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**MARKERS AND MAILBOX**
- **M 1** PROJECT MARKER, SURVEY MARKER
- **M 2** MAILBOX
**NOTES**

All concrete shall be Class "B" Concrete.

All concrete edges should have a 3/4" x 45° chamfer. Chamfer on vertical edges should extend a minimum of one foot below finished ground line.

When headwalls are placed on the inlet end of corrugated metal pipe or beveled concrete pipe, a bevel should be used at the inlet opening. The cut of the pipe shall be made from the face of the pipe to the pipe. The bevel should be constructed from the end of the pipe to the face of the wall.

When headwalls are placed on the inlet end of concrete pipe, the "bevel" or "groove" of the pipe should be placed in the wall in line of the bevel, except when the pipe is to be cut for placing in headed headwalls. The inside of the "bevel" or "groove" should be filled with concrete up to the flow line.

Bevels are not required on outlet headwalls.

Reinforcing fabric shall conform to the requirements of 708.3 and 708.4 of the Specifications.

Reinforcing fabric, as detailed herein, shall be used in all walls of headwall structures. The covering for the fabric shall be fullness measured from the surface of the concrete to the face of the wire, unless otherwise specified. The fabric shall be cut or measured to conform to the pipe opening in the wall, and may be otherwise cut or field bent to fit the structure.

In lieu of the reinforcing fabric described above, as shown reinforcing steel bars, meeting the requirements of 708.1 of the Specifications, may be used in these structures. Covering for the reinforcing shall be two inches, measured from the surface of the concrete to the face of the bars, unless otherwise specified. Bars shall be furnished in such lengths, or field bent or cut as necessary, to fit the structures and to accommodate the pipe opening in the walls.

Keyed or dowel type construction joints, acceptable to the Engineer, may be used during construction.

The pay quantity for Straight headwalls, constructed in accordance with the details herein, within the cubic yards of Class B Concrete specified herein.

Cost of aluminizing fabric and reinforcing bars shall be included in the unit price bid for "Class B Concrete".

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**Straight Headwall**

(Corrugated Metal Pipe Shown)

**Dimensions**

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**West Virginia Department of Transportation**

**Highway Engineering Division**

**Standard Details**

**Pipe Culvert**

**Windwalls**

(SHEET 4 OF 4)
### Dimensions of Galvanized Steel End Section for Round Pipe

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<td>2</td>
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<td>2</td>
</tr>
<tr>
<td>Mass (pounds)</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

### Notes

- **Typical end sections for pipes and pipe arches are detailed herein. Other similar designs may be used if acceptable to the engineer.**
- **Galvanized steel end sections shall be used on the ends of corrugated steel pipes and/or pipe arches at those locations specified on the plans. End sections shall be measured as the number of units installed by each size and type and shall be paid for in accordance with 60% of the specifications.**
- **Two-piece and three-piece end sections shall be of lap seam construction, tightly joined with 5/8" diameter galvanized rivets or bolts.**
- **For 60" thru 84" pipes, the reinforced edges of the end sections shall be supplemented with galvanized stiffener angles fastened by 5/8" diameter galvanized bolts and nuts. This requirement shall also be applicable to the end sections for 77"x50", 79"x60", 83"x61", and 81"x56" pipe arch sizes. In addition, for those pipe arch sizes, angle reinforcement shall be used under the center panel seams.**
- **The end section connection details shall be as shown on this plan sheet or of a similar design as recommended by the manufacturer. All similar designs shall provide a secure attachment of the end section to the pipe or pipe arch.**
- **Although a pipe or pipe arch may have a bituminous coating and/or paved invert, it will not be necessary to apply bituminous coating or pave the end section, connectors, or connector section.**
- **The plate extensions shall be the same thickness as the end sections and shall be fastened to the plate with 5/8" diameter galvanized bolts. Length of the plate extension shall be 430" for 12" thru 30" diameter pipes and for pipe arches with rise values up to and including 28". The length shall be 430" (approx.) for larger pipe sizes and 630" (approx.) for larger pipe arches.**

### Typical Cross Section (Pipe and Pipe Arch)

- **Bolted or Riveted Connection**
- **Threaded Rod Connection**

---

**NOTE TO RECONTRACTOR:**

- **END SECTIONS FOR CORRUGATED STEEL PIPES AND PIPE ARCHES**

---

**STANDARD SHEET 083**
NOTES

THIS INLET SHOULD ONLY BE SPECIFIED WHEN ABLATING CONCRETE PAVEMENT

THE FINAL INSTALLED TOP SURFACE OF INLET AND GRATE SHALL BE FLUSH WITH ADJACENT FINISHED SURFACES SUCH AS PAVEMENT, GUTTERS, CURBS, AND SIDEWALKS. TOP OF GRATE ELEVATION, IF SHOWN ON THE PLANS, IS FOR INFORMATION ONLY.

CONSTRUCTION MAY BE CAST-IN-PLACE, PRECAST IN ONE OR MULTIPLE SECTIONS, OR ANY COMBINATION OF CAST-IN-PLACE AND PRECAST.

REBARS ARE TO BE INSTALLED AT THE THIRD POINTS TO CONNECT CURB TO INLET. REBARS ARE NOT REQUIRED IF CURB IS POURED MONOLITHICALLY WITH INLET OR IF TYPE V OR VI MEDIAN IS SPECIFIED ON THE PLANS.

FOR DETAILS OF GRATE SUPPORT BARS, SHALLOW FRAME, AND GRATES (IF REQUIRED), SEE INLET CASTINGS STANDARD SHEET D8E-X. USE OF THE SHALLOW FRAME WILL BE LIMITED TO ROADWAYS CONSTRUCTED OF CONCRETE PAVEMENT, IF Aigail ROADWAY IS BUILT OF HOT MIX ASPHALT PAVEMENT.

THE FRAME AS REQUIRED FOR A TYPE I INLET (STANDARD SHEET D9C) WILL BE REQUIRED.

THE CONTRACTOR MAY, AT HIS OPTION, OMIT USE OF THE FRAME BY FORMING A LEDGE IN THE CONCRETE.

SPECIAL CARE SHALL BE EXERCISED IN FORMING THE 2" WIDE CONCRETE LEDGE TO PROVIDE A SMOOTH EVEN SURFACE FOR SUPPORTING THE GRADES IF THE SHALLOW FRAME IS NOT USED.

NO PROJECTIONS SHALL EXIST ON THE REARING SURFACES OF THE LEDGE OR THE GRADES, AND THE GRADES SHALL SEAT ON THE LEDGE WITHOUT RISKING.

OPTIONAL CONSTRUCTION JOINTS LABLED "C" MAY BE PLACED IN FRONT OF THE LEDGE AS DETAILED HEREIN OR AS APPROVED BY THE ENGINEER. NON-SHRINK GROUT MEETING THE REQUIREMENTS OF SUBSECTION 7.5.3 OF THE SPECIFICATIONS MAY BE USED TO A DEPTH OF 1/2" FOR LEVELING BETWEEN PRECAST SECTIONS. THINNER DEPTHS WILL BE ALLOWED IF AS PER THE MANUFACTURER'S RECOMMENDATIONS.

PC (MINIMUM PIPE COVERAGE) SHALL BE 12" BELOW INLET TOP FOR PIPES PLACED UNDER SIDEWALK OR GRASSED AREA OR 24" BELOW INLET TOP FOR PIPES PLACED UNDER PAVEMENT OR SHOULDERS.

CURB, IF SPECIFIED, MAY BE EITHER CONCRETE PLACED ON THE INLET BACKWALL AS DETAILED HEREIN OR AN APPROVED CURB BOX AS MANUFACTURED WITH THE GRATE AND FRAME. "C" DIMENSIONS OF THE CURB BOX SHALL BE AS DETAILED TO THE STANDARD CURB AS SPECIFIED ON THE PLANS. THE CURB WILL BE PAID FOR PER SECTION 610, IN OTHER CASE.

THIS INLET SHALL NOT BE PLACED IN A PEDESTRIAN CROSS WALK.

THE MINIMUM DISTANCE FROM THE TOP OF ANY PIPE OPENING TO ANY CONSTRUCTION JOINT ABOVE THE OPENING SHALL BE FOUR INCHES.

THE NUMBER AND LOCATION OF PIPE OPENINGS SHALL BE AS SHOWN ON THE PLANS. THE CONTRACTOR AT NO ADDITIONAL COST SHALL BE RESPONSIBLE FOR ANY TEMPORARY BRACING REQUIRED TO TRANSPORT PRECAST INLET SECTIONS DUE TO MULTIPLE OPENINGS.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

CONSTRUCTION STANDARDS DIVISION

STANDARD SHEET D9C-A
NOTES

Optional construction joints labeled "C" may be roughened concrete, keyed or dovetailed as per the typical details shown herein or as approved by the Engineer. Non-shrink grout meeting the requirements of subsection 775.5 of the specifications may be used to a depth of 1/2" for leveling between precast sections. Thicker depths will be allowed if as per the manufacturer's recommendations.

The covering for reinforcing steel shall be two inches, measured from the surface of the concrete to the face of the bar, unless otherwise shown. All reinforcing steel shall be epoxy coated and meet the requirements of section 602 of the specifications.

This inlet shall not be placed in a pedestrian crosswalk.

Construction may be cast-in-place, precast in one or multiple sections, or any combination of cast-in-place and precast.

The minimum distance from the top of any pipe opening to any construction joint above the opening shall be four (4) inches.

The number and location of pipe openings shall be as shown in the plans. The contractor and/or subcontractor shall be responsible for any temporary bracing required to transport precast inlet sections due to multiple openings.

CONSTRUCTION JOINT DETAILS

BILL OF STEEL

<table>
<thead>
<tr>
<th>Item</th>
<th>Size</th>
<th>Bar</th>
<th>No.</th>
<th>Length</th>
<th>Weight</th>
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<td>A1</td>
<td>3/8</td>
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<td>2</td>
<td>3'-0&quot;</td>
<td>6</td>
</tr>
<tr>
<td>A2</td>
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<td>2</td>
<td>2</td>
<td>2'-0&quot;</td>
<td>7</td>
</tr>
<tr>
<td>A3</td>
<td>3/4</td>
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<td>1</td>
<td>2'-0&quot;</td>
<td>6</td>
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<td>5/8</td>
<td>2</td>
<td>2</td>
<td>5'-0&quot;</td>
<td>5</td>
</tr>
<tr>
<td>C</td>
<td>3/4</td>
<td>2</td>
<td>2</td>
<td>5'-0&quot;</td>
<td>5</td>
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<td>D</td>
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<td>1</td>
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<td>1 1/4&quot;</td>
<td>1</td>
<td>1</td>
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</table>

TOTAL 80 LBS.
CONCRETE AND REINFORCING STEEL QUANTITIES

<table>
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<tr>
<th>20 Feet</th>
<th>General Description</th>
<th>Rebar Size</th>
<th>A Bars (Diameter)</th>
<th>B Bars (Diameter)</th>
<th>C Bars (Diameter)</th>
<th>D Bars (Diameter)</th>
<th>E Bars (Diameter)</th>
<th>F Bars (Diameter)</th>
<th>G Bars (Diameter)</th>
<th>H Bars (Diameter)</th>
<th>K Bars (Diameter)</th>
</tr>
</thead>
</table>

*The quantities shown above are for an 8 ft. wide inlet. Additional reinforcers may be required beyond the quantities listed above to meet the needs of the application. The above table to be used for estimating purposes only.*
The final-installed top surface of inlet and grate shall be flush with adjacent finished surfaces such as pavement, gutters, curbs, and sidewalks. Top of grate elevation, if shown on the plans, is for information only.

Construction may be cost-in-place, precast in one or multiple sections, or any combination of cost-in-place and precast.

Type 2 Grate shall be used at locations unless otherwise specified on the Plans. Type 1 Urban Grates shall be used only at specially designated locations as shown on the plans.

The Contractor, at his option, may omit use of the frame by forming a ledge in the concrete.

Special care shall be exercised in forming the 2" wide concrete ledge to provide a smooth, even surface for supporting the grate if the shallow frame is not used. No provisions shall exist on the bearing surfaces of the ledge or the grates, and the grates shall seal on the ledge without rocking.

The Mounding Detals shown is not required when an inlet is placed in a sag.

Optional construction joints labeled "C" may be roughened concrete, keyed or keyed as per the typical details shown herein or as approved by the Engineer. Non-shrink grout meeting the requirements of subsection 715.5 of the specifications may be used to a depth of $\frac{1}{2}"$ for leveling between precast sections. Thicker depths will be allowed as per the manufacturer’s recommendations.

This inlet is to be installed in roadside or median ditches only. It is not to be placed adjacent to pavement or in the gutter pan of combination curb and gutter.

The minimum distance from the top of any pipe opening to any construction joint above the opening shall be four (4) inches.

The number and location of pipe openings shall be as shown on the plans. The contractor at no additional cost, shall be responsible for any temporary bracing required to transport precast inlet sections due to multiple openings.

<table>
<thead>
<tr>
<th>No.</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D (HMin)</th>
<th>E</th>
<th>F</th>
<th>Bars</th>
<th>WT</th>
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<tbody>
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<td>3-7/8</td>
<td>2-6</td>
<td>3-7/8</td>
<td>223</td>
<td>62</td>
<td>3-7/8</td>
<td>15</td>
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<td>2-6</td>
<td>2-6</td>
<td>2-6</td>
<td>3-1/2</td>
<td>2-6</td>
<td>3-1/2</td>
<td>223</td>
<td>62</td>
<td>3-1/2</td>
<td>15</td>
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<td>2-6</td>
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<td>3-7/8</td>
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<td>3-7/8</td>
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<td>2-6</td>
<td>3-7/8</td>
<td>223</td>
<td>62</td>
<td>3-7/8</td>
<td>15</td>
</tr>
</tbody>
</table>

Table Note: Grate and frame weights are for information only and will increase if larger straps and bars are used. The following substitutions in dimensions are acceptable for fabricating the grate and frame:

- Strap Thickness: 1/2"
- Strap Depth: 3"
- Bar Depth: 3"

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
Pavement Design Standards

TYPE G INLET
The final installed top surface of inlet and grate shall be flush with adjacent finished surfaces such as pavement, gutters, curbs, and sidewalks. Top of grate elevation, if shown on the plans, is for information only.

Construction may be cast-in-place, precast in one or multiple sections, or any combination of cast-in-place and precast.

This inlet is intended for use with type V and VI medians (concrete barrier medians) as specified on the plans.

Optional construction joints labeled "C" may be roughened concrete, keyed or doweled as per the typical details shown herein or as approved by the Engineer. Non-shrink grout meeting the requirements of subsection 715.5.5 of the specifications may be used to a depth of 1/2" for leveling between precast sections. Thicker depths will be allowed as per the manufacturer's recommendations.

Grate as shown on Standard Sheet DRI-2K to be used with this inlet.

PC (minimum pipe cover) shall be 12" below inlet top for pipes placed under sidewalk or grassed area or 24" below inlet top for pipes placed under pavement or shoulder.

This inlet shall not be placed in a pedestrian crosswalk.

The minimum distance from the top of any pipe opening to any construction joint above the opening shall be four (4) inches.

The number and location of pipe openings shall be as shown in the plans. The contractor shall be responsible for any temporary bracing required to transport precast inlet sections due to multiple openings.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
HIGHWAY ENGINEERING MANUAL
STANDARD DETAIL

TYPE H INLET

STANDARD SHEET DRI-H
**TYPICAL INSTALLATIONS**

Blown-in Concrete
(Nominal 8.5"

Type 1 or Type 2 Slot

Base

2 Rows of Partitions, Each Side

1.3/-2 Width

**SLOT DETAILS**

Blown-in Concrete
(Nominal 8.5"

Type 1 Slot

Base

1.3/-2 Width

**NOTES**

The contractor may, at his option, but subject to the limitations as noted on this sheet and elsewhere on the plans, install Type 1 or 2 Slots as approved by the Owner.

When specified on the plans, Type 1 Slots shall include expanded steel mesh heald guards locked to the spacer bars.

Gravel shall be omitted from the perforated slot inlet installation when free-draining base is specified and will be placed against the inlet.

When slot heights of 8.5" are specified, the Type 1 Slots may be fabricated by stacking a 2.5" slot on top of a 6" slot. The assembly slot then be joined by minimum 1/4" x 1" fillet welds at 6" centers along each side of the horizontal joint. The resultant slot height may be slightly less than 8.5".

Slot inlet shall not be placed across a pedestrian crosswalk.

**SLOTS NOTES**

**TYPE 1 SLOT**

BEARING BARS AND SPACERS: These elements are to be 3/16" diameter steel suitable to be formed into the slot. The slot shall be installed at an angle of 45° from the vertical. If the slot inlet is placed on a grade and adjacent to a curb or median, the slot inlet is to be installed at the same grade as the adjacent curb or median.

**TYPE 2 SLOT**

GRATE AND CLAMP: These parts are to be hot-dip galvanized mild carbon steel conforming to ASTM A569. Grating, measuring 3" x 4' x 4' deep by 1-3/4" wide, shall extend the full length of each pipe section slot.

REMARKS: The rebars shall be bent to cross the slots, opening on 6" centers, and shall be coated with a non-scaling, non-tarnishing powder.


REMOVABLE FORMS: Forms are to be cellular foam with a wood or plastic cap.

**SLOT INLET**

**STANDARD SHEET DRWS**
SINGLE-GRADE SHALLOW FRAME

SINGLE-GRADE DEEP FRAME (ROUND OR SQUARE BASE)

TILT-BAR GRATE

GRATE SUPPORT BAR
NOTES

Type A Manholes, when specified on the Plans, may be constructed in either a cast-in-place or pre-cast option as shown herein.

Steps, frames, and covers shall be as shown on Standard Sheet DRT-A.

"Keyed" or "dowled" type construction joints acceptable to the Engineer may be used in the construction of concrete manholes.

If the cast-in-place manhole is over twelve feet (12') in depth, the sidewalk below that depth will be double thickness.

Pipe at elevations other than shown may be joined to the manhole by cutting a hole the size of the connecting pipe in the manhole. Inserting the pipe into the manhole shell and closing all openings around the connecting pipe with joint mortar.

Drawing shows pipe entering and leaving manhole in a straight line. However, the pipes may enter or leave at an angle or place as called for or shown on the Plans.

Minimum height of bench wall above flowline of pipe is 25% of the diameter of the pipe.

The use of brick for manhole construction will not be allowed when a manhole is located in the roadway.

The following additional notes are applicable for pre-cast manholes.

Manhole steps shall be placed in plastic concrete wall during manufacture or mortared into holes after the concrete has set.

Sidewalk sections may be used in any combination to produce a manhole of desired depth, except the tapered top section shall be retained as shown.

The tapered top section shall be manufactured and meet all the same requirements as the manhole's sidewalks, but shall conform to the dimensions detailed herein.

Lifting holes in the tapered top section and the circumferential notches in the manhole cover are for handling purposes only.

The pre-cast sidewalk units shall be set in joint mortar or sealed with O-ring gaskets.
**NOTES**

"Keyed" Or "Dowelled" Type Construction Joints, Acceptable To The Engineer, May Be Used In The Construction Of Concrete Manhole.

If Cast-in-Place Manhole Is Over Twelve Feet (12') In Depth, The Sidewalls Below That Depth Will Be Double Thickness.

If Pipe Is At Elevations Other Than Shown May Be Connected To The Manhole By Cutting A Notch Of The Size Of The Connecting Pipe In The Manhole, Inserting The Pipe, The Thickness Of The Manhole Shell And Covering With Opening Around The Connecting Pipe With Joint Mortar.

Either This Manhole Or The Precast Manhole Shall Be Standard Sheet DRT-X. May Be Furnished When Type B Manhole Is Called For In The Contract. The Finish And Grade Shale Be As Shown On Standard Sheet DRT-X. MEX CASTINGS, Steps Shall Be As Shown On Standard Sheet DRT-X.

Minimum Height Of Bench Wall Above Flowline Of Pipe is 25% Of The Diameter Of The Pipe.

The use of brick for manhole construction will not be allowed when a manhole is located in the roadway.

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**COMPLETE STRUCTURE**

- **Invert Channel Or Slant Pipe Some Size At Bottom On Inside Of Sidewalls.**
- **4" Min.**
- **Pipe Size, Type, And Location As Specified On The Plans.**

**SECTION THROUGH FOOTER**

- **Standard Cast Iron, Reinforced Plastic Or Reinforced Corrugated-Rubber Manhole Steps.**

**PLAN VIEWS**

- **Section B-B**
  - **3" Min.**
  - **Field-cast Concrete Footer**
  - **Pre-cast Rein**
  - **Concrete or Brick**
  - **3" Min.**
  - **Concrete or Brick**

- **Section A-A**
  - **3" Min.**
  - **Concrete or Brick**
  - **Concrete or Brick**
  - **3" Min.**
  - **Concrete or Brick**

**CONCRETE BASE**

Optional Precast Or Field-cast (For Use With Storm Sewers Only)
Notes:
- Lining on covers shall be stainless STEEL or SANITARY STEEL as applicable.
- Bottom ribs may be deleted from manhole cover castings.
- The 1/8" raised lugs are a skid resistant measure. Alternative measures will require approval by the Engineer.
- Shop Drawings shall be submitted if details and dimensions vary.
MEDIAN OUTLET IN HIGH FILL
To be used where called for on the plans or as shown on the cross sections.

OUTLET THROUGH BERM
To be used where called for on the plans or as shown on the cross sections.

NOTES
For pipe without corrugations, a one inch layer of fine aggregate for leveling will normally be adequate to achieve a uniform bearing surface. For corrugated pipe, layers shall be 1" minimum for 1/2" depth corrugations, 2" minimum for 1" depth corrugations, and 3" minimum for 2" or 2-1/2" depth corrugations.

TYPICAL PIPE BEDDING
NOTES

Payment for the outlet pipe includes drop connections in the free draining base trench and slopewall or connections to drainage structures as required. Maximum outlet spacing is to be 250' in embankments. Outlets in cut sections will be made to the nearest drainage structure. Slopewall details will be in accordance with Standard DBB (sheet 3 of 4). At vertical sags, one outlet shall be constructed at the low point and additional outlets shall be constructed at 25 feet and 50 feet each way from the low point.

Underdrain pipe as detailed to be 6" diameter non-perforated rigid pipe except for the 5 of pipe placed in the free draining base trench unless otherwise specified in the plans.

All outlets are to be equipped with a Slopewall for Underdrain and Varmint Screen as detailed. Slopewalls will not be paid for separately but shall be included in the cost of the underdrain pipe. Underdrain pipe fitted to inlet or if fastened to culvert pipe by pipe saddle, grouting, cementing, or other means that will provide a secure attachment satisfactory to the engineer shall be included in the cost of the underdrain pipe.

Commercially available galvanized hardware screen is to be snugly fitted inside each Slopewall. The screen is to have the capability of being removed and reinstalled for maintenance operations. The screen wires shall be welded at a spacing in each direction of 3/8" to 3/4". The cost of the screen to be included in the cost of the underdrain pipe or edge drain.

Crossovers shall have outlets coordinated with regular roadway outlets to ensure that spillage shall be free draining.

Typical lateral trench sections shown are possible selections, other configurations may be utilized if depth and width are obtained. Spacing shall be 100' maximum in areas designated as requiring lateral trench.

Lateral trench sections shall be installed at locations as follows:
- Cross Slope = 0.01567: Grade = 4% and above
- Cross Slope = 0.02287: Grade = 5% and above
- Cross Slope = 0.04000: Grade = 6% and above
- Cross Slope = 0.06000 and greater: no trench required
Filter fabric and aggregate for Filter fabric underdrain shall conform to the requirements of Section 606.2 of the Specifications. All coats associated with the 5" perforated underdrain pipe required in the Filter Fabric underdrain installation to be included in the contract price bid for Filter Fabric underdrain.

Underdrain shall generally follow the grade of the pavement where the grade is not less than 1%. A desirable minimum of 1% and an absolute minimum of 0.5% with 18" of cover shall control the placement of underdrain unless otherwise noted on the plans.

The top of the underdrain pipe shall be placed at an elevation equal to the top of the outlet pipe of all inlets or manholes unless otherwise noted on the plans.

Spring Control shall be used where noted on the plans or as directed by the Engineer. Cost of excavation, filter fabric and installation shall be included in the contract price bid for "Crushed Stone, Crushed Gravel, or Silica Sand for Underdrain." Elevations as indicated shall be as shown on the plans or determined in the field.

For pipe top details, see Standard Sheet DBB, Sheet 3 or 4.

All Underdrain outlets are to be equipped with a spilewell for Underdrain and Varmint Screen as detailed on Standard Sheet DBB, 3 of 4 or tied to existing inlets or culvert pipes. Spilewell for underdrain will not be paid for separately but shall be included in the cost of the Underdrain pipe or Filter Fabric underdrain. Underdrain pipe tied to existing inlets or manholes shall be paid for separately. No grouting, cementing, or other means that will provide a secure attachment satisfactory to Engineer shall be paid for separately. All concrete to be cast "B" or "C".

Filter fabric underdrain installation.
1. The type of backfill and repaving of trenches under existing pavement shall be as specified in the plans. If no type is specified, the applicable detail shall be used. When a Type F Trench is specified under an existing roadway, repaving of the pavement section shall be per the applicable detail on this sheet.

2. Asphalt thickness shown here are in addition to any resurfacing which may be included in this project. Trench to be completed before resurfacing.

3. Type of stone to be same as specified for base on this project and payment to be in tons or C.Y, as specified in those items. If such stone is not specified, cost is to be included in the unit price of pipe and stone to meet requirements of Section 307 Class I.

4. Payment for asphalt to be in tons of material specified for the project. If such items are not specified cost is to be included in the unit price of pipe. Asphalt base or patching and leveling may be used.

5. Cost of all labor, materials, and equipment required to complete the work to the surface of the existing pavement in accordance with the applicable detail(s) shall be included in the unit price of the pipe.

6. Where type A trenches are wider than 7' in existing bituminous pavement, concrete may be deleted if existing asphalt thickness and 18' stone are restored.

7. Traffic is to be maintained at all times by the use of appropriate traffic control devices. Use of metal plates, having sufficient rigidity to span trench, is required to prevent wheel loads from being transmitted to the CLSM or concrete. The plates are to be securely anchored to prevent movement caused by traffic. These are to be left in place until the CLSM has attained a 50% of its compressive strength. Cost of such plates is to be included in the unit price bid for pipe.

8. Concrete surface to be rough for bonding of asphalt if area is to be resurfaced. Trench to be completed before resurfacing.

9. Testing of steel bars & dowels is waived; however the Engineer must verify dimensions.

10. Concrete shall be constructed in accordance with Section 501 except that testing is waived if from a Certified Supplier.

11. Dowel bars are to be coated in accordance with Section 709.15 of the specifications.

12. Joint sealers are to be coated in accordance with Section 709.15 of the specifications.
CONCRETE COLLAR DETAIL

<table>
<thead>
<tr>
<th>DIAMETER OF PIPE</th>
<th>A</th>
<th>B</th>
<th>CU. YD. CONC.</th>
<th>DIAMETER OF PIPE</th>
<th>A</th>
<th>B</th>
<th>CU. YD. CONC.</th>
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NOTES:

- A and B are minimum dimensions. Forming will not be required.
- If minimum dimensions are obtained, metal connecting bands may be substituted for a concrete collar to join existing new metal pipes. The cost of metal bands are to be included in the unit bid price for the various pipes.

Concrete for constructing the collar shall be in accordance with Section 715.12 of the specifications; however, testing will not be required. The cost of concrete collar is to be included in the unit bid price of proposed pipe.

**TYPE F DRAINAGE PIPE TRENCH**

**NOTES:**

- CLSM - controlled low strength material.
- This detail shall be used on proposed pipes / culverts when specified on the plans. The cost of the Type F Trench is incidental to the pipe / culvert.
- If a Type F Trench is used where there is no existing or proposed inlet, the CLSM shall be poured full depth 2' past each edge of pavement. The trench will be encaied in 4" of CLSM an additional 10' max, beyond edge of pavement. There is an existing or proposed inlet, the CLSM shall be poured full depth to the inlet.
GUARDRAIL HEIGHT

Transitions in guardrail height must be accomplished at a rate of 1" vertical distance per 12' run (i.e., horizontal distance). Height transitions shall be before and after the posts, or connections, begin.

Height transitions between 28 1/2" and 31" require moving the splice overlaid the post by placing an additional post at half the normal spacing.

Guardrail height shall be as indicated on plans.

Construction tolerances for rail height is plus or minus 1/4".

The Standard Temporary Treatment is acceptable for both 28 1/2" and 31" guardrail heights.

Approach Terminal: Separate approved product lists will be maintained for both 28 1/2" and 31" terminal height.

Guardrail Height to Cut Slope Terminal (AS1) must be transitioned per the standard details shown to 28 1/2" height (the height of the CST). Thru Beam transitions shall be per Standard GR-4 dated 11-15-01 for 28 1/2" and dated 11-21-02 for 31".

NOTES

Guardrail systems on NMS routes must meet NCHRP 350 or the most current AASHTO Manual for Assessing Safety Hardware (MASH) crash testing criteria and have an eligibility letter to be used on NYSM projects.

Guardrail shall be secured to the blocks, post, and other elements by 5/8" dia. bolts and nuts conforming to the details herein and to the requirements of TGL-4 of the Standard Specifications. Nuts shall conform to ASTM A456, Grade A or better.

Approach and Terminal End Treatments shall be as shown or specified on the Plans or directed by the Engineer.

The top quality of guardrail will be the Linear Foot of guardrail measured along the face of the rail from center to center of end posts. Cost of the Terminal Section Buffer End shall be included in the cost of the Guardrail.

The approach slope of the end guardrail shall be 1:6:1 or flatter.

The Type, Class and Height of Guardrail shall be as shown on the Plans, or as directed by the Engineer. City, in Direction of Traffic.

GUARDRAIL ELEMENTS

(Sheet 1 of 2)

STANDARD SHEET GM
**GUARDRAIL ELEMENTS**

**SECTION RAIL ELEMENT**

- **NUT**: SLEAVE BOLT
- **HEIGHT**: 5/8"
- **Button Head**: 1-5/16" Dia. Round x 5/16"

**BASE WIDTH Nominal Thickness 0.105"**

**BASE WIDTH Tolerance**: ±1/16"

**1-1/4" Symmetrical About Q**

**2-3/16" 1-1/16" 0-3/16"**

**29/32" x 1-1/8" 5/32""

**RAIL SPlice - 28 1/2" HEIGHT ON POST**

Eight (8) Splice Bolts are to be used on all Rail Splices

**RAIL SPlice - 21" HEIGHT OFF POST**

Eight (8) Splice Bolts are to be used on all Rail Splices

**TERMINAL SECTION BUFFER END**

- **Top Hole**: 1-1/2" Dia. Round x 6-1/4"
- **2-1/4" Dia. Round x 24"**
- **Splice Bolt**: 3/4" x 29/32"

**BASE METAL Nominal Thickness 0.105"**

**Ground Line or Shoulder Surfacing at Face of Rail**

**End Post**

**WEST VIRGINIA DEPARTMENT OF TRANSPORTATION**

**DEPARTMENT OF HIGHWAYS**

**STANDARD SHEET GRI**
NOTES

The blocks shall be bolted to the steel posts in the same manner when the beams are at the same elevation as they would when the beams are at different elevations.

The standard bolt shall be used for wood guardrailpost when possible.

The applicable details and notes of Standard Sheet GR2 shall apply to this sheet.

When a wood block is used adjacent to a wood post, the block shall be notched to the post with a galvanized steel Post common rail. The rails to be driven in the center of the top or bottom of the block.

Round Wood Posts shall not be used on WVDOT Projects after 12-31-2017.
NOTES

1. FOR FILL TO CUT GUARDRAIL TERMINALS (TRAILING END, TWO LANE HIGHWAYS) ALL AT THE END WHERE INCLUDING USES AS SPECIFIED, THE DETAILS AND REQUIREMENTS SHOWN IN SHEET 4A AND 4B WILL BE APPLICABLE.

2. PRIOR TO PLACING GUARDRAIL, A FINAL CHECK OF EXISTING CONDITIONS WILL BE MADE BY THE ENGINEER AND ANY ADJUSTMENTS NECESSARY TO INSURE THE PROPER LOCATION AND FUNCTIONING OF THE GUARDRAIL FOR THE PURPOSE FOR WHICH IT IS INTENDED WILL BE MADE ACCORDINGLY.

3. POSTS, BLOCKS AND RAIL ELEMENTS SHALL BE THE SAME TYPES USED IN THE NORMAL GUARDRAIL INSTALLATION. GUARDRAIL BLOCKS SHALL NOT BE USED ON ANY POSTS COMPLETELY UNDERGROUND.

4. THE FINAL DECISION AS TO THE TYPE OF CUT SLOPE TERMINAL INSTALLATION TO BE USED ON EACH SEGMENT WILL BE BASED ON ACTUAL CONDITIONS ENCOUNTERED. CUT SLOPE TERMINAL INSTALLATION CAN INTERFERE WITH NORMAL DRAINAGE THROUGH A CUT SECTION. WHEN THIS OCCURS, DETAILS FOR MAINTAINING POSITIVE DRAINAGE WILL BE SHOWN ON THE PROJECT PLANS.

5. WHEN INSTALLING CST TERMINAL TO THE TOP OF CUT SLOPE GUARDRAIL, THE CUT SHALL BE INSTALLED AT 28-1/2" HEIGHT. TAPER 31" GUARDRAIL DOWN VERTICALLY PRIOR TO CST INSTALLATION.

6. THE CUT SLOPE TERMINAL SHOULD BE USED ONLY WHEN MOUNT GUARDRAIL.

7. THE FLARE RATE OF THE GUARDRAIL MAY BE STEEPENED TO 8:1 AFTER CROSSING AT A MINIMUM.

8. WHEN INSTALLING CST TERMINAL INTO THE TOP OF RAIL GUARDRAIL, THE CUT SHALL BE INSTALLED AT 28-1/2" HEIGHT. TAPER 31" GUARDRAIL DOWN VERTICALLY PRIOR TO CST INSTALLATION.

9. THE CST GUARDRAIL TERMINAL SHOULD BE USED ONLY WITH 2:1 OR STEEPER BACK SLOPE.

10. THE PLANES OF THE GUARDRAIL MAY BE STEEPENED TO 8:1 AFTER CROSSING THE CUT SECTION TO SHORTEN THE LENGTH OF THE TERMINAL.

11. PRIOR TO EXTENDING POST 2, THROUGH ENTRANCE OF CUT, TOP TO POST 2 AT 8:1.

12. FOR THE RUB RAIL SECTION USE 8' LONG POSTS.

13. SEE SHEET 4A AND 4B FOR DETAILS OF TYPE A AND TYPE B TERMINALS.

14. SEE SHEET 4A AND 4B FOR DETAILS OF TYPE A AND TYPE B TERMINALS.

15. MAXIMUM CLEARANCE FROM BOTTOM OF W-BEAM TO GROUND LINE RANKING W-BEAM RUBRAIL IS 18".

16. MAXIMUM CLEARANCE FROM BOTTOM OF RUBRAIL TO GROUND LINE RANKING W-BEAM RUBRAIL IS 18".

17. THE CST GUARDRAIL TERMINAL SHOULD BE USED ONLY WITH 2:1 OR STEEPER BACK SLOPE.

18. THE CST GUARDRAIL TERMINAL SHOULD BE USED ONLY WITH 2:1 OR STEEPER BACK SLOPE.

19. THE CST GUARDRAIL TERMINAL SHOULD BE USED ONLY WITH 2:1 OR STEEPER BACK SLOPE.

20. THE CST GUARDRAIL TERMINAL SHOULD BE USED ONLY WITH 2:1 OR STEEPER BACK SLOPE.

21. THE CST GUARDRAIL TERMINAL SHOULD BE USED ONLY WITH 2:1 OR STEEPER BACK SLOPE.

22. THE CST GUARDRAIL TERMINAL SHOULD BE USED ONLY WITH 2:1 OR STEEPER BACK SLOPE.

23. THE CST GUARDRAIL TERMINAL SHOULD BE USED ONLY WITH 2:1 OR STEEPER BACK SLOPE.

24. THE CST GUARDRAIL TERMINAL SHOULD BE USED ONLY WITH 2:1 OR STEEPER BACK SLOPE.
NOTES:
1. USE 1/2 INCH STEEL PLATE MEETING REQUIREMENTS OF ASTM A 36.
2. GALVANIZING REQUIRED FOR PLATE AND HARDWARE.
3. USE ZINC RICH PAINT TO COAT FIELD DRILLED HOLES.

GENERAL NOTES:
 TYPE A (SOFT SHALE OR SOIL) CUT SLOPE TERMINAL GUARDRAIL SHALL BE THAT GUARDRAIL WHICH IS TO EXTEND A MINIMUM OF TWO 6'-3" SPANS INTO THE CUT SLOPE FROM THE FIRST POST BEYOND THE TOE OF THE CUT SLOPE AND IS TO TERMINATE A MINIMUM OF 1'-0" BELOW THE GROUND ELEVATION OF THE BACK SLOPE, EXCEPT IN AREAS OF HEAVY ROCK OUTCROPPING WHERE THE MINIMUM DEPTH MAY BE 6 INCHES. 

A TRENCH NO GREATER THAN 18" IN WIDTH SHALL BE EXCAVATED INTO THE CUT SLOPE TO ACCOMMODATE THE TYPE A TERMINAL INSTALLATION. THE CONTRACTOR SHALL ARRANGE AND WORK SEQUENCE SUCH THAT EACH TYPE A CUT SLOPE TERMINAL INSTALLATION BE (EXCAVATED), POSTS DRIVEN, RAIL ELEMENTS AND GUARDRAIL COMPONENTS ASSEMBLED, TRENCH BACKFILLED, AND DISTURBED SLOPE SHAPED SEEDED AND MULCHED ALL IN A CONTINUOUS OPERATION.
Type B (Shale or Rock) Cut Slope Terminal Installation shall consist of anchoring the guardrail against the face of the cut slope utilizing guardrail and shale and rock bolts, as detailed herein.
PARABOLIC LAYOUT PLAN

NOTES

For details of Flared End Terminal see approved shop drawings.

All materials used shall meet the applicable requirements of Section 627 of the Standard Specifications Road and Bridges.

The offset dimensions are given to the center of the traffic face of the postblock except at the post, where the dimension is to the center of the traffic face of the post. Offset points are to be located by measurements of the back of rail at the nominal post spacing shown on pre-approved shop drawings. Posts are to be set approximately radial to the rail at each location.

Yellow reflective sheeting shall cover the entire nose of those terminals with a flat impact head. Those terminals with a rounded impact head shall be covered with a 3" x 3" yellow reflective sheet.

As of 11-13-12 revision date, the detail is obsolete and no longer used for new construction.
FLARED END TERMINAL
STRAIGHT LAYOUT

NOTES

Flared End Terminal shall meet MCIP-350 and/or leak testing for appropriate height.
Separate Approved Product Lists shall be maintained for both 28 1/2" and 21" terminal heights.
For details of Flared End Terminale pre-approved shop drawings:
Post and splice locations are per manufacturer.
At materials used shall meet the applicable requirements of Section 607 of the Standard Specifications Road and Bridges.
The post offset dimensions are given in the center of the traffic face of the base cover, except at the first post, where the dimension is to the center of the traffic face of the post. Offset points are to be located by measurements at the back of sidewalk to the nominal post spacings shown on pre-approved shop drawings. Posts are to be set approximately radial to the curbing at each location.
When a wood block is used adjacent to a wood post, the block shall be nailed to the post with a 2½" or 3½" common nail. Nails to be driven into the center of the top or bottom of the block.

The cost of manufacturing and installing the Flared End Terminal, complete with all miscellaneous hardware and parts as detailed on the pre-approved shop drawings, is to be included in the unit price bid for "Flared End Terminal".
Yellow reflective sheeting shall cover the entire nose of those terminals with a 1-foot impact head. Those terminals with a rounded impact head shall be covered with a 1½" x 3¼" yellow reflective sheet.

West Virginia Department of Transportation
STANDARD SHEET GRS
TANGENT END TERMINAL

NOTES:

Tangent End Terminal shall meet NCHRP-350 and/or Walsh testing for appropriate height. Separate Approved Product Lists will be maintained for both 28 1/2" and 31" terminal heights.

Post and splice locations are per manufacturer.

For details of Tangent End Terminal, see pre-approved shop drawings.

All materials used shall meet the applicable requirements of Section 607 of the Standard Specifications for Roads and Bridges.

The wood block shall be painted with a 2-3" high white line.

The Tangent End Terminal shall maintain a 4" minimum offset from the edge of the impact head to the edge of the traveled way, for new or existing shoulders that have an offset of 5" or less from the edge of the traveled way, the road (and median) may be reduced from the meander face of rail. The offset distance shall be 1" at a taper rate of 25:1; 3" at a taper rate of 3:1 or a taper rate of 5:1 for a total flare length of 6-1/2". See Flare Detail.

Rail stem panel lengths shall be 25" only. Shorter lengths shall not be used.

The cost of furnishing and installing the Tangent End Terminal, complete with all miscellaneous hardware and parts as detailed on the pre-approved shop drawings, is to be included in the unit price bid for "Tangent End Terminal".

Yellow reflective sheeting shall cover the entire nose of those terminals with a flat impact head. Those terminals with a rounded impact head shall be covered with a 2'-0" x 3'-0" yellow reflective sheet.
These guardrail details are appropriate for connection to a vertical-concrete shape and should not be connected directly to a concrete-slab shape. Concrete-slab shape bridge rails or barriers shall be transitioned to a vertical shape at the guardrail connection in a manner detailed elsewhere in the Project Plans.

Although these details may appear to guardrail-to-bridge transitions and connections, they actually apply to guardrail-to-guardrail transitions and connections to concrete barriers, concrete rigid walls or other structures as specified and detailed on the Project Plans.

These details are not required for transitioning guardrails to a bridge when the guardrail is located on the railing and at a divided highway bridge. Normal guardrail details shall apply.

Installation shall be performed in such a manner as to maintain the rail elements (top w-beam parallel) to the roadway centerline throughout the length of the 18'-0" transition for both designs.

Posts A, B, C, D require an additional hole to attach bottom blocks and bottom beams. For wood post design, the bottom beam wood block shall be centered and attached with 1/2" diameter post bolts. For steel post design, the bottom beam wood blocks shall be offset drilled to sit squarely on the post flange and attached with 1/2" diameter bolts.

For both transitions, the sixth post from the vertical-concrete wall shall require an additional hole on the back face of the post to attach the bottom w-beam with 1/2" diameter bolts.

The rubber (bottom w-beam) may be shop bent for approximately the last three feet to facilitate installation.

A, B, C, and D posts and blocks shall be bolted to the top rail elements however, posts and blocks shall be bolted and carefully erected to provide firm contact of the blocks against the top rails of these posts.

Back holes in all sections shall be shop fabricated.

These details are for transitioning 0.3" post spacing guardrail to a vertical-concrete shape when transitioning 0.3" post spacing guardrail to a vertical-concrete shape, the 25' of rail prior to this 18'-0" transition shall be 0.3" post spacing.

There is no separate pay item for the connection and all components as detailed herein shall be included in the contract price for guardrail.
Two sections of W-beam
one set inside the other
58" carriage bolt, nut and washer

SECTION A-A

7'-10 38"
5'

24" H.S. hex bolts
with 1/4" bearing plate
5 spaces @ 1'-6 3/4"
4 spaces @ 3'-1 1/2"

SECTION B-B

W6 x 9.0 steel post
and block

1 - 10 38"
Slope = 50:1
or flatter

RUBRAIL
WOOD BLOCKS
7' X 4'

POST | THICKNESS
--- | ---
1 | 4 1/2"
2 | 3 1/2"
3 | 2"
4 | 1"

NOTES
1. This guardrail transition is appropriate for connection to a concrete safety shape.
2. Bridge rail ends and bridge parapets must be of adequate strength to accept full impact loading.
3. Posts 1-4 require an additional hole to attach lower block and rubber rail.
4. Rubberrail wood blocks located on posts 1 through 4 are offset drilled and secured with 58" carriage bolts to posts 2 and 4; rubberrail and posts of posts 1, 3, and 5.
5. W-beam is not bolted to posts at posts 2 through 4 and posts 6 and 8.
6. Stud spacer tube, schedule 40 galvanized pipe, 6" 0.031 x 9", and attached by a 58" carriage bolt and rectangular plate washer.
7. See sheet 3 of 3 for detail. Block is attached by 36" x 3" bolt.
8. There is no separate pay item for this connection.

Guardrail End Shoe

58" Dia. Block Bolt,
2" Long, with Circular Washer
Block is Attached By
A 3/8" Bolt

ELEVATION

RECTANGULAR PLATE WASHER DETAIL

1 3/4" 1/16" x 1" Slotted Hole
28" 3/16" (approximate base metal thickness)
This guardrail transition is appropriate for connection to a vertical concrete shape and should not be connected directly to a concrete safety shape. Concrete safety shape guardrails or barriers shall be transitioned to a vertical shape at the guardrail connection in a manner detailed elsewhere in the Project Plans. The two sections of 12'-6" thrie beam require additional holes in order to mount the beam to the post nearest to the concrete wall. See Sheet GR 11-C for details not shown on this sheet.

Guardrail systems must have met either the NCHRP 350 or the most current AASHTO Method for Assessing Safety Mechanism (AASAM) crash testing criteria and have an FHWA eligibility letter to be used on WVDOH projects. Only FHWA approved guardrail systems utilizing wood or approved block-outs shown on the Division's "Approved Source/Product Listing" shall be used. Steel "W" Shapes shall not be used for block-outs. Only one type of block shall be used for block-outs throughout any project, unless otherwise specified.

**Notes:**
- See Sheet GR 11-C for details not shown on this sheet.
- Guardrail systems must have met either the NCHRP 350 or the most current AASHTO Method for Assessing Safety Mechanism crash testing criteria and have an FHWA eligibility letter to be used on WVDOH projects. Only FHWA approved guardrail systems utilizing wood or approved block-outs shown on the Division's "Approved Source/Product Listing" shall be used. Steel "W" Shapes shall not be used for block-outs. Only one type of block shall be used for block-outs throughout any project, unless otherwise specified.
Plan

25' THRIE BEAM TRANSITION

END THRIE BEAM

3/8" H.S. HEX THROUGH BOLTS
WITH 5/8" BEARING PLATE

THRIE BEAM TERMINAL CONNECTOR

CONCRETE WALL TRANSITION

AS DETAILED ELSEWHERE

THRIE BEAM TERMINAL CONNECTOR

DOUBLE NUT

6" DEEP BLOCKOUT

SHAPE AT THE GUARDRAIL CONNECTION
IN A MANNER DIRECTLY TO A CONCRETE SAFETY SHAPE. CONCRETE SAFETY SHAPE RAILS OR BARRIERS SHALL BE TRANSITIONED TO A VERTICAL SHAPE AT THE GUARDRAIL CONNECTION ON A MANNER DETAILLED ELSEWHERE IN THE PROJECT PLANS.

THE TWO SECTIONS OF 12' 6" THRIE BEAM REQUIRE ADDITIONAL SLOTTED HOLES IN ORDER TO MOUNT THE BEAM TO THE POST NEAREST TO THE CONCRETE WALL.

ONLY BLOCK-OUTS SHOWN ON THE DIVISION’S “APPROVED SOURCE/PRODUCT LISTING” SHALL BE USED. STEEL "W" SHAPES SHALL NOT BE USED FOR BLOCK-OUTS. ONLY ONE TYPE OF BLOCK SHALL BE USED THROUGHOUT ANY PROJECT, UNLESS OTHERWISE SPECIFIED.

SEE SHEET GR II-C FOR DETAILS NOT SHOWN ON THIS SHEET.
Standard Detail GR 12 dated 7-1-99 shall not be used on WVDOH Projects let after 12-31-2017.

NOTES

Height of the median, dimension "H", shall be included in the Plan.

Additional heights of median, dimension "C" shall be specified.

The contractor shall have the option to install either the N-J Shape or the F-Shape median unless otherwise specified in the Plan.

For additional dimensions, notes and details, see Sheet 1 and 3.

**TABLE 1: TYPE V MEDIAN - N-J SHAPE Dimensions**

<table>
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<th>Dimension</th>
<th>Type I</th>
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<th>Type III</th>
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<tr>
<td>&quot;D&quot;</td>
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</table>

N-J SHAPE

(Affected to Bituminous Paving)

(Affected to Concrete Paving)
Standard Detail GR 12 with revision date 11-13-12 shall not be used on WVDOH Projects after 12-31-2017.
Standard Detail GR 12 dated 7-1-99 shall not be used on WVDOH Projects after 12-31-2017.
**DETAIL FOR 16" BLOCKOUT DEPTH**

- It is acceptable to use blockouts up to 16" deep to increase the post offset to avoid underground obstacles. There is no limit to the number of posts that can have additional blockouts up to 16" deep.

**DETAIL FOR 36" BLOCKOUT DEPTH**

- Under special circumstances, such as avoiding obstacles that are not relocated, it is acceptable to install additional blockouts to obtain up to 36" depth for one or two consecutive posts in a section of guardrail.

- Do not use 16" or 36" blockouts if it causes the post to be driven beyond shoulder hinge point or causes a fixed object to be within the deflection distance of the barrier.

**METHODS OF REDUCING W-BEAM DEFLECTION**

- Reduce post spacing to 3'-1 1/2".
- Reduce post spacing to 1'-6 1/2".
- Double nest rail element.
- Any one stiffening method shall not exceed 25" in length.
- Any combination of stiffening methods shall not exceed 50" in length.
POST DRIVING FOR CONTINUOUS TRANSVERSE UNDERGROUND OBSTRUCTION

PLAN

75' Min. Length Standard Guardrail

25'-0" Max. Span

6'-3"

SYSTEM POST

CRT POST

Std. Splice Connection (As needed) Bolt W-Beams Together

ELEVATION

OMITTING MULTIPLE POSTS FOR UNDERGROUND OBSTRUCTION

Only those posts conflicting with the obstacle shall be eliminated.
A maximum of three posts may be eliminated within 25'-0" span of W-Beam guardrail.
NOTES

PERMANENT CONCRETE BARRIER MAY BE CONSTRUCTED IN SECTIONS AS SHOWN HEREIN AND SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE APPLICABLE PROVISIONS OF SECTION 610 OF THE STANDARD SPECIFICATIONS.

EXPANSION JOINTS SHALL BE PLACED IN THE MEDIAN BARRIER AT 20FT INTERVALS ALONG THE LENGTH OF THE MEDIAN.

THE FINISHED SURFACE OF THE MEDIAN BARRIER SHALL BE SMOOTH, DENSE, UNPITTED AND FREE FROM AIR BUBBLE POCKETS, DEPRESSIONS, AND HONEYCOMB. IF DEEMED NECESSARY BY THE ENGINEER, THE ABOVE MENTIONED FINISHED SURFACE WILL BE OBTAINED BY THE USE OF WATER AND A WOOD BLOCK OR CARBORUNDUM BRICK.

UNLESS OTHERWISE SPECIFIED, BI-DIRECTIONAL DELINATORS, MEETING THE REQUIREMENTS OF THE SECTION 661 OF THE STANDARD SPECIFICATIONS AND MOUNTED ON SUITABLE SUPPORTS SHALL BE SECURED TO, AND SPACED ALONG THE LENGTH OF, MEDIAN BARRIER AS SHOWN AND SPECIFIED ON STANDARD SHEET TE 11-S OF THE STANDARD DETAILS BOOK, VOLUME II.

ANY BARRIER CONSTRUCTED FOR BIFURCATION SHALL MAINTAIN THE SLOPE RATIO ON THE VERTICAL FACE.

MATERIAL PROPERTIES

CONC. BARRIER f'c = 4,000 psi
ALL REBAR = GRADE 60
GROUT = 4,000 psi MIN.

STANDARD DETAIL

DIVISION OF HIGHWAYS
WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

REVISION DATE
PREPARED 12-15-17

SHEET 2 OF 2
SEE DETAIL A-A SHEET 1 OF 2

DETAIL A
SINGLE SLOPE
CONCRETE BARRIER
PLAN - DETAIL A-A

ELEVATION - DETAIL A-A

REINFORCEMENT NOTES:

SEE ACI DETAILING MANUAL FOR STANDARD HOOK DIMENSIONS. ALL DIMENSIONS ARE OUT TO OUT.

FIGURES IN CIRCLES SHOW BAR TYPES.

DIMENSION OR 180 DEGREE HOOKS TO BE SHOWN ONLY WHERE NECESSARY TO RESTRICT HOOK SIZE, OTHERWISE STANDARD HOOKS ARE TO BE USED.

REBAR QUANTITIES BASED ON EACH 20FT SECTION OF MEDIAN BARRIER

PREFIXES

B = BARRIER

* ANY BARRIER CONSTRUCTED FOR BIFURCATION
SMAHL MAINTAIN THE SLOPE RATIO ON THE VERTICAL FACE

BAR TYPES
TYPICAL HOOK BOLT DETAILS
TYPE E JOINTS

PAVEMENT SECTION

ALTERNATE HOOK BOLT

See Alternate Hook Bolt for Slip-Form Paving

45°Countersink
1/16” Deep

TRAPEZOIDAL KEY
(J Bolt Shown)

ALTERNATE (HALF-ROUND) KEY
(Alternate Hook Bolt Shown)

PAVEMENT SECTION

NOTES

Tie bolts shall meet the requirements of Section 709.1 of the Specifications.

Tie bolts shall be placed on 30” centers max., placed longitudinally on 30” centers (max.), and centered across the joint or pavement edger may be used in place of the bolt assemblies. The longitudinal tie bolt assembly for slip-form paving shall consist of one sleeve nut, one 8” long hook bolt or J bolt, and 15” long alternate hook bolt. As an initial step in installing this assembly, the 12” long alternate hook bolt with sleeve nut attached, shall be positioned in the proper location in the pavement by appropriate slip-form paving equipment.

Typical tie bolt assemblies are shown herein. Minor variations in details and dimensional tolerances are permitted, however, minimum values specified herein shall be complied with.

All tie bars and Tie Bolt Assemblies shall be epoxy coated in accordance with Section 706.1 of the Standard Specifications.
MEDIAN BARRIER EXPANSION JOINT DETAILS

SECTION B-B
Concrete Transition Pavement with 2" Bluminous Overlay

SECTION D-D
Concrete Median
Gutter
Bridge Structure

SECTION A-A
Joint thru Median
Concrete Subbase
Concrete Curb
Concrete Shoulder

SECTION C-C
Joint thru Concrete Curb and Gutter
Concrete Shoulder
Concrete Curb and Gutter
Optional Construction Joint

SECTION F-F
Concrete Pavement
Concrete Shoulder

SECTION H-H
Concrete Pavement
Concrete Shoulder

SECTION E-E
Joint thru Concrete Shoulder
(With Concrete Curb)

SECTION G-G
Joint thru Concrete Shoulder
(Without Concrete Curb)

SECTION J-J
Concrete Transition Pavement
Concrete Pavement

NOTE:
The appropriate details and notes of Standard Sheet PV15 (Sheet 1 of 2) shall apply to the Standard Sheet.

The cost of the extension of the bridge approach expansion joints through concrete shoulders, concrete medians, curbs, and gullies shall be included in the cost of the joints per each.

The cost of forming the 15' straight-line flares in the median barrier shall be included in the unit price bid for the median barrier.

Concrete paved shoulders, adjacent to bridge transition pavement and receiving the 2" bluminous overlay, shall be built in accordance with normal concrete shoulder construction, except as with the bridge transition pavement, the final finish requirements are waived, the concrete paved shoulder joints need not be sealed, the bluminous curing sealant/ or lock cost requirements are waived and alternate curing materials - such as necessary, and the 3'-3" wide strip of shoulder at the joint shall be included in the cost of the bridge approach expansion joint. Also, where the concrete shoulders are overlaid, the rumble strip (joggle bar) requirements are waived.
CONCRETE CURBING AND SIDEWALK

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DEPARTMENT OF HIGHWAYS
STANDARD DETAIL

NOTES:
For all concrete curbing, the face of the curbing shall be offset a minimum of two feet from the edge of traffic lane, unless otherwise shown on the Plans.

Construction of concrete curbing shall be by the "Separate Method" when sawed joints are constructed in the pavement.

All curb joints shall be made by acceptable forming methods.

For combination concrete curbs and gutters, the slope of the 2" wide concrete gutter shall conform to the pavement slope or as otherwise specified on the Plans.
**NOTES**

The standard curb taper, class I shall be used at the end of all plans concrete curbing, unless otherwise called for on the plans.

The standard curb taper, class I shall be used at the end of all combination curb and gutter, and all integral concrete curbing, unless otherwise called for on the plans.

The details as shown for sidewalk and curb treatment at driveways are to be utilized unless otherwise called for on the plans.

Section B-B details additional depth of sidewalk at driveways and section D-D details standard depth sidewalk.

Seawalls with shall be exclusive of curb width shall be 5' unless otherwise shown on plans.

Seawalls cross slope of 2:1 is absolute maximum. There is no construction tolerance for increased cross slope past 2:1.

Seawalls less than 5' in width shall have a 5' x 5' passing space at intervals of 200' or less.

**SIDEWALK AND CURB TREATMENT AT DRIVEWAYS**

- 6"PCC pavement or per driveway typ.
- 6"aggregate base, 4" free draining base or per driveway typ.

**SECTION A-A**
- Type I Curbing
- Transition
- Type N' Curbing

**SECTION B-B**
- Type S Curbing
- Match sidewalk width

**SECTION C-C**
- Match sidewalk width

**SECTION D-D**
- Standard curb
- Conc. Sidewalk
- Bed course

**SIDEWALK TYPICAL**

1. Concrete Sidewalk Item 609001 S.Y.
2. Bed course material Item 609002 C.Y.
NOTES
RAMP CONCRETE SHALL MEET THE REQUIREMENTS OF SECTION 600 OF THE SPECIFICATIONS. RAMP SURFACE SHALL INCLUDE A "DETECTABLE WARNING SURFACE" CODE PVT. SHOT 3 OR 5 AS SHOWN FOR EACH RAMP TYPE. A CURB DUMP FROM TRANSVERSE TO FLARE SLICES, OR EQUAL, MAY BE REQUIRED ON CONCRETE SURFACES.

NORMAL GUTTER FOR USE AND MAINTENANCE SHALL BE INSERTED THROUGH THE RAMP AREA, UNLESS OTHERWISE SHOWN OR SPECIFIED.


DRAINAGE STRUCTURES SHALL NOT BE INSERTED IN LINE WITH RAMPS.

LOCATION OF THE RAMP SHALL BE PERPENDICULAR TO THE IDENTITY OF CONSTRUCTION OF NEW RAMPS. ANY CHANGE IN PEDESTRIAN AREAS SHALL HAVE OPENINGS NOT GREATER THAN 10" AND SHALL BE INSERTED WITH LOAD DECK OF OPENING PERPENDICULAR TO THE DIRECTION OF PEDESTRIAN TRAVEL.

IF THE 8.33:1 D/E RATIO CANNOT BE OBTAINED DUE TO GRADE OF THE ADEQUATE WAY, THE SLOPED PORTION OF THE RAMP SHALL BE EXTENDED TO A MAXIMUM LENGTH OF 10'-0".

A TURNING SPACE AS DEPICTED IN THE DETAIL IS TO BE PROVIDED AT RAMP-TOP OF APPROPRIATE CURVE RAMPS. THE TURNING SPACE SHALL HAVE A MINIMUM WIDTH OF 4 FT. WHEN NO OBSTRUCTIONS EXIST AT THE FOOT OF THE RAMPS, SUCH AS A BUILDING, POLE, ETC. THE MINIMUM WIDTH OF THE TURNING SPACE SHALL BE 5 FEET.

CURB RAMPS MAY BE INSERTED PERPENDICULAR TO THE DIRECTION OF PEDESTRIAN TRAVEL.

TYPICAL SEPARATION WIDTH 6'-0", MINIMUM WIDTH 4'-0".

THE TYPE OF RAMP TO BE USED SHALL BE AS SHOWN ON THE PLANS.

THE FOLLOWING CAN BE CONSIDERED GUIDELINES IN SELECTING RAMPS TYPES, BUT ARE INCLUDED HERE FOR INFORMATION ONLY.

RAMP TYPES

TYPE A: 1. FOR USE WHERE SEPARATION EXTENDS TO STREET AND WHERE SEPARATION HORIZONTAL TO THE STREET AND TURNOVER SPACE.

TYPE B: 1. RAMPS MAY ONLY BE USED ON ALTERNATION PROJECTS. WHERE THE SEPARATE CURVE RAMPS ARE NOT REQUIRED, THE TYPE B RAMPS ARE NOT REQUIRED.

TYPE B: 1. PARALLEL RAMPS ARE FOR USE WHERE SEPARATE SEPARATION HORIZONTAL TO THE STREET AND TURNOVER SPACE CAN BE PROVIDED.

TYPE B: 1. PARALLEL RAMPS ARE FOR USE WHERE SEPARATE SEPARATION HORIZONTAL TO THE STREET AND TURNOVER SPACE CAN BE PROVIDED.

TYPE C: 1. COVERS ASPECTS OF TYPE B AND TYPE C RAMPS AS REQUIRED. THE CURB UNNECESSARY TO BE INSERTED WHERE THE STREET AND A CURB IS INSERTED ON THE STREET.

FOR DETECTABLE WARNING SURFACE

NOTES SEE PVT. SHOT 3 OR 5 AS SHOWN.

SIDEWALK RAMPS

(SHEET 1 OF 3)
**Type III Ramps at Intersection**

1. **Type III**
   - Non-walk surface
   - Concrete curb
   - Ramp turning space width 5'-0" typ.
   - Curb and gutter or plain curb
   - Crosswalk

2. **Type IIIA**
   - Non-walk surface
   - Concrete curb
   - Ramp turning space width 5'-2" typ.
   - Curb and gutter or plain curb
   - Crosswalk

3. **Type IIIB**
   - Non-walk surface
   - Concrete curb
   - Depressed curb
   - Crosswalk
   - Curb and gutter or curb & gutter

---

**Notes**

- Curb may not be required when wall or building is present.
- Pay limits for curb ramps.
- Curb ramps require a 14'-0" minimum turning space with a minimum cross slope and longitudinal slope of 2.0%.
- Where pedestrian pavement turning angles are not noted, see note regarding obstruction on Sheet 1 of 3 and slope to drain to curb.

---

**Department of Transportation**

**Sidewalk Ramps**

(Sheet 2 of 3)

*(Not to scale)*
NOTES

THE APPROPRIATE DETAILS AND NOTES OF STANDARD SHEET PVT 77, SHEETS 1 AND 2 SHALL APPLY TO THIS STANDARD SHEET.

DETECTABLE WARNING SURFACES SHALL EXTEND ACROSS THE FULL WIDTH OF THE CURB RAMP, LANDING OR TRANSITION.

DOVES SHALL BE ARRANGED IN THE PREDOMINANT DIRECTION OF THE CURB RAMP.

DESIGN AND PLACEMENT OF DETECTABLE WARNING SYSTEMS SHALL BE IN ACCORDANCE WITH SECTION 609 OF THE SPECIFICATIONS AND THE PUBLIC RIGHTS OF WAY ACCESSIBILITY GUIDELINES (PSWG).

DETECTABLE WARNING SURFACE

**TYPE I RAMP AND TYPE IV RAMP SHOWN AT INTERSECTION**

1. **TYPE IV RAMP**
   - RAMP TURNING SPACE WIDTH: 5'-0" TYP.
   - SIDEWALK AREA
   - CONCRETE CURB
   - DETECTABLE WARNING SURFACE (TYP.)
   - CURB RAMP
   - TYPE IV RAMP

2. **SIDEWALK RAMPS**
   - PAY LIMITS FOR CURB RAMPS

3. **NOTE**
   - 0.33% MAX. RAMP SLOPE INCLUDING CONSTRUCTION TOLERANCE.
   - CROSS SLOPE 2.00% MAX. INCLUDING CONSTRUCTION TOLERANCE.
   - CURB RAMPS REQUIRE A 4'-0" MINIMUM TURNING SPACE WITH A MAXIMUM CROSS SLOPE AND LONGITUDINAL SLOPE OF 2.00%.
   - VERIFY FEETINGS PER FOR TURNING VARIOUS PER.
   - NOT TO SCALE
PEDESTRIAN GATE DETAIL

VEHICULAR GATE DETAIL

NOTES

The applicable details and notes of Standard Sheet 11 (Sheet 1 of 2) shall apply to this Standard Sheet.

Except for "normal length" time posts, all other posts and braces shall be galvanized steel pipe members or galvanized steel roll formed members as shown in the "Fence Members Table" herein. When galvanized pipe posts are used, galvanized post braces shall be used.

When roll formed posts are used, roll formed post braces shall be employed.

Roll formed posts and braces shall meet the requirements of 12.8 of the Specifications.

Strengtheners and their accompanying post bands shall not be used with the roll formed posts. Instead, the fence fabric shall be integrally woven into the lock loops of the posts.

Post caps shall not be used on roll formed posts.

Gate frames and gate vertical braces shall be galvanized pipe members. Gate fabric shall have the same coating as the fence fabric. All other metal components of gates shall be galvanized, with the exception of die-cast aluminum corner fittings, or pressed steel corner fittings.

FENCE MEMBERS TABLE

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<tr>
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<th>GALVANIZED PIPE</th>
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WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

STANDARD SHEET 11

RW FENCE-CHAIN LINK
6' FENCE FABRIC HEIGHT
(sheet 2 of 2)
ELEVATION

SECTION A-A

Notes
Clean the fence shall be in accordance with Section 608 of the Specifications.
Filter fabric shall be in accordance with Section 715.3.3 of the Specifications.
Super silt fence shall be in accordance with Section 642.8.8 of the Specifications.
Square filter fabric to chain link fabric with the spaced at 24" centers.
Posts shall be driven.

2" No. 6 Gage dimension mesh knuckled or hot drawn with galvanized or stainless coated, then galvanized. Class 0 and
coating shall be used.
NOTES

Signs shall be fabricated from 0.08" thick aluminum sheets or #16 gauge galvanized steel sheets. Reflectors are not required. Signs shall have black legends and borders on white backgrounds. The letters and numerals are to be of the same size and style as shown herein.

Channel posts shall meet the requirements of Section 607.2 of the Specifications.

Steel signs and posts shall be galvanized in accordance with ASTM A-153.

Steel hardware shall conform with Subsections 709.23 of the Specifications or galvanized hardware with Subsections 709.36 and 709.37. Steel hardware shall be galvanized in accordance with ASTM A-153.

Top of posts shall extend to the top of signs.

All signs shall be punched with 3/8-inch holes on main vertical centerline, holes shall be so located that the signs can be attached to the posts of three inches below the top of the signs and three inches above the bottom of the posts.
STANDARD SURVEY MARKER

PLAN VIEW

- Ground Line
- Bronze Casting
- Concrete
- Machine finished, plumbed after setting to indicate Control Point, Centerline Staking & Monument Elevations, or as directed by the Engineer
- Mark for alignment reference after setting

ELEVATION VIEW

- Ground Line
- Bronze Casting
- Concrete
- #3 Rebar 3'-0" Length

SECTION E-E

- #3 Rebar
- Survey markers shall conform to the requirements of the Standard Specifications. Sufficient reinforcement shall be included in precast survey markers to resist handling stresses.

ALTERNATE SURVEY MARKER

PLAN VIEW

- Deep hex socket that won't "wobble" when tapped on to rebar
- Mark for alignment reference Center punch & cross

ELEVATION VIEW

- #6 Rebar
- 3 1/4" Min. Aluminum Domed Cap for #6 Rebar with Plastic Insulator

FINISH GROUND LINE

- Plastic Insulator that locks cap tight on to rebar and helps prevent dissimilar metal corrosion.

SECTION E-E

- #6 Rebar
- 36" Long

NOTES

Survey markers shall conform to the requirements of the Standard Specifications.