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NOTES

All concrete shall be Class "B" Concrete.

All concrete edges shall have a 3/4" x 45° chamfer. Chamfer on vertical edges shall be continued 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 shall be used at the inlet opening. The edge of the pipe shall be set back from the face of the inlet opening. The pipe shall 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 "bead" or "groove" of the pipe shall be placed in the wall in lieu of the bead, except when the pipe is to be cut for placing in masonry headwalls. The inside of the "bead" or "groove" shall be filled with concrete up to the flow line.

Bevels are not required on outlet headwalls.

Reinforcing fabric shall conform to the requirements of 706.3 and 706.4 of the Specifications.

Reinforcing fabric, as detailed herein, shall be used in all walls of masonry structures. The covering for the fabric shall be formed by means of a reinforcing fabric of the same kind and quality as that conforming to the requirements of the Specification, i.e., concrete, and shall be placed on the inside of the wall of the structure.

Concrete reinforcing shall be used as necessary to facilitate 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, meeting the requirements of 706.1 of the Specification, 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 pipe, unless otherwise specified. Bora shoes shall be furnished in such lengths, on field bent or cut as necessary, to fit the structure and to accommodate the pipe opening in the wall.

Keyed or dovetailed 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, shall be included in the unit price bid for "Class B Concrete".

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

PIPE CULVERT HEADWALLS

STATE HIGHWAY DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAY
STANDARD SHEET ORI
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 OF 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 TOGETHER. GALVANIZED RIVETS OR BOLTS.

FOR 60" THRU 64" PIPES, THE REINFORCED EDGES OF THE END SECTIONS SHALL BE SUPPLEMENTED WITH GALVANIZED STIFFENER ANGLES FASTENED BY 3/8" DIAMETER GALVANIZED BOLTS AND NUTS. THIS REQUIREMENT SHALL APPLY TO THE END SECTIONS FOR 71"X90", 73"X95", 83"X97", AND 81"X95" PIPE ARCH SIZES. IN ADDITION, FOR THOSE PIPE ARCH SIZES, ANGLE REINFORCEMENT SHALL BE USED UNDER THE CENTER HINGE.

THE END SECTION CONNECTION DETAILS SHALL BE AS SHOWN ON THIS PLAN SHEET OR ON 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 PAINTED INSERT, IT WILL NOT BE NECESSARY TO BITUMINOUS COAT OR PAINT THE END SECTION, CONNECTORS, OR CONNECTOR SECTIONS.

THE PLATE EXTENSIONS SHALL BE THE SAME THICKNESS AS THE END SECTIONS AND SHALL BE FASTENED TO THE PLATES WITH 3/8" DIAMETER GALVANIZED BOLTS. LENGTH OF THE PLATE EXTENSION SHALL BE 90° (APPROX.) FOR 12" THRU 30" DIAMETER PIPES AND FOR PIPE ARCHES WITH RISE VALUES UP TO AND INCLUDING 29°. THE LENGTH SHALL BE 90° (APPROX.) FOR LARGER PIPE SIZES AND 90° (APPROX.) FOR LARGER PIPE ARCHES.
NOTES

THIS INLET SHOULD ONLY BE SPECIFIED WHEN ABUTTING CONCRETE PAVEMENT.

THE FINAL INSTALLED TOP SURFACE OF INLET AND GRADE SHALL BE FLUSH WITH ADJACENT FINISHED SURFACES SUCH AS PAVEMENT, GUTTERS, CURBS, AND SIDEWALKS. TOP OF GRADE 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 POINT 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 GRADE SUPPORT BAR, SHALLOW FRAME, AND GRATES (2 if required), SEE INLET CASTINGS STANDARD SHEET D65-X. USE OF THE SHALLOW FRAME WILL BE LIMITED TO ROADWAYS CONSTRUCTED OF CONCRETE PAVEMENT, IF ADJACENT ROADWAY IS BUILT OF HOT MIX ASPHALT PAVEMENT. THE FRAME AS REQUIRED FOR A TYPE F INLET (STANDARD SHEET D65F) 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 BEARING SURFACES OF THE LEDGE OR THE GRADES, AND THE GRADES SHALL SEAT ON THE LEDGE WITHOUT RISKING.

OPTIONAL CONSTRUCTION JOINTS LABELED "CJ" MAY BE ROUNDED CONCRETE, MENDED OR DOWELED AS PER THE TYPICAL DETAILS SHOWN HEREIN OR AS APPROVED BY THE ENGINEER. NON SHINNY CORNERS 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 AS PER THE MANUFACTURER'S RECOMMENDATIONS.

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

CURB, IF SPECIFIED, MAY BE EITHER CONCRETE PLACED IN THE INLET BACKFILL AS DETAILED HEREIN OR AN APPROVED CURB BOX AS MANUFACTURED WITH THE GRADE AND FRAME. DIMENSIONS OF THE CURB BOX SHOULD BE AS SPECIFIED TO THE STANDARD CURB AS SPECIFIED ON THE PLANS, THE CURB WILL BE PAID FOR PER SECTION 610, IN EITHER 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 IN THE PLANS. THE CONTRACTOR IS RESPONSIBLE FOR ANY TEMPORARY BRACING REQUIRED TO TRANSPORT PRECAST INLET SECTIONS DUE TO MULTIPLE OPENINGS.

TYPE A INLET

STANDARD SHEET D65-0
NOTES

The final installed top surface of inlet and grate shall be flush with adjacent finished surfaces such as pavements, 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 quarter points to connect curb to inlet. Rebars are not required if curb is poured monolithically with inlet or if type Y or Y medium is specified on the plans.

For details of grate support bar, shallow frame, and grates, see inlet castings standard sheet DRI-C.

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 3/4" wide concrete ledge to provide a smooth, even surface for supporting the grate frame. No surface projections shall extend to the bearing surfaces of the ledge of the grates and the grates shall rest on the ledge without rocking.

Optional construction joints, labeled "CJ" may be roughened concrete, treated or formed 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 3/4" for leveling between precast sections. Thicker depths will be allowed as per the manufacturer's recommendations.

PC (Minimum Pipe Cover) shall be 12" below inlet top for pipes placed under sidewalks or grassed areas or 24" below inlet top for pipes placed under pavement or shoulder.

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. Dimensions of the curb box should reasonably conform to the standard curb as specified on the plans. The curb will be paid for per section 805 in either 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 (4) inches.

The number and location of pipe openings shall be as shown in the plans. The contractor shall not, additional costs, shall be responsible for any temporary bracing required to transport precast inlet sections due to multiple openings.
CONCRETE AND REINFORCING STEEL QUANTITIES

The quantities shown above are for an inlet to five feet. If deeper inlets are required, the quantities must be adjusted accordingly.

The above table is to be used for estimating purposes only.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

OUTLET AND DEFEATHERING
STANDARD DETAIL

TYPE E INLET

STANDARD SHEET SCALE

1" = 1'-0"

NOTES

Type E inlet detailed herein is for use on a grade. If it is to be used in any other application, it should be built symmetrically about centerline of pipe and length of opening specified.

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

Optional construction joints labeled "C" may be keyed or dovetailed as per the typical details shown herein or approved by the Engineer.

If Type E inlet is to be constructed along with a sidewalk, the sidewalk shall be constructed monolithic with the top edge on the inlet. The sidewalk shall be reinforced with Type B Fabric placed 2" from bottom of pipe and extended into the top of the inlet a minimum distance of 6". Cost of Type B Fabric shall be included in the unit price bid for Concrete Sidewalk.

This inlet shall not be placed in a pedestrian walk.
CONSTRUCTION JOINT DETAILS

NOTES

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, prestressed in one or multiple sections, or any combination of cast-in-place and prestressed.

Optional construction joints required. C joints may be roughened concrete, keyed or dowelled as per the typical details shown herein or as approved by the Engineer. Non-shrinking grout meeting the requirements of subsection 115.5 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.

For details of grates (two required), see Inlet Coatings Standard Sheet D9-6.1 and Inlet Coatings Standard Sheet D9-6.1-1.

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.

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. Dimensions of the curb box should reasonably conform to the standard curb as specified on the plans. The curb will be held for prosecution of section 610 in either case.

Filet joints 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 (4) inches.

The number and location of pipe openings shall be as shown in 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.
The following substitutions in dimensions are acceptable for fabricating the grate and frame:

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

Table Note: Grate and frame weights are for information only and will increase if larger straps and bars are used.

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.
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 dowelled as per the typical detail 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 1/2" for leveling between precast sections. Thicker depths will be allowed as per the manufacturer’s recommendations.

Grate as shown on Standard Sheet D66-X 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 at no additional cost, shall be responsible for any temporary bracing required to transport precast inlet sections due to multiple openings.
TYPICAL INSTALLATIONS

SLOT DETAILS

NOTES

The contractor may, at his option but subject to the limita-
tions as noted on this sheet and elsewhere on the plans, install
Type 1 or 2 Slots or approved equiva-
lents.

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

Ground 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 assembled slot then be joined by minimum 1/2" x 1" fillet
welds at 6" centers along each side of the horizontal joint.
The resultant slot height may be slightly less than 85/".

Slot inlets shall not be placed across a pedestrian crosswalk.

SLOTS NOTES

TYPE 1 SLOT

BEARING BARS AND SPACERS: These elements are to be 3/16"
structural steel suitably welded to form the open slot and net-di-
gauze, as per ASTM A-623. Spacers may be vermicular (tied
approximately 30° from vertical). If the slot inlet is placed on
a grate and adjacent to a curb or median, the inlet is to be in-
stalled to position tilled spacers to 3" upgrade toward the
incoming gutter flow.

TYPE 2 SLOT

GRADE AND CLAMP: These parts are to be hot-dip galvanized mild
carbon steel conforming to ASTM A557. Grating, measuring
3/4" deep by 1-3/8" wide, shall extend the fulllength of
each pipe section slot.

REMARKS: The rebar shall be serpentine bent to cross the slotted
opening on 6" centers and shall be coated with 3 mils of
carbon-bonded epoxy powder.

J-BOLT: The J-bolt shall be 5/8" inch diameter, plated, ASTM
A307 steel and supplied with self-locking nuts.

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

SLOT HEIGHT: 4" minimum slot height acceptable where 2.5"
slot height is specified.
SINGLE-GRADE SHALLOW FRAME

SINGLE-GRADE DEEP FRAME (ROUND OR SQUARE BASE)

TILT-BAR GRATE

GRATE SUPPORT BAR

INLET CASTINGS

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL
NOTES

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

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

Pipe At Elevations Other Than Shown May Be Jailed To The
Manhole By Cutting A Hole In The Side Of The Connecting Pipe In
The Manhole, Inserting The Pipe, Then The Thickness Of The Manhole Shell
And Covering All Openings Around The Connecting Pipe With Joint
Mortar.

Either This Manhole Or The Precast Manhole On Standard Sheet
(DRT-A) May Be Furnished When Type B Manhole Is Called For In The
Contract. The Frame And Grate Shall Be As Shown On Standard
Sheet DRT-X. M-150 CASTINGS. Steps Shall Be As Shown On
Standard Sheet DRT-X.

Minimum Height Of Bench Wall Above Flange 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.

"COMPLETE STRUCTURE"

Single-Slot Deep Frame With Round Base.

"SECTION THROUGH FOOTER"

Pipe Size, Type, And Location As Specified
On The Plans.

"PLAN VIEWS"

"SECTION B-B"

Standard Cast Iron, Reinforced
Projects Or Reinforced Corrosion-
Resistant Rubber Manhole Steps.

CONCRETE BASE
Optional Precast Or Field-cast
(For Use With Storm Sewers Only)
NOTES

Lifting on covers shall denote STORM SEWER or SANITARY SEWER as applicable.

Bottom hole may be deleted from manhole cover castings.

The 1/2" 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.
*Except for structural pipe where length of bedding wall need not exceed width of bottom plate. However, if structural, plate pipe is first assembled and then placed in the trench, the 0.15 O.D. minimum value applies.*

**Typical Pipe Bedding**

- **Class B Bedding:**
  - On Rock Foundation
  - Fine Aggregate for Leveling
  - Compacted Backfill Material
  - 0.15 O.D. Min.
  - 0.60 per ft. for cover pipe, 12" min., 24" max.

**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 should 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.
**STANDARD CONCRETE GUTTER TYPES**

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Cutter depths shall be specified in 4-inch increments. Cutter widths shall be specified in increments for widths of two to six feet and a 2-foot increase for widths of over six feet. The 4-inch cutter shall be increased at the rate of 12 inches per each 2-foot width.

*Shadows inside gutter slope for two-sided ditches, unless otherwise specified.

**Concrete Gutter Treatment at Inlets**

**PREFabricated EDGE Drain**

**NOTES**

Waterstop shall be 4x4m wide, 2x2m thick, extending 5% below section and 0% above less than 0.67 web steels.

The waterstop'ds are for informational purposes only; all waterstops shall conform to the general shape shown and meet the requirements of Section 705.4 of the Specifications.

Concrete gutter types, depths and widths shall be specified on the plans and shall conform to the table above. Only the concrete gutter type shall be specified in each individual run of gutter.

The "Concrete Gutter Treatment at Inlets" details shown in is for transferring a V-ditch section to the wall of the ditch. The distance is to be used to make this transition regardless of the length of the approach ditch.

Cutoff walls for concrete gutter shall be constructed and paid for in accordance with Section 636 of the Specifications.

There will be no separate payment for Select Embankment Channel, if the embankment is obtained from the unclassified excavation. If select embankment is not available from unclassified excavation, payments will be made under Section 21 for Rock Borrow Excavation. Unless otherwise specified on the plans, the maximum rock size will be "T" and the maximum rock size will be one-half "T".

All edge drain outlets are to be equipped with a "Strainer" for sediment and vegetation, as detailed on Standard Sheet DR-6. 3 of 4 or tied to existing inlets or pipes. Underdrain pipe tied to inlets or connected to culvert pipe by pipe saddle, grouting cementing or other means that will provide a secure attachment to the embankment shall be included in the cost of the underdrain pipe. The cost of the underdrain pipe to inlet or pipe will be included in the unit price bid for edge drain.

When edge drain outlets cannot be outlets at 45° or 45° to prevent edge erosion, appropriate details as shown on the drawings for Drainage Base outlet on Standard Sheet DR-6 3 of 4 are to be used.
Payment for the outlet pipe includes drop connections in the free drawing base trench and slipway, or connections to drainage structures as required. Maximum outlet spacing is 250 feet. The outlet will be made to the nearest drainage structure. Slope setting will be in accordance with Standard DBB (sheet 3 or 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 shall be 6-inch diameter non-perforated rigid pipe except for the top 50 feet of pipe placed in the free drawing 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 shall be 6-inch inside diameter or 10-inch outside diameter. The screen wires shall be welded to the pipe in each direction 3-inch to 5-inch. The screen wires shall be welded to the pipe in each direction 3-inch to 5-inch. The cost of the screen wire will be included in the cost of the underdrain pipe or edge drain.

Commercially available gauze wire hardware screen is to be supplied and installed on each SlopeWall. The screen wires shall be welded to the pipe in each direction 3-inch to 5-inch. The cost of the screen wire will be included in the cost of the underdrain pipe or edge drain.

Crossties shall have outlets coordinated with regular roadway outlets to ensure that the outlet screen free drawing.

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

Lateral trench sections shall be installed at locations as follows:
- Cross Slope of 0.05/1.0, Grade of 4% and above
- Cross Slope of 0.020/1.0, Grade of 5% and above
- Cross Slope of 0.040/1.0, Grade of 6% and above
- Cross Slope of 0.060/1.0 and greater no trench required

This information is from the Vertical Walls, Department of Transportation's Standard Details.
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 0.5%. A desirable minimum of 1% and an absolute minimum of 0.5% with 18" of cover shall control in the placement of underdrain unless otherwise noted on the plans.

The top of the underdrain pipe shall be placed at the same elevation as 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 cap details, see Standard Sheet DBB, Sheet 3 of 4.

All Underdrain outlets are to be equipped with a sliopaswell for underdrain and Varmint Screen as detailed on Standard Sheet DBB, 3 of 4 or tied to existing inlet or culvert pipes. Slipoaswell 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 inlets or culvert pipes, slipoaswell, cementing, or other means that will provide a secure attachment satisfactory to Engineer shall be included in the cost of the Underdrain pipe or Filter Fabric underdrain.
NOTES:
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 the 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 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 for 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. The plates 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 503 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.

PAVEMENT UNDER EXISTING REPAVING TRENCHES

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 the 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 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 for 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. The plates 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 503 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.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

REPAIRING TRENCHES UNDER EXISTING PAVEMENT

STANDARD DETAIL SHEET DR-9
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>
</tr>
</thead>
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<tr>
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<td>54&quot;</td>
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<td>2'-0&quot;</td>
<td>9.87</td>
</tr>
</tbody>
</table>

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

If 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 pipe shall be encased in 4" of CLSM an additional 10' max. beyond edge of pavement if there is an existing or proposed inlet. The CLSM shall be poured full depth to the inlet.

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.

CLSM - Controlled Low Strength Material

Notes:

If 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 pipe shall be encased in 4" of CLSM an additional 10' max. beyond edge of pavement if there is an existing or proposed inlet. The CLSM shall be poured full depth to the inlet.

Unspecified items are incidental to the pipe / culvert.

Full depth 2' past each edge of pavement.
GUARDRAIL HEIGHT

Transitions in guardrail height shall be accomplished at a rate of 1" vertical distance in 12'-6" (3.8 m) of horizontal distance. Height transitions shall be made before and treatments or connections begin.

Height transitions between 28-1/2" and 31" require moving the splice overall past the post by placing an additional post at half the nominal spacing.

Guardrail height shall be as indicated on plans.

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

The Standard Terminal End 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" & 31" terminal height.

Guardrail that lies to Cut Slope Terminals (CST) shall be modified per the standard details shown to 28-1/2" height (the height of the CST).

Three Beam transitions shall be per Standard GR-4 dated 11-13-02 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 grade of B or better on NCHRP projects.

Guardrail shall be secured to the blocks, posts 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 A 456, 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 coating of guardrail will be the blue coat 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 to the face of all guardrail shall be 1:30 or flatter.

The Type, Class, and Height of Guardrail shall be as shown on the plans, in accordance with the Department’s standard details.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

GUARDRAIL ELEMENTS
(SHEET 1 OF 2)

STANDARD SHEET GRM

GUARDRAIL ELEMENTS
(SHEET 1 OF 2)

STANDARD SHEET GRM
SECTION RAIL ELEMENT

NUT SPLIC BOLT
SLICE BOLT Same Except Length

1/16" Tolerance
1-1/16" 11-1/16"
1/16" 1/16"
Base Width Nominal Thickness 0.105
15/16" Symmetrical About %
5/8" Height
1-1/4"
3/4"
5/8"

Button Head 1-5/16" Dia. Round x 5/16" Height

1/32" Slot in Rail Element
29/32" x 1-1/8" 5/32" Headed Nuts

RAIL SPLICE - 28 1/2" HEIGHT ON POST

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

12-1/2" Lap

RAIL SPLICE - 21" HEIGHT OFF POST

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

21 4-1/8" 4-1/2"

END POST

LENGTH APPROX.

6-1/8" R-4

30 X

11/2"

Top

Base Metal Nominal Thickness 0.105"
WOOD GUARDRAIL POST (RECTANGULAR)

WOOD GUARDRAIL POST (ROUND)

WOOD POST DETAIL

STEEL GUARDRAIL POST (WOOD BLOCK)

STEEL POST DETAIL

WOOD POST DETAIL (REINFORCED)

STEEL POST DETAIL (REINFORCED)

NOTES

GENERAL:

For guardrail installations on federal-aid projects, the guardrail specifications in the following text shall be used. For guardrail installations on state and local projects, the specifications in the following text shall be used unless otherwise specified.

WOOD GUARDRAIL POSTS:

Wood guardrail posts shall be two (2) inches nominal (1-1/2 inches actual) in diameter, unless otherwise specified. The posts shall be treated with a preservative approved by the appropriate regulatory agency. The posts shall be installed in such a manner that the center of the guardrail is parallel to the centerline of the roadway. The posts shall be secured to the foundation system in accordance with the applicable design criteria. The posts shall be connected to the guardrail rails and the guardrail system shall be secured to the posts in accordance with the applicable design criteria. The guardrail system shall be designed to withstand the forces imposed by the traffic loads.

STEEL GUARDRAIL POSTS:

Steel guardrail posts shall be two (2) inches nominal (1-1/2 inches actual) in diameter, unless otherwise specified. The posts shall be treated with a preservative approved by the appropriate regulatory agency. The posts shall be installed in such a manner that the center of the guardrail is parallel to the centerline of the roadway. The posts shall be secured to the foundation system in accordance with the applicable design criteria. The posts shall be connected to the guardrail rails and the guardrail system shall be secured to the posts in accordance with the applicable design criteria. The guardrail system shall be designed to withstand the forces imposed by the traffic loads.

WOOD BLOCKS:

Wood blocks shall be two (2) inches nominal (1-1/2 inches actual) in diameter, unless otherwise specified. The blocks shall be treated with a preservative approved by the appropriate regulatory agency. The blocks shall be installed in such a manner that the center of the guardrail is parallel to the centerline of the roadway. The blocks shall be secured to the foundation system in accordance with the applicable design criteria. The blocks shall be connected to the guardrail rails and the guardrail system shall be secured to the blocks in accordance with the applicable design criteria. The guardrail system shall be designed to withstand the forces imposed by the traffic loads.

STEEL BLOCKS:

Steel blocks shall be two (2) inches nominal (1-1/2 inches actual) in diameter, unless otherwise specified. The blocks shall be treated with a preservative approved by the appropriate regulatory agency. The blocks shall be installed in such a manner that the center of the guardrail is parallel to the centerline of the roadway. The blocks shall be secured to the foundation system in accordance with the applicable design criteria. The blocks shall be connected to the guardrail rails and the guardrail system shall be secured to the blocks in accordance with the applicable design criteria. The guardrail system shall be designed to withstand the forces imposed by the traffic loads.

WOOD POSTS:

Wood posts shall be two (2) inches nominal (1-1/2 inches actual) in diameter, unless otherwise specified. The posts shall be treated with a preservative approved by the appropriate regulatory agency. The posts shall be installed in such a manner that the center of the guardrail is parallel to the centerline of the roadway. The posts shall be secured to the foundation system in accordance with the applicable design criteria. The posts shall be connected to the guardrail rails and the guardrail system shall be secured to the posts in accordance with the applicable design criteria. The guardrail system shall be designed to withstand the forces imposed by the traffic loads.
The blocks shall be bolted to the steel posts in the same manner as 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 guardrail post when possible.

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

The 1" (minimum) notch dimension as shown for round Wooden Posts shall be located along the vertical centerline of the entire upper 14" of the post and shall be of no less than whether the post is notched as shown or otherwise cut or squared to form a vertical flat plane and then, at some location below the top 14", is circularly sliced out to the surface of the post.

When a wood area is used adjacent to a wood post, the block shall be nailed to the post with a galvanized steel 1.00 common nail, the nails to be driven in the center of the top or bottom of the block.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

DOUBLE-FACED GUARDRAIL POSTS

STANDARD SHEET GRI3
1. For cut to fill guardrail terminals (trailing ends, fill side), and all approach ends where included ends are specified, the details and requirement notes shall be applicable.

2. Prior to placing guardrail, a final check of existing conditions will be made by the engineer and any adjustment 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 type shall be made from the beginning of the terminal will be made from the initial conditions encountered. At each location, the guardrail shall be installed at 28-1/2" height.

5. 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.

6. When installing cut type into 31" top of rail, height guardrail, the cut shall be installed at 28-1/2" height. The cut guardrail shall be vertical prior to cut installation.

7. The cut guardrail terminal should be used only with 2:1 or steeper back slope.

8. The plane rate of the guardrail may be steepened to 8:1 at after crossing the ditch bottom to shorten the length of the terminal.

9. Guardrail to extend from post 1, through entirety of cut, to post 22 at a minimum.

10. For the rub rail section use 8' long posts.

11. See GR-4A and GR-4B for details of type A and type B terminals.

12. Maximum clearance from bottom of W-beam to ground line nearby W-beam posts is 18".

13. Anchors, rail, 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.

14. The final decision as to the type of cut slope terminal installation type shall be made from the beginning of the terminal will be made from the initial conditions encountered. At each location, the guardrail shall be installed at 28-1/2" height.

15. When installing cut type into 31" top of rail, height guardrail, the cut shall be installed at 28-1/2" height. The cut guardrail shall be vertical prior to cut installation.

16. The cut guardrail terminal should be used only with 2:1 or steeper back slope.

17. The plane rate of the guardrail may be steepened to 8:1 after crossing the ditch bottom to shorten the length of the terminal.

18. Guardrail to extend from post 1, through entirety of cut, to post 22 at a minimum.

19. For the rub rail section use 8' long posts.

20. See GR-4A and GR-4B for details of type A and type B terminals.
NOTES:
1. USE CLASS B CONCRETE.
2. USE EPOXY COATED REINFORCING STEEL, PER SECTION 002 OF THE SPECIFICATIONS.
3. USE GALVANIZED THREADED ROD.
4. THREADED RODS CAN BE CAST INTO CONCRETE BLOCK OR HOLES CAN BE DRILLED INTO BLOCK AND RODS ANCHORED WITH EPOXY.
5. DRILL HOLES A MINIMUM 6 INCH DEEP. CLEAN DRILLED HOLES PRIOR TO INSERTING THREADED ROD.

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 end shoes and rock bolts, as detailed herein.
PARABOLIC LAYOUT PLAN

NOTES

For details of Flared End Terminals use approved shop drawings.

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

The post offset dimensions are given to the center of the traffic face of
the post or block 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 the post from the nominal post spacing shown on
pre-approved shop drawings. Posts are to be set approximately level to the
riding at each location.

Where a wood block is used adjacent to a wood post, the block shall be nailed
to the post with a galvanized steel #8 common nail. The nails to be driven
into the center of the top or bottom of the block.

The cost of furnishing and installing the Flared End Terminal, complete with all
miscellaneous hardware and parts as detailed in 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 flat impact head. Those terminals with a rounded impact head shall
be covered with a 3" x 3" x 3/16" yellow reflective sheeting.

As of 11-15-12 revision date, the detail is obsolete and no longer used for
new construction.
FLARED END TERMINAL
STRAIGHT LAYOUT

NOTES

Flared End Terminal Shall Meet NCHRP-350 and/or Wash testing for appropriate height.

Separate Approved Product Lists will be maintained for both 28 1/2" and 21" terminals.

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

Post and splice locations are per manufacturer.

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

The post offset dimensions are given to the center of the traffic lane of the blackboard except at the first post, where the dimension is to the center of the traffic lane of the post. Offset points are to be located by measurements at the black of the nominal post spacings shown on pre-approved shop drawings. Posts are to be set approximately radial to the railing at each location.

When a wood block is used adjacent to a wood post, the black shall be nailed to the post with a galvanized steel 50 common nail. The nails to be driven into the center of the top or bottom of the block.

The cost of furnishing and installing the Flared End Terminal, complete with all miscellaneous hardware and parts as described 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 rear of those terminals with a flared impact head. Those terminals with a rounded impact head shall be covered with a 10" x 30" yellow reflective sheet.
TANGENT END TERMINAL PLAN

NOTES:

Tangent End Terminal shall meet NCHRP-350 and/or wash testing for appropriate height. Separate Approved Product Lists will be maintained for both 28 ½" 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 Roads and Bridges.
The wood block shall be nailed to the post with a galvanized steel flat common nail. The nails are to be driven into the center of the top or bottom of the block.
The Tangent End Terminal installations shall maintain a 4" minimum offset from the edge of the impact head to the edge of the traveled way. For narrow existing shoulders that have an offset of 5 or less from the face of the road element to the edge of the traveled way, the rail and post shall be
flared from the center face of rail. The flared offset distance shall be 1" at a taper rate of 250, for a total flare length of 25" or a taper rate of 500, for a total flare length of 50" (see Flare Detail).
Rail element 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 accessories, 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 1" x 3" x 5" yellow reflective sheet.

FLARE DETAIL
Steel tubes shall meet the requirements of ASTM Specification A3600, Grade B, and shall be galvanized after fabrication in accordance with the requirements of AASHTO Specification M11. Other terminal components, such as anchor plates, cable assemblies, hardware, plates, pipe sleeves, etc., shall conform to the design and requirements of section 607 of the Specifications.

For each S1E1 and treatment installation, it should be the Contractor’s option whether to utilize the Tubular Steel End Foundation design detailed herein or Concrete Filled End Foundation design detailed, unless one type is specified in the plans. When the Concrete Filled End Foundation is used, the embedded portion of the post shall be double wrapped with Composition Paper or single wrapped with sheet metal or other materials acceptable to the Engineer before concrete placement to facilitate replacement of damaged posts.

The cost of furnishing and installing the Special Trailing End Terminal, including structural tubing, plate, hardware, and welded bearing plates for Tubular Steel End Foundations; concrete forms, wood, and fabric, or necessary excavation, compaction paper and sheet metal for Concrete Filled End Foundations, and all “Hardware” hardware, cables, studs, plate, and pipe sleeves shall be included in the unit price bid for “Special Trailing End Terminal,” per each. Percentual components, i.e., parts, blocks, rail elements, hardware, etc., along with the special size and/or special length wood guardrail end post and the hardwood sector be 100% for a guardrail per linear foot.

ELEVATION
SPECIAL TRAILING END TERMINAL (STET)
CONCRETE FLOODED END FOUNDATION
NOTES

1. Rubrail end must be attached flush with sloped toe of safety shape. Installation can be greatly simplified by fabricating or shop-fabricating the rubrail end to be consistent with the toe of the safety shape. Rubber bands twist both clockwise and counterclockwise may be required in most situations.

2. The rubrail attachment to the concrete safety shape requires three closely fitted holes. Appropriately sized bolts anchors should be used to reduce the risk of splitting the concrete.

3. There is no separate pay item for this connection and all components are detailed herein shall be included in the contract price for guardrail.

BENT PLATE RUBRAIL DETAIL

WOOD BLOCKOUT FOR RUBRAIL DETAIL

BEARING PLATE DETAIL

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
ENGINEERING MANUAL
RUBRAIL DETAILS
SHEET 3 OF 3
STANDARD SHEET GRID
W-BEAM TRANSITION TO SAFETY SHAPE
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 guardrail rails or barriers shall be transitioned to a vertical shape at the guardrail connection in a manner detailed elsewhere in the Project Plans.

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 Manual for Assessing Safety Hardware (MASH) crash testing criteria and have an FHWA eligibility letter to be used on WVDOH projects. Only FHWA approved guardrail systems utilizing 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. On projects, unless otherwise specified.

Concrete transition will as detailed elsewhere.

Thrie beam terminal connector.

Two sections of thrie beam, one set inside the other.

Thrie beam transition section (6'-3"")

Slopes = 10:1 Or Flatter

For 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. On projects, unless otherwise specified.

Concrete transition will as detailed elsewhere.

Thrie beam terminal connector.

Two sections of thrie beam, one set inside the other.

Thrie beam transition section (6'-3"").

Slopes = 10:1 Or Flatter

For 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. On projects, unless otherwise specified.
NOTES

1. See Sheet GR 11-C for details not shown on this sheet.

2. The two sections of 12' 6" THRIE BEAM require additional
   slotting holes in order to mount the beam to the post
   nearest to the concrete wall.

3. 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 for ALL projects,
   unless otherwise specified.

4. See Sheet GR 11-C for details not shown on this sheet.
NOTES

The median and footer can be paved monolithically. When the median is paved on existing concrete pavement, the footer shall be secured with dowels drilled and grouted in the existing concrete pavement, as shown.

When the median and footer are to be paved separately, a median construction joint shall be used.

Where the median is placed over existing pavement construction joints, median sections shall be separated by open joints having the same width as the pavement joints for the same median width. At either median construction joints, a 2" wide and 2" deep groove shall be formed across the top and along the sides for the entire length of the median, or a depth full but joint shall be formed at approximately 15'-20' intervals along the length of the median. In addition these groved or built joints shall be transverse with a plus or minus one-foot tolerance with the contraction joints in abutting concrete pavement.

Expansion joints shall be placed in the median at structures when so indicated, opposite expansion joints in abutting concrete pavement, and at existing expansion joints in underlying concrete pavement, and at all locations as shown on the Plans or directed by the Engineer. At expansion joints, median sections shall be jointed by the opening filled for the entire depth of the median with NYA preformed joint filler which complies with the requirements of section 650 of the Standard Specifications for Roads and Bridges. The filler shall be recessed 1/2" in from the sides and top of the median and the completed joint shall receive no further treatment except sealing with a waterproof sealer is prohibited. The median shall be adequately terminated at each end of median installations as shown or specified elsewhere in the Plans.

Drainage openings shall be provided in the median where indicated on the Plans or directed by the Engineer.

Unless otherwise specified, in directions to contractors meeting the requirements of Section 650 of the Standard Specifications for Roads and Bridges, and mounted on a suitable support, shal be secured to, and spaced along the length of the median as shown and specified on Standard Sheet G-5 of the Standard Details Book. The cost of finished concrete, interior, preformed joint filler, gate, and solvent and preformed joint fillers shall be included in the cost in the median.

The type of surface adjacent to the median, whether normal or widened pavement, shall be selected by the Engineer, and shall be included in the cost of the median but shall not jointly with the surface.

The contractor shall have the option to install either the M-6 or F-Shape median, unless otherwise specified in the Plans.

Additional dimensions, notes and details see sheet 2 and 3.

SECTION A-A (3'-6" Joint Spacing)

SECTION A-A (60'-8" Joint Spacing)

SECTION A-A (15'-6" Joint Spacing)

© center-to-center of Construction Joint, except where Expansion Joint are Specified.

** formed full-depth butt joint.

*** open joint over existing rigid pavement contraction joint. Median joint width equal to pavement joint width.
N-J SHAPE

NOTES

Height of the median, dimension "D", shall be included in the plan.
Additional height of median, dimension "C" shall be vertical.
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.
NOTES

The contractor shall have the option to install either the N-J Shape or the F-Shape medians unless otherwise specified on the Plans.

For additional dimensions, notes and details see Sheet 1 and 2.

For additional notes and details of the guardrail bolt pattern, see Standard Detail Sheet GRD9.

Designated bolt notes do not apply to existing ends posts that are not being reconstructed.
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 3/8".
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.

Notes:

- Unless otherwise noted, no separate measurement or payment shall be made when details on this sheet are used. The cost associated with using these details shall be included in the appropriate guardrail pay item.
NOTES:

Unless otherwise noted, no separate measurement or payment shall be made when details are used. The cost associated with these details shall be included in the appropriate guardrail pay item.

Details on this sheet to be used with Class I Guardrail only.

Methods of obstacle avoidance shown in Guardrail Modifications Sheet GR35 are preferred, if applicable.

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' span of W-Beam guardrail.
NOTES

The bolts shall meet the requirements of Section 709.7 of the Specifications.

Tie bolts shall be placed in 30" centers max. and on 15" centers min. and centered across the joint or pavement edge may be used in place of the bolt assemblies.

Metal channel shall run the full length of the pavement. The longitudinal tie bolt assembly for slip-on paving shall consist of one sleeve nut, one 8" long hook bolt or J bolt, and 12" 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-on 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 709.1 of the Standard Specifications.

See Alternate Hook Bolt for slip-on paving.
NOTES

THE STANDARD CURB TAPER, CLASS I SHALL BE USED AT THE END OF ALL PLAIN 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 CURB CURVING, UNLESS OTHERWISE CALLED FOR ON THE PLANS.

THE DETAILS AS SHOWN FOR SIDEWALK AND CURB TREATMENT AT DRIVEWAYS ARE TO BE USED UNLESS OTHERWISE CALLED FOR ON THE PLANS.

SECTION A-A DETAILS A 6" TRANSITION LENGTH ON THE INCLINE OF THE CURB WHERE DRIVEWAYS AND TYPE N CURBING ARE ENCOUNTERED.

SECTION B-B & C-C DETAILS ADDITIONAL DEPTH OF SIDEWALK AT DRIVEWAYS AND SECTION D-D DETAILS STANDARD DEPTH SIDEWALK.

SECTIONS 3 & 5 SHALL BE 6" UNLESS OTHERWISE SHOWN ON PLANS.

SIDEWALK CROSS SLOPE OF 2% IS ABSOLUTELY MAXIMUM. THERE IS NO Construction TOLERANCE FOR INCREASED CROSS SLOPE PAST 2%.

SIDEWALKS LESS THAN 5" IN WIDTH SHALL HAVE A 5' X 5' PASSING SPACE AT INTERVALS OF 20' OR LESS.

SIDEWALK AND CURB TREATMENT AT DRIVEWAYS

- 6" PCC PAVEMENT OR PER DRIVeway TYP.
- 8" AGGREGATE BASE, 4" FREE DRAINING BASE OR PER DRIVeway TYP.

CONCRETE CURBING AND SIDEWALK (SHEET 2 of 2)

CONCRETE 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 609 OF THE SPECIFICATIONS. RAMP SURFACE SHALL INCLUDE A "DETECTABLE WARNING SURFACE" SIDE PVI 500, 3 OR 5 AS SHOWN FOR EACH RAMP TYPE. A COURSE BROOMED TRANSVERSE TO FLAKE SLICES, OR EQUALLY, NON-SLIP FROM SHALL BE PROVIDED ON CONCRETE SURFACES.

NORMAL GUTTER FOR LINE AND GOODS SHALL BE MAINTAINED THROUGH THE RAMP AREA, UNLESS OTHERWISE SHOWN OR SPECIFIED.

5'/12 (4) PRECAST EXPANSION JOINTS SHALL MEET THE REQUIREMENTS OF SECTION 609 OF THE SPECIFICATIONS. SHALL BE PLACED AT ALL LOCATIONS WHERE RAMP CONTACTS CURB, GUTTER, OR CONCRETE PAVEMENT.

WHEN THE RAMP IS POURED SEPARATELY FROM THE SIDEWALK, THE EXPANSION MATERIAL SHALL BE PLACED AT ALL LOCATIONS WHERE THE NORMAL GUTTER AND THE RAMP MEET.

DRAINAGE STRUCTURES SHALL NOT BE PLACED IN LINE WITH RAMP.

LOCATION OF THE RAMP SHALL TAKE PRECEDENCE OVER LOCATION OF THE DRAINAGE STRUCTURE. EXCEPT WHERE EXISTING STRUCTURES ARE BEING UTILIZED FOR CONSTRUCTION OF NEW RAPMS.

ANY CURB IN PEDESTRIAN AREAS SHALL HAVE OPENINGS NOT GREATER THAN 3" AND SHALL BE PLACED WITH SLOPE OF OPENING PERPENDICULAR TO THE DIRECTION OF PEDESTRIAN TRAVEL.

IF THE 0.128:120 SLOPE CANNOT BE OBTAINED DUE TO GRADE OF THE ELEVATED ROADWAY, THE SLOPED PORTION OF THE RAMP SHALL BE EXTENDED TO A MAXIMUM LENGTH OF 10'/12.


CURB RAMP SHALL MEET SIDEWALK REQUIREMENTS FOR CLEARANCE, TYPICAL SIDEWALK WIDTH 5'-0" (MINIMUM WIDTH 3'-0"

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

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

RAMP TYPES

TYPE I CUBE: 1 FOR USE WHERE SIDEWALK EXTENDS TO STREET AND WHERE SIDEWALK DECKS ARE GAP, OR WHERE BEGINNING OR CURB CAN BE USE FOR CURB AND TURNING SPACE.

TYPE II CUBE: 2 NOT FOR NEW CONSTRUCTION.

TYPE III CUBE: 3 NOT FOR NEW CONSTRUCTION.

TYPE IV CUBE: 4 FOR USE WHERE SIDEWALK DECKS ARE GAP, OR WHERE BEGINNING OR CURB CAN BE USE FOR CURB AND TURNING SPACE.
TYPE I RAMP AND TYPE IV RAMP SHOWN AT INTERSECTION

TYPE I RAMP

1. 0.33% (2") MAX. RAMP SLOPE, INCLUDING CONSTRUCTION TOLERANCE.
2. CROSS SLOPE 2.00% MAX. INCLUDING CONSTRUCTION TOLERANCE.
3. CURB RAMPS REQUIRE A 0.25'-0" MINIMUM TURNING SPACE WITH A MAXIMUM CROSS SLOPE AND LONGITUDINAL SLOPE OF 2.00% Where pedestrian perform turning maneuver, see note regarding intersections on sheet 1 of 3, to turn to curb.

TYPE IV RAMP

NOTES

1. THE APPROPRIATE DETAILS AND NOTES OF STANDARD SHEET PVT7, SHEETS 1 AND 2 SHALL APPLY TO THIS STANDARD SHEET.
2. DETECTABLE WARNING SURFACES SHALL EXTEND ACROSS THE FULL WIDTH OF THE CURB RAMP, LANDING OR TRANSITION.
3. DOWELS SHALL BE ALIGNED IN THE PREDOMINANT DIRECTION OF THE CURB RAMP.
4. 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 (PROWAG).
PEDESTRIAN GATE DETAIL

VEHICULAR GATE DETAIL

NOTES

The applicable details and notes of Standard Sheet FT (Sheet 1 of 2) shall apply to this Standard Sheet. Except for "normal length" line 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 be 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.
Notes:

Chain link fence shall be in accordance with Section 608 of the Specifications.
Filter fabric shall be in accordance with Section 715.3.5 of the Specifications.
Super silt fence shall be in accordance with Section 642.6.8 of the Specifications.

Square filter fabric to chain link fabric with ties spaced at 24" centers.
Posts shall be driven.

ELEVATION

SECTION A-A
NOTES

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

U-channel posts shall meet the requirements of Section 657.2 of the Specifications.

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

Steel hardware shall conform with Subsection 705.23 of the Specifications. Galvanized hardware with Subsections 705.36 and 705.37. Steel hardware shall be galvanized in accordance with ASTM A-153.

Top of posts shall extend to the top of signs.

All posts and signs shall be punched with 3/8-inch holes on 12-inch centers, notches shall be so located that the signs can be attached to the posts at three inches below the top of the sign and three inches above the bottom of the sign.
**STANDARD SURVEY MARKER**

**PLAN VIEW**

- Machine finished, stamped after setting to indicate Center Point, Control Station & Monument Elevations, or as directed by the Engineer.
- Mark for alignment reference after setting.

- Bronze Casting
- Concrete

**ELEVATION VIEW**

- Plan View Center punch & cross

**SECTION E-E**

- Bronze Casting
- Concrete

**NOTES**

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

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**ALTERNATE SURVEY MARKER**

**PLAN VIEW**

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

**ELEVATION VIEW**

- #6 Rebar
- 3 1/4" Min. Aluminum Dome 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**

**NOTES**

Survey markers shall conform to the requirements of the Standard Specifications.
NOTES:
ALL WOOD TO BE PRESSURE TREATED PINE.
TESTING OF THE MATERIALS WILL NOT BE REQUIRED.
THE COST OF ALL WORK AND MATERIALS SHALL INCLUDE
THE MAILBOX SUPPORT, REMOVING EXISTING MAILBOX SUPPORTS,
AND RELOCATING EXISTING MAILBOXES INTO NEW SUPPORTS.