled in accordance with Sec. 714.1, Form 408.
5. Concrete median barriers shall be shown on the construction drawings.
6. Expanded Joint Material shall be used at oil construction joints.
7. For sections with curved surfaces a maximum 1/4" joint on one side will be permitted. For curves greater than 2° 30', 30' barrier lengths must be shortened to maintain longitudinal joint tolerances.

CONCRETE MEDIAN BARRIER WITHOUT JOINT CONTINUITY
(See Note 2)

CONCRETE MEDIAN BARRIER WITH JOINT CONTINUITY
(See Note 2)
CONCRETE MEDIAN BARRIER TREATMENT AT PIERS

NOTES

1. No additional compensation will be allowed for transitions in the concrete median barrier at piers or structures.
2. At hazardous locations, impact attenuators such as Hydro Cushion, GREAT 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.

INLET PLACEMENT AT CONCRETE MEDIAN BARRIER
MONOLITHIC CONSTRUCTION

TYPICAL CAST-IN-PLACE OR SLIP-FORM CONSTRUCTION

TYPICAL END TRANSITION CONSTRUCTION

TYPICAL PRECAST CONSTRUCTION

NOTES
1. For permanent and temporary present barrier, any these items supplied by an approved manufacturer, as listed in Subitem 1-11, will be permitted. Any manufacturer's adhesion to be listed in Subitem 1-11, or those to shall meet the requirements of Form 408 Specification, Section 623, Concrete Median Barrier, and Section 708.2(E), Precast Concrete Median Barrier.
2. In cast-in-place, slip-form, and precast concrete construction, adhesion shall meet the requirements of Form 408 Specification, Section 623, Concrete Median Barrier, and Section 708.2(E), Precast Concrete Median Barrier.
3. For cast-in-place or slip-form construction, a pre-tied prestressed slab material shall be used at all construction joints.
4. Precast concrete barrier construction on existing pavement will require special details to be shown on the construction drawings.
5. In precast concrete barrier construction on existing pavement, any these items shall be placed at the top surface of the barrier in the center of the median. Details shall be shown on Traffic Standard, TC 7703 D-55. Details shall be shown in accordance with Form 408 Specification, Section 660.2(E). A slab top layer of non-shrink mortar shall be used at the top of the slab to material for leveling purposes.
6. For permanent installations for permanent barrier, refer to Typical Reinforcement Details on Sheet 2 of 5.
7. A typical barrier and transition section may be used for permanent barrier construction only when the barrier section is located outside the speed limit. However, the permanent barrier section is required for permanent installations where the speed limit is 60 MPH or less. Otherwise, an impact attenuation device designed to absorb the energy of an impacting vehicle in the weight range of 2,000 to 4,500 lbs. at the specified design speed, with a maximum force of 8.5 G's and a maximum peak force of 12 G's, shall be used.
1. The material used for the plates in the joints shall meet the requirements of AASHTO Designation M183 or ASTM A36 structural steel. Plates shall be galvanized in accordance with AASHTO Designation M18 or coated in accordance with Form 408 Specifications, Section 107. All plates shall be \( \frac{3}{4} \) x \( \frac{7}{16} \) x length required.

2. All tongue-and-groove barriers shall be cast either double-male or double-female. All tongue-and-groove and transition units shall be cast with either a male or a female connection. All tolerances for male connections shall be \( +\frac{3}{4} \) in. \(-\frac{1}{8}\) in. and \( +\frac{1}{16}\) in. \(-\frac{1}{16}\) in. for female connections.

3. The ideal barrier orientation on super-elevated sections is a vertically-oriented barrier when the grade toward the barrier is descending and a perpendicularly-oriented barrier when the grade toward the barrier is ascending. The best compromise is a vertically-oriented barrier with the elevation of the two faces governed by the grade at each side of the barrier.

4. The tongue-and-groove connection design shown represents a barrier system patented by the Smith Cattleguard Company, Midland, Virginia. Contractors shall provide for patented barrier use by suitable legal agreement with the patentee, as required by Form 408 Specifications, Section 107.03.

---

**NOTES**

- **Steel Plate, See Note:**
- **1/4" x 1/2" x thickness**
- **Steel Plate, See Note:**
- **1/4" x 1/2" x thickness**
- **See Note 3, This Sheet.**
- **Note: Symmetry**
- **Vertical Axes**
- **Ascending Grade**
- **Descending Grade**
- **Best Compromise Orientation on Super-Elevated Sections**
- **Ideal Orientation**
- **Best Compromise Orientation**
- **Commonwealth of Pennsylvania DEPARTMENT OF TRANSPORTATION BUREAU OF DESIGN**
- **CONCRETE MEDIAN BARRIER PERMANENT**
- **Recommended by:**
- **May 6, 1982**
- **Reviewed by:**
- **May 6, 1982**
- **By:**
- **John A. Smith, Dir., Bureau of Highway Design**
- **Alfred Oben, Jr., Bureau of Highway Design**

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**TYPICAL BARRIER CONNECTION SYSTEMS**

**TYPICAL REINFORCEMENT DETAILS**
For double-male connections, use 2 minimum, for double-female connections, use 3½ minimum, and for slotted-plate connections, use 5½ minimum for fabric or bar limits.

1. For temporary barrier installations, delineators shall be side-mount or top-mount, as determined on a project by project basis. Side-mount delineators shall be located 8 inches from the top face of the barrier to the center of the device. Top-mount delineators shall be installed as shown on Traffic Standard TC 7709, Sheet 4 of 6. Delineators shall be installed at a maximum longitudinal spacing of 40 feet and located at T/2 on the designated barrier section. Only delineators supplied by an approved manufacturer, as listed in Bulletin No. 55, will be permitted.

2. Warning lights may be provided in lieu of top or side-mount delineators on temporary barriers. They shall be installed at a maximum spacing of 80 feet located at T/2 on the designated barrier section. Only the first two lights at the start of the barrier may be yellow Type A flashing lights. All other warning lights shall be yellow Type C steady burn lights. Only lights supplied by an approved manufacturer, as listed in Bulletin 55, will be permitted.
TYPICAL END TRANSITION SECTION

TYPICAL END TRANSITION REINFORCEMENT DETAILS

MINIMUM FLARE TREATMENT

FLARE RATE DIMENSIONS

<table>
<thead>
<tr>
<th>Speed</th>
<th>Flare Rate (in)</th>
<th>10</th>
<th>12</th>
<th>14</th>
<th>16</th>
<th>18</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.25</td>
<td>0.05</td>
<td>0.5</td>
<td>0.6</td>
<td>0.7</td>
<td>0.8</td>
<td>0.9</td>
</tr>
<tr>
<td>0.2</td>
<td>0.025</td>
<td>0.25</td>
<td>0.3</td>
<td>0.35</td>
<td>0.4</td>
<td>0.45</td>
</tr>
<tr>
<td>0.15</td>
<td>0.02</td>
<td>0.2</td>
<td>0.25</td>
<td>0.3</td>
<td>0.35</td>
<td>0.4</td>
</tr>
</tbody>
</table>

Notes:
1. The Minimum Flare Treatment guidelines and impact attenuator criteria presented on this sheet shall be used for approach edge of temporary barrier installations.
2. All impact attenuators shall be designed to absorb the energy of an impacting vehicle in the impact range of 2,000 to 4,000 pounds of the specified design speed, with a minimum average force of 6.5 G's and a maximum force of 12 G's. For temporary barrier installations, an impact attenuator shall be eliminated only if any of the following conditions are satisfied:
   A. The barrier is extended at the proper flare rate until the end of the barrier system is a minimum 30 feet from the edge of the nearest traffic lane.
   B. The barrier is extended at the proper flare rate until the end of the barrier system can be buried in a cut section.
   C. The barrier is extended at the proper flare rate until the end of the barrier system is properly connected or overlapped with existing guide rail. Lap connection details shall be submitted to the Central Office, Bureau of Highway Design, for approval.
3. End transition sections shall be used to terminate a temporary barrier system only when the criteria in Note 2A. and/or 2B. is satisfied. Otherwise, appropriate impact attenuators shall be used.

For more detailed information, refer to Sheet 3 of this document.
TYPICAL ALTERNATE BARRIER TREATMENT AT PIERS

TYPICAL BARRIER TREATMENT AT PIERS

1. Expansion Joint Material shall be used around all piers.
2. Joints shall be sealed with an approved joint sealer.
3. No additional compensation will be allowed for transitions in the concrete median barrier at piers or structures.
4. Additional voids may be cast in the tapered end sections and shall meet the requirements presented in Section D-D.
5. All coarse aggregate shall meet the requirements of Form 408 Specifications, Section 703.3. Alternate suitable granular material may be used as filler material.
6. To prevent intrusion of coarse aggregate into weep holes, use wire mesh screening or other suitable material.

TYPICAL INLET PLACEMENT AT CONCRETE MEDIAN BARRIER

TYPICAL MEDIAN BARRIER TRANSITION DETAIL
1. All material and workmanship shall be in accordance with Section 624, Form 408.
2. All depressions greater than 3" (76 mm) shall be filled with rock 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. Fasteners at 18" (457 mm) c. to c. along the joint.
5. Metric equivalents are shown in parentheses for all given dimensions.

**NOTES**

**TREATMENT AT GROUND**

**DEPRESSIONS GREATER THAN 1" (305 mm)**

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

**TYPE 1 RIGHT-OF-WAY FENCE**

**TYPE 2 RIGHT-OF-WAY FENCE**

**TYPE 5 RIGHT-OF-WAY FENCE**

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

Right-of-Way Fence
Removable Fence Section at Structures as shown on the drawings. See RC-61 for details.

R/W FENCE TREATMENT AT HIGH WALLED ABUTMENT

R/W FENCE TREATMENT AT STUB ABUTMENTS

R/W FENCE TREATMENT AT CULVERTS.

Drive anchor may be used as an alternate to connect concrete footings for all types of Right-of-Way Fence.

Drive Anchor Details for Post Braces on Type 2 and Type 5 R/W Fence

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

R/W FENCE TREATMENT AT HIGHWAY UNDER CROSSROAD

Drive Anchor Orientation

Drive Anchor Blade (2 req'd.)

Drive Anchor Blade (4 req'd.)

Drive Anchor Blade (4 req'd.)

Drive Anchor Blade (4 req'd.)

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Drive Anchor Blade (4 req'd.)

Drive Anchor Bl...
Panel length varies with required length of barricade.

Alternate Red and White stripes, traffic side only, see Note I, this sheet.

Extruded Aluminum Channel, See detail, this sheet.

Extruded Aluminum Channel with Class I or Class II reflective material applied, See Note I, this sheet.

WG x 9 Steel Post

Post Clip and Post Clip Bolt, see detail, this sheet

DETAIL A

Panel to Post Connection

Max. Post Spacing: 10' {3m}

Butt splice as necessary at posts.

Max. Post Spacing: 10' {3m}

Extruded Aluminum Channel

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

Class I or Class II reflective material applied, See Note I, this sheet.

Panel to Post Connection

Max. Post Spacing: 10' {3m}

ALUMINUM PANEL - STEEL POSTS

Class I or Class II reflective material applied to panel, See Note I, this sheet.

Butt splice as necessary at posts.

Max. Post Spacing: 10' {3m}

ALUMINUM PANEL - WOOD POSTS

Only Class I or Class II reflective sheathing material supplied by an approved supplier as listed in Bulletin No. 15 will be permitted.

Wood posts may be mechanically driven. In areas where posts cannot be driven mechanically, the use of concrete footings shall be required.

See RC-52, sheet 2 of 5 for mounting of either wood or steel posts on concrete pavement.

SECTION A-A

SECTION B-B

NOTES

1. Only Class I or Class II reflective sheathing 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.
WOOD PANEL - STEEL POSTS

Panel length varies with required length of barricade

Class I or Class III reflective material applied to 0.063" x 0.020" (1.6mm x 0.51mm) aluminum strip and fastened to wood panels. See Note 1, RC-63, sheet 1 of 2.

2" x 0.020" (51mm x 0.51mm) aluminum strip, pressure treated.

½" x 1" (13 mm x 25mm) hardwood or Lag screws ¼" (19 mm) long, top and bottom.

Alternating Red and White stripe, traffic side only, See Note 1, RC-63, sheet 1 of 2.

Max. Post Spacing - 10' (3m)

WOOD PANEL - WOOD POSTS

Panel length varies with required length of barricade

Class I or Class II reflective material applied to 0.063" x 0.020" (1.6mm x 0.51mm) aluminum blank and fastened to wood panels. See Note 1, RC-63, sheet 1 of 2.

2" x 0.020" (51mm x 0.51mm) hardwood, pressure treated.

¼" x 1" (16mm x 25mm) hardwood, pressure treated.

Alternating Red and White stripe, traffic side only, See Note 1, RC-63, sheet 1 of 2.

Max. Post Spacing - 10' (3m)

STEEL POST FOR WOOD PANEL

WOOD POST FOR WOOD PANEL

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN
PERMANENT BARRICADES
WOOD PANEL

Recommended April 1979
Approved April 1981

Director, Bureau of Design
Deputy Chief Hwy. Engr.

RC-63
Joint Sealer

Expansion joint material shall be cut to conform to the cross sectional area and be placed at structures and at the end of a day's work.

Curb face may be constructed vertical as permitted for

PLAIN CEMENT CONCRETE CURB

INTEGRAL CEMENT CONCRETE CURB

PLAIN CEMENT CONCRETE CURB GUTTER

PLAIN CEMENT CONCRETE GUTTER

NOTES

1. All lines shall conform to the requirements of Form 408.
CONCRETE MOUNTABLE CURBS

CONCRETE MOUNTABLE CURB ON EXISTING CONCRETE PAVEMENT AND BRIDGE DECKS.

Where may provide for a deeper face at curb when an overlay is placed on the existing pavement, however the exposed face type of curb shall be 2" max.

LIMIT OF CONSTRUCTION INCIDENTAL TO INLET INSTALLATION

CONCRETE MOUNTABLE CURBS
TRAFFIC SEPARATOR IN RAMP GORE AREA

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 1/4 (6.35mm) wide and the depth equal to 1/36th 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 21, 1979
Approved: June 6, 1979

Director, Bureau of Design
Chief Hwy. Engineer

RC-66
IIf PLAN, as shown on the drawings or as directed by the engineer.

SECTION 8-8
ROCK LINING

PLAN

SECTION A-A
ROCK BASIN

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

SECTION D-D
PAVED ENERGY DISSIPATOR

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN
EROSION & SEDIMENT CONTROL
Discharge into a stabilized area or a temporarily protected area.

Angle OS req'd.

I. Discharge into a stabilized area or on temporarily protected area. -

Plan

SUGGESTED MIN. SIZES

Pipe Size

Diameter

8" to 10"

10" to 12"

Metal, Flexible, or Plastic Pipe adequately anchored to fill slope. Length is variable.

Suitable connection for the type of pipe used on the fill slope.

Metal Pipe 8 elbow

Top of embankment during construction.

Section A-A

TEMPORARY SLOPE PIPE DRAIN

SECTOR A-А

TEMPORARY SLOPE PIPE DRAIN

SECTOR C-C

LOG BARRIER

BALED STRAW BARRIER

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

EROSION & SEDIMENT CONTROL

Director, Bureau of Design

County Chair, May Eng.

RG-70
TRASH RACK AND ANTI-VORTEX DEVICE

The cross-sectional area of the riser pipe must be at least 1.5 times the cross-sectional area of the conduit.

Emergency Spillway

- 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 normal design flow of the spillway.

END VIEW

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

EROSION & SEDIMENT CONTROL

PLAN VIEW OF AN EMERGENCY SPILLWAY CUT INTO EXISTING GROUND

PLAN VIEW OF AN EMERGENCY SPILLWAY CUT INTO EXISTING GROUND

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

EROSION & SEDIMENT CONTROL

PLAN VIEW OF AN EMERGENCY SPILLWAY CUT INTO EXISTING GROUND

Commonwealth of Pennsylvania
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EROSION & SEDIMENT CONTROL

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EROSION & SEDIMENT CONTROL

PLAN VIEW OF AN EMERGENCY SPILLWAY CUT INTO EXISTING GROUND

Commonwealth of Pennsylvania
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EROSION & SEDIMENT CONTROL

PLAN VIEW OF AN EMERGENCY SPILLWAY CUT INTO EXISTING GROUND

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

EROSION & SEDIMENT CONTROL
ISOMETRIC VIEW OF INLET RISER PIPE & DRAINAGE DIKE

Notes:
- Drill holes 2" deep in concrete endwall to receive 1/2" log bolt.
- Upon removal of standbox fill holes in endwall with non-shrink, non-shrinking mortar in accordance with section 705.501 of the 408.
- Upon establishment of suitable soil stabilization and at the direction of the engineer, the Standbox shall be removed and shall become the property of the Contractor.
- The Stand 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.

ENDWALL STANDBOX

2" x 4" inch wood

ISOMETRIC OF PLYWOOD STANDBOX

Note:
- Exterior grade plywood
- 1/2" dia holes spaced 3" vertically and 1/4" horizontally (4 sides)
- 2" x 2" roller

INLET RISER PIPE

Upon establishment of suitable soil stabilization and at the direction of the engineer, the Inlet Riser Pipe shall be removed and placed in the property of the contractor and may be used at other locations as required.
Special Design will be required on steeper slopes.

**ATTACH TO LIGHTING POLE GROUNDING LUG**

**NOTE:**

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 of anchor bolts shall be galvanized.
D: Ground rod 1/2" x 5" min. copper clad steel. Max. resistance to earth ground shall be 25 ohms.
E: See RD-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).
I: Minimum bend radius to be six times conduit diameter, unless otherwise specified.
J: Top of conduit bushing not to be higher than 1/2" (50mm) from the top of the foundation.
K: Template for setting anchor bolts for type "A" or type "S" lighting poles is furnished by the lighting pole manufacturer.

**NOTES:**

- If a "7" anchor bolts are required.
- Top of forms shall be level in both directions.
- All anchor bolt nuts, steel, flat or spring lock washers and top of anchor bolts shall be galvanized.
- Ground rod 1/2" x 5" min. copper clad steel. Max. resistance to earth ground shall be 25 ohms.
- See RD-83 for pole details.
- For lighting pole anchorages on bridges, see bridge construction standard drawings.
- Leave 30 inches of #4 ground wire coiled above foundation. (Wire extends through center of foundation).
- Type FC foundations are designed for 30 ft. maximum arm length. (See table).
- Minimum bend radius to be six times conduit diameter, unless otherwise specified.
- Top of conduit bushing not to be higher than 1/2" (50mm) from the top of the foundation.
- Template for setting anchor bolts for type "A" or type "S" lighting poles is furnished by the lighting pole manufacturer.

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

**HIGHWAY LIGHTING FOUNDATIONS**

**CONVENTIONAL LIGHTING POLE**

<table>
<thead>
<tr>
<th>FOUNDATION DIMENSIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MOUNTING HEIGHT</strong></td>
</tr>
<tr>
<td>Up to 36&quot;</td>
</tr>
<tr>
<td>36&quot; - 42&quot;</td>
</tr>
<tr>
<td>42&quot; - 48&quot;</td>
</tr>
<tr>
<td>48&quot; - 54&quot;</td>
</tr>
<tr>
<td>54&quot; - 60&quot;</td>
</tr>
</tbody>
</table>

Approved: July 11, 1980
 Recommended: July 4, 1980

Director, Bureau of Design
Governor's Office of Highway Affairs
Ground Wire, see note 2, 1/8 in. sh.

Anchor Bolt Assembly

2' Rod Min. (Typ.)

To be backfilled with compacted embankment material.

Exothermic weld or Exchanger

Pedestal Steel, 16 #8 bars, or equivalent, 1/4" x 30" Hooks, or equivalent, with min. 30 bar dia. top.

Floating Steel, top & bottom, as shown on drawings.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

HIGHWAY LIGHTING
FOUNDATIONS
HIGH MAST LIGHTING POLE

DRILLED CAISSON FOUNDATION
PLAN SECTION B-B
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-1 or JB-2 shown on RC-82.
Equivalent approved prestressed 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 bluish paint.

Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN
HIGHWAY LIGHTING
JUNCTION BOXES—LIGHT DUTY

Director, Bureau of Design
Deputy Sec. for Highway Admin

Recommended
Approved
Architect, Bureau of Design
Director, Bureau of Design
ROUND ALUMINUM and STEEL POLES
AND OCTAGONAL STEEL POLES

1. See RC-80 for details on pole foundations.
2. Manufacturer 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-C-598(2).

5. Type "S" Poles shall be certified by the Federal Highway Administration to meet the latest AASHTO requirements for breakaway supports. Breakaway bases include:
   - Thick brass plate
   - Hose hole
   - Anchor Base
   - Tenon for Slip-fit (2"

4. See RC-80 for details on pole foundations.

IDENTIFICATION TAG DETAIL

- Mounting Details
- Pole No.
- Height

TERMINOLOGY

1/2" 8" 12" 18" 24" 30" 36" 48" 60" 72"

POLE MOUNTING DETAILS

1. GEN 1
2. Manufacturers 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-C-598(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" Poles shall be certified by the Federal Highway Administration to meet the latest AASHTO requirements for breakaway supports. Breakaway bases include:
   - Thick brass plate
   - Hose hole
   - Anchor Base
   - Tenon for Slip-fit (2"

CONVENTIONAL LIGHTING POLE DETAILS

DESCRIPTION

Lighting Poles, shall be in accordance with manufacturer's specifications. Manufacturer's specifications shall be provided for all poles, when required on or as shown on the project. All construction details shall be fully dimensioned as specified.

SECTIONAL STEEL POLES

- Longitudinal welds on multi-sleeved poles shall be spliced at same IP.

DETAIL A

- Section X-X
- Anchor Base

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

HIGHWAY LIGHTING

CONVENTIONAL LIGHTING POLE DETAILS

[Signatures and approval stamps]
Terminal Box DISC.

Control Switch on I0' (3.048 m) cord

Plug for direct power at 240 Volts

Power Supply 240 / 480 Volts

AWG#-4 Bore---,1 Copper to Ground Rod

TYPICAL LOWER SECTION MECHANISM

Solid Neutral Bar isolated from Ground

J.B. Terminal Box Mounted on Luminaire Lowering Ring

Lightning Arrester

Typical Circuit Schematic

TYPICAL HIGH MAST POLE

60 Amp Enclosed Circuit Breaker

J.B. Mounted on Lowering Ring

Ground Rod grounded to lug at top of pole with AWG #10 Braided Copper

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 I enclosure.

3. The lightning rod grounding conductor shall be grounded directly on the pole shaft with lugs provided by the manufacturer of the 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 metallic flexible conduit.

6. Pole identification tag as detailed on RC-83, sheet 1 of 2, shall be affixed to each high mast pole.
**BRACING DETAILS**

**TYPE 1 BRACING**
- Discontinuous trees over 4" caliper
- Evergreen trees over 6" high
- Not for street trees, slope planting, or west areas

**TYPE 2 BRACING**
- Discontinuous trees 4" to 8" high
- For all street trees and west areas over 4" caliper

**TYPE 3 BRACING**
- Discontinuous trees over 8" caliper

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**PLANTING DETAILS**

**ROOT BOLLED**
- For trees over 3" caliper
- Only for west areas

**PLANT BED EDGING**
- Use of U-shape staples

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**TABULATION OF BRACE POST REQUIREMENTS**

<table>
<thead>
<tr>
<th>Type of Bracing</th>
<th>Size of Material</th>
<th>Min. Track Post</th>
<th>Req. Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>DECIDUOUS</td>
<td>4&quot; x 4&quot;</td>
<td>12&quot; POST,H bun</td>
<td>12&quot; x 16&quot;</td>
</tr>
<tr>
<td>EVERGREEN</td>
<td>6&quot; x 6&quot;</td>
<td>12&quot; POST,H bun</td>
<td>12&quot; x 16&quot;</td>
</tr>
</tbody>
</table>

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**GENERAL NOTES**

1. **WORNS SHALL BE USED FOR ALL TREE PLANTING EXCEPT FOR WEST AREAS AND OTHER HIGH-MAINTENANCE AREAS, AS DIRECTED.**

2. **Roots 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 (1/2) the height of the tree.**

4. **Trees shall be planted with trees of packets.**

5. **Guys shall be equally spaced around the tree.**

6. **For trees to be planted in unobstructed areas, trees shall be spaced by three (3) U-shaped staples, equally spaced around the tree.**

7. **Roots contact fertilized packets shall be eliminated from the pit for trees to be planted in unobstructed areas.**

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**BRACING & PLANTING DETAILS**

**FERTILIZER POCKET**
- Use for trees over 3" caliper

**PLANT BED EDGING**
- Use of U-shape staples

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**COMMONWEALTH OF PENNSYLVANIA**
**DEPARTMENT OF TRANSPORTATION**

**BUREAU OF DESIGN**

**Approved**

**Director, Bureau of Design**

**J. D. Hoyle, P.E.**

**J.D. Hoyle, P.E.**

**J.D. Hoyle, P.E.**

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**REFERENCE:** FORM NO. 408/76 - SECTIONS 805, 806, 808, 803, and 801