April 25, 2018

Dear Standard Plan Book Holders:


The Michigan Department of Transportation has revised the subject standard plans as follows:

   Standard Plan R-49-G
   Standard Plan R-50-G
   Standard Plan R-51-E
   Standard Plan R-54-I
   Standard Plan R-71-C
   Standard Plan R-76-E

New permanent concrete barrier designs were adopted to satisfy federal requirements for conformance with the Manual for Assessing Safety Hardware (MASH).

Special Instructions:
For those choosing to maintain a loose leaf hard copy of the Standard Plans, the following assembly instructions are provided. Remove and replace the appropriate standard plans with the enclosed revisions.

Note that in some cases it may be necessary to retain the outdated plans until all projects using these superseded plans have been completed.

Questions regarding revisions may be submitted by email to: MDOT-Road-Design-Standards@michigan.gov

Sincerely,

Kristin Schuster
Engineer of Design

Enclosures

cc:     C. Libiran
        W. Pikka
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Note: Former Standard Plans IV-87, IV-89, IV-90, and IV-91 Series, used for building cast-in-place concrete headwalls for elliptical and circular pipe culverts, are now being replaced with plans that detail each specific size. The Municipal Utilities Unit will provide special details for inclusion in construction plans for MDOT projects. To assure prompt delivery, request must be made in advance. Contact Steve Urda 517-373-0745.

Former Standard Plans IV-93 and IV-94 series are being replaced with precast concrete slab & box culverts, as per a frequently used special provision (for slab culverts) and the 2012 Standard Specifications for Construction (for box culverts).
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**DETAIL SHOWING ALTERNATE METHOD OF INSTALLING CULVERT IN HIGH FILL AREAS**

- Proposed Ditch
- Proposed Shoulder
- Drainage Structure or Corrugated Metal Pipe End Section, etc.
- Corrugated Metal Pipe
- Alternate Location of Pipe
- Normal Laying Position of Pipe
- Elbows will be included in measurement of culvert pipe.

**DETAIL SHOWING DOWNSPOUT CONSTRUCTION USING METAL END SECTION ON UPPER END**

- Proposed Ditch End Section
- Pipe Downsput
- Standard Outlet Headwall or End Section (see notes)
- Elbows will be included in measurement of culvert pipe.

**NOTES:**

Concrete paved ditches shall be constructed with end anchors on both inlet and outlet ends and with intermediate anchors when the grade exceeds 15%. All edges and joints of concrete paved ditches shall be rounded to a radius of ¼”.

Corrugated metal pipe end sections may be used on the lower ends of steep culverts or downsputs with limited amounts of runoff or where they would be exposed to traffic in the clear zone. Corrugated metal pipe end sections in these locations may require additional erosion control such as more riprap. Toe plates should be called for when end sections are used on steep culverts or downsputs.

The concrete paved, grouted cobble, and plain cobble ditches shall be underlaid with geotextile. The edges of geotextile shall extend up the sides of the ditch bottom to the bottom of the mulch blanket and shall run the full length of the ditch. When overlapping occurs, overlap material a minimum of 2'-0".

Use high velocity mulch blankets on fill slopes 1:2 or steeper. Use standard mulch blankets on fill slopes flatter than 1:2.

**MICHIGAN DEPARTMENT OF TRANSPORTATION**

**BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR**

**PAVED AND COBBLE DITCHES, & DRAINAGE TREATMENT DETAILS**

9-10-2010 4-6-2010 R-46-D SHEET 2 OF 2
20'-0" MAXIMUM BETWEEN JOINTS

PLACE 1/4" x 4" FIBER JOINT FILLER BETWEEN BACK OF CONCRETE BARRIER AND CONCRETE FILLER WALL SLAB

6'-0" TYPICAL JOINT SPACING IN CONCRETE FILLER SLAB

1'-6" MIN.

HATCHED AREA INDICATES 1/4" FIBER JOINT FILLER

PIER COLUMNS

20'-0" MAXIMUM BETWEEN JOINTS

1" EXPANSION JOINT AT BRIDGE PIERS
SEE EXPANSION JOINT DETAIL

ELEVATION

TYPE A BARRIER

CONCRETE BARRIER
SECTION C-C

TO BE FILLED WITH GRANULAR MATERIAL CLASS II OR OTHER MATERIAL APPROVED BY THE ENGINEER (SEE NOTES)

ES JOINT (TYP)

CONCRETE VALLEY GUTTER OR CONCRETE SHOULDER (TYP)

VARIES 40° MIN.

SECTION D-D

TYPE A BARRIER

THICKNESS OF ADJACENT VALLEY GUTTER/SHOULDER OR 3" WHICHEVER IS GREATER

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

CONCRETE BARRIER

3-29-2018 2-24-2017 R-49-G
CONCRETE BARRIER

20'-0" MAXIMUM BETWEEN JOINTS

8'-0" TAPERED SECTION
(SEE NOTES)

1" EXPANSION JOINT AT BEGINNING AND END OF SPLIT SECTIONS
SEE EXPANSION JOINT DETAIL

CONSTRUCTION STATIONING SHALL BE PLACED ON BOTH SIDES OF THE BARRIER. USE 3" TO 4"
PAVEMENT STENCILS IMPRINTED ¼" DEEP.

BARREER REFLECTIVE MARKER
SEE STANDARD SPECIFICATIONS

HATCHED AREA INDICATES ¼" FIBER JOINT FILLER

E5 JOINT (TYP)

ELEVATION

TYPE B BARRIER
ELEVATION

TYPE B BARRIER

HATCHED AREA INDICATES
1/4" FIBER JOINT FILLER

20'-0" MAXIMUM BETWEEN JOINTS

PLACE 1/4" x 4" FIBER JOINT FILLER
BETWEEN BACK OF CONCRETE BARRIER
AND CONCRETE FILLER WALL SLAB

6'-0" TYPICAL JOINT SPACING
IN CONCRETE FILLER SLAB

1'-6" MIN.

2" CLEARANCE FOR
SLIP-FORMING (TYP)

PLACE 4" DRAIN HOLES
AT 10'-0" MAX. SPACING
OUTSIDE PIER COLUMNS

1" EXPANSION JOINT
AT BRIDGE PIERS
SEE EXPANSION JOINT DETAIL

PLAN

PIER COLUMNS

4" DRAIN HOLE (TYP)

24

1

ES JOINT (TYP)

1/4" FIBER JOINT FILLER (TYP)

PLANE OF
WEAKNESS JOINT

20'-0" MAXIMUM BETWEEN JOINTS

407 x 407
SECTION E-E

SECTION F-F

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR
CONCRETE BARRIER

3-29-2018
F.H.W.A. APPROVAL
2-24-2017
PLAN DATE
R-49-G SHEET
1 OF 9
SECTION G-G

- 4" concrete filler slab (see notes)
- 1/4" fiber joint filler (typ)
- To be filled with granular material class II or other material approved by the engineer (see notes)
- E5 joint (typ)
- Concrete valley gutter or concrete shoulder (typ)

SECTION H-H

- 4" concrete filler slab (see notes)
- 1/4" fiber joint filler (typ)
- To be filled with granular material class II or other material approved by the engineer (see notes)
- E5 joint (typ)
- Concrete valley gutter or concrete shoulder (typ)

4" drain hole

2" clearance for slip-forming (typ)
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

CONCRETE BARRIER

1. Barrier reflector markers shall match color of edge line.

2. 25'-0" on curves with a radius less than 1150'.

3. 50'-0" on tangent sections and curves with a radius of 1150' or more.

The concrete barrier shall be constructed on an existing base or shoulder and dowelled with epoxy coated #6 deformed bars 1"-3" long. Dowel placement shall start 1'-6" from end of standard section. Dowels shall be placed every 3'-0" along the barrier alternating from side to side. 16'-0" C-C along each side. Dowels are included in the pay item "Concrete Barrier, Double Face, Type B". On split sections, dowels shall be placed 3'-0" C-C along each side of the barrier. Spacing may be adjusted to avoid conflict with joints. Dowels are included in the pay item "Concrete Barrier, Double Face, Type B". The base for "Concrete Barrier, Double Face, Type B" will be paid for separately (for example: as concrete shoulder, concrete base course, etc.).

The tamped sections at the beginning and end of concrete barrier, split are included in the pay item "Concrete Barrier, Split, Type __".

The top and faces of the barrier shall not vary more than 1/4" in 10' when checked with a 10' straightedge, except at grade changes and curves, and shall be free of rumps, sags, and other irregularities.

The concrete filler slab shall be paid for as "Sidewalk, Conc. 4 Inch". The 1/4" fiber joint filler shall be included in the pay item "Sidewalk, Conc. 4 Inch".

The class II granular material used in filling split barrier sections will be paid for as "Concrete Backfill, CIP".

Place 1" expansion joints at 400' intervals in both type A and type B barriers. Also place 1" expansion joints at split sections and on both ends of all structures (including sign support foundations, light standard foundations, bridge piers, or any structure with a foundation). Place 1" expansion joints in 4" concrete filler slab aligned with expansion joints in barrier.

Plane of weakness joint spacing shall be 20'-0" maximum and 10'-0" minimum. Plane of weakness joints in the barrier shall be to a depth of at least 4" and shall be edged.

Barrier shall be ended so as to not present a hazard to approaching traffic, such as by curving it away from a target position beyond the clear zone, by ending at a structure, or by utilizing an impact attenuation device.

For valley gutter details, see standard plan R-33-series.

End longitudinal joint will not be paid for separately but shall be included in the payment for the valley gutter or shoulder which is adjacent to the barrier wall on the base for the concrete barrier.

Barrier reflector markers are to be spaced at the following intervals:

1) 50'-0" on tangent sections and curves with a radius of 1150' or more.

2) 25'-0" on curves with a radius less than 1150'.

Barrier reflector markers shall match color of edge line.

NOTES:

When "Concrete Barrier, Double Face, Type A" is designated on the plans, the barrier may be constructed using dowels and a widened base as specified for the "Concrete Barrier, Double Face, Type B". The dowels, extra width of base, or any extra work required will be included in the pay item "Concrete Barrier, Double Face, Type A".

When "Concrete Barrier, Double Face, Type B" is designated on the plans, the barrier shall be constructed on an existing base or shoulder and dowelled with epoxy coated #6 deformed bars 1"-3" long. Dowel placement shall start 1'-6" from end of standard section. Dowels shall be placed every 3'-0" along the barrier alternating from side to side. 16'-0" C-C along each side. Dowels are included in the pay item "Concrete Barrier, Double Face, Type B". On split sections, dowels shall be placed 3'-0" C-C along each side of the barrier. Spacing may be adjusted to avoid conflict with joints. Dowels are included in the pay item "Concrete Barrier, Double Face, Type B". The base for "Concrete Barrier, Double Face, Type B" will be paid for separately (for example: as concrete shoulder, concrete base course, etc.).
LIGHT STANDARD FOUNDATION
(CONCRETE BARRIER, DOUBLE FACE)
MICHIGAN DEPARTMENT OF TRANSPORTATION

BUREAU OF DEVELOPMENT

STANDARD PLAN FOR

LIGHT STANDARD FOUNDATION
(CONCRETE BARRIER, DOUBLE FACE)

SECTION A-A
(TYPE A BARRIER)

SECTION A-A
(TYPE B BARRIER)

CONCRETE VALLEY GUTTER (TYP)
SEE STANDARD PLAN R-33-SERIES

E5 JOINT (TYP)
SEE STANDARD PLAN R-49-SERIES

CONCRETE VALLEY GUTTER (TYP)
SEE STANDARD PLAN R-33-SERIES

CONCRETE VALLEY GUTTER (TYP)
SEE STANDARD PLAN R-33-SERIES

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

LIGHT STANDARD FOUNDATION
(CONCRETE BARRIER, DOUBLE FACE)

3-29-2018 4-21-2017 R-50-G SHEET 3 OF 6
SECTION B-B
(TYPE A BARRIER)
UNIFORMLY TRANSITION THE BARRIER FACES
FROM SINGLE SLOPE SHAPE TO VERTICAL WALL

SECTION B-B
(TYPE B BARRIER)
UNIFORMLY TRANSITION THE BARRIER FACES
FROM SINGLE SLOPE SHAPE TO VERTICAL WALL
GROUNDING ROD

ANCHOR BOLT (TYP)

\% OF ANCHOR BOLT TIES

E5 JOINT (TYP) SEE STANDARD PLAN R-49-SERIES

SECTION C-C

2'-8"

3"

\% BEVEL OR 1" R (TYP)

SECTION D-D

4-21-2017

3-29-2018

2'-8"

3"

\% BEVEL OR 1" R (TYP)

LIGHT STANDARD FOUNDATION (CONCRETE BARRIER, DOUBLE FACE)
MICHIGAN DEPARTMENT OF TRANSPORTATION

SHEET PLAN

STATEMENT OF SNAP DATE

F.H.W.A. APPROVAL

BUREAU OF DEVELOPMENT STANDARD PLAN FOR

BAR

SIZE

LENGTH

REQUIRED

WEIGHT (LBS)

A1

#5

11'-6"

24

288

A2

#5

5'-6"

44

252

D

#4

6'-5"

44

190

TOTAL WEIGHT OF STEEL = 730 LBS

STEEL REINFORCEMENT (EPOXY COATED)

CONCRETE QUANTITIES

FOOTING

2.7 CYD

VERTICAL WALL SECTION

4.9 CYD

TRANSITION SECTIONS (TYPE A)

5.9 CYD

TRANSITION SECTIONS (TYPE B)

6.2 CYD

NOTES:

THE SIDE CONFIGURATION SPECIFIED ON THIS PLAN CONFORMS TO THE "SINGLE SLOPE" SHAPE.

ALL EXPOSED EDGES ON THE BARRIER SHALL HAVE A 1/2" BEVEL OR 1" RADIUS.

ANCHOR BOLTS, NUTS, AND WASHERS SHALL BE ACCORDING TO THE CURRENT STANDARD SPECIFICATIONS.

PRIOR TO BEING APPROVED FOR SHIPMENT, EACH SET OF FOUR ANCHOR BOLTS SHALL BE TIED TOGETHER INTO A BASKET BY WELDING #6 BAR CIRCLES (OR APPROVED EQUAL) ALONG WITH SECURING A 1/4" PLYWOOD (OR APPROVED EQUAL) TEMPLATE. THE ANCHOR BOLT BASKET SHALL BE CAREFULLY SET AND HELD VERTICAL AT THE CORRECT LOCATION AND AT THE PROPER HEIGHT WITH THE 1/4" PLYWOOD (OR APPROVED EQUAL) TEMPLATE.

THE CONCRETE VALLEY GUTTER USED IN CONJUNCTION WITH THE LIGHT STANDARD FOUNDATION SHALL BE CONSTRUCTED AS DETAILED ON THIS PLAN.

WORK THIS STANDARD WITH STANDARD PLAN R-49-SERIES AND WHEN APPLICABLE R-33-SERIES.

MATERIALS FOR THE ELECTRICAL GROUNDING SYSTEM SHALL BE ACCORDING TO THE STANDARD SPECIFICATIONS UNLESS OTHERWISE SPECIFIED ON THIS PLAN.

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

LIGHT STANDARD FOUNDATION
(CONCRETE BARRIER, DOUBLE FACE)

3-29-2018

F.H.W.A. APPROVAL

4-21-2017

PLAN DATE

R-50-G

SHEET

6 OF 6
Plan showing steel reinforcement.

Elevation showing steel reinforcement.

C bars 50 spaces at 6" = 25'-0" in barrier wall for sign support D.

C bars 44 spaces at 6" = 22'-0" in barrier wall for sign support C.

A2 bars 44 spaces at 6" = 22'-0" in footing for sign support C.

A2 bars 50 spaces at 6" = 25'-0" in footing for sign support D.

A1 bars 50 spaces at 6" = 25'-0" in barrier wall for sign support D.

A1 bars 44 spaces at 6" = 22'-0" in footing for sign support C.

A1 bars at 1'-6" spacing in footing.
CONCRETE BARRIER, DOUBLE FACE

TRANSITION SECTION

16'-0"

SIGN SUPPORT SECTION

CONTRACTION JOINT (TYP)

1" EXPANSION JOINT (TYP)

EDGE OF SHOULDER

VALL EY G U T T ER

CONCRETE

TRANSITION SECTION PLAN

(TYPE B BARRIER)

CONCRETE VALLEY GUTTER (TYP)

SEE STANDARD PLAN R-33-SERIES

SECTION A-A

(TYPE A BARRIER)

CONCRETE VALLEY GUTTER (TYP)

SEE STANDARD PLAN R-49-SERIES

ES JOINT (TYP)

SEE STANDARD PLAN R-49-SERIES

PLACE GLARE SCREEN ON THE SIDE APPROACHING THE SIGN SUPPORT FOUNDATION (TYP)

UNIFORMLY TRANSITION ES JOINT FROM 3" OUTSIDE THE FACE OF THE CONCRETE BARRIER, DOUBLE FACE TO FLUSH WITH THE SIGN SUPPORT SECTION OVER THE LENGTH OF THE TRANSITION SECTION

MAINTAIN UNIFORM DEPTH OF FLOW LINE IN CONCRETE VALLEY GUTTER (TYP)

0.5" BEVEL OR 1" R (TYP)

1'-4"
SECTION A-A
(TYPE B BARRIER)

SECTION B-B
(TYPE A BARRIER)

SECTION B-B
(TYPE B BARRIER)

NOTE:
MAINTAIN CONSTANT BARRIER SLOPE ON BOTH SIDES
OF THE BARRIER THROUGHOUT THE ENTIRE LENGTH
OF THE TRANSITION SECTION.

FLOW LINE

NOTE:
UNIFORMLY TRANSITION ES JOINT FROM 3" OUTSIDE
THE FACE OF THE CONCRETE BARRIER, DOUBLE FACE
TO FLUSH WITH THE SIGN SUPPORT SECTION OVER
THE LENGTH OF THE TRANSITION SECTION.

NOTE:
UNIFORMLY TRANSITION ES JOINT FROM 3" OUTSIDE
THE FACE OF THE CONCRETE BARRIER, DOUBLE FACE
TO FLUSH WITH THE SIGN SUPPORT SECTION OVER
THE LENGTH OF THE TRANSITION SECTION.
ANCHOR BOLT ALIGNMENT

Michigan Department of Transportation
Bureau of Development Standard Plan for
Sign Support Foundation
(Concrete Barrier, Double Face)

3-29-2018 4-21-2017 R-51-E Sheet 5 of 6
STEEL REINFORCEMENT (EPOXY COATED)

<table>
<thead>
<tr>
<th>BAR</th>
<th>BAR SIZE</th>
<th>LENGTH</th>
<th>NUMBER REQUIRED</th>
<th>WEIGHT (LBS)</th>
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<tbody>
<tr>
<td>A1</td>
<td>#5</td>
<td>22'-2&quot;</td>
<td>22</td>
<td>509</td>
</tr>
<tr>
<td>A2</td>
<td>#5</td>
<td>9'-2&quot;</td>
<td>90</td>
<td>861</td>
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<tr>
<td>C</td>
<td>#4</td>
<td>5'-6½&quot;</td>
<td>90</td>
<td>334</td>
</tr>
</tbody>
</table>

TOTAL WEIGHT OF STEEL = 1,704 LBS

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<thead>
<tr>
<th>BAR</th>
<th>BAR SIZE</th>
<th>LENGTH</th>
<th>NUMBER REQUIRED</th>
<th>WEIGHT (LBS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>#5</td>
<td>25'-2&quot;</td>
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<td>578</td>
</tr>
<tr>
<td>A2</td>
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<td>102</td>
<td>976</td>
</tr>
<tr>
<td>C</td>
<td>#4</td>
<td>5'-6½&quot;</td>
<td>102</td>
<td>378</td>
</tr>
</tbody>
</table>

TOTAL WEIGHT OF STEEL = 1,932 LBS

CONCRETE QUANTITIES

<table>
<thead>
<tr>
<th>SIGN SUPPORT TYPE</th>
<th>SIGN SUPPORT FOOTING SECTION NUMBER</th>
<th>SIGN SUPPORT TRANSITION SECTION (TYPE A)</th>
<th>TRANSITION SECTIONS (TYPE B)</th>
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</thead>
<tbody>
<tr>
<td>C</td>
<td>10.0 CYD</td>
<td>12.3 CYD</td>
<td>13.7 CYD</td>
</tr>
<tr>
<td>D</td>
<td>11.3 CYD</td>
<td>13.9 CYD</td>
<td>14.5 CYD</td>
</tr>
</tbody>
</table>

NOTES:

THE SIDE CONFIGURATION SPECIFIED ON THIS PLAN CONFORMS TO THE "SINGLE SLOPE" SHAPE.

ALL EXPOSED EDGES ON THE BARRIER SHALL HAVE A ½" BEVEL OR 1" RADIUS.

ANCHOR BOLTS, NUTS, AND WASHERS SHALL BE ACCORDING TO THE CURRENT STANDARD SPECIFICATIONS.

ANCHOR BOLTS SHALL BE CAREFULLY SET AND HELD VERTICAL AT THE CORRECT LOCATION AND AT THE PROPER ELEVATION WITH ¼" PLYWOOD (OR APPROVED EQUAL) TEMPLATE UNTIL CONCRETE IS SET. EACH SET OF FOUR BOLTS SHALL BE TIED TOGETHER BY WELDING INTO A BASKET WITH #6 BAR CIRCLES (OR APPROVED EQUAL) ALONG WITH SECURING A ¼" PLYWOOD (OR APPROVED EQUAL) TEMPLATE IN PLACE PRIOR TO BEING APPROVED FOR SHIPPING (SEE ANCHOR BOLT DETAIL).

SIGN SUPPORT FOUNDATION INCLUDES THE TRANSITION SECTION ON BOTH ENDS WITH THE 1" EXPANSION JOINTS USED TO GAP FOR STRUCTURES BEING PLACED AS SPECIFIED ON THIS PLAN.

MODIFICATIONS TO THE CONCRETE VALLEY GUTTER AND LOCATION OF THE CONCRETE GLARE SCREEN USED IN CONJUNCTION WITH THE SIGN SUPPORT FOUNDATION SHALL BE CONSTRUCTED AS DETAILED ON THIS PLAN AND INCLUDED IN THEIR RESPECTIVE ITEMS AND PAID FOR AT THE CONTRACT UNIT PRICE PER LINEAR FEET, WHICH INCLUDES PAYMENT IN FULL FOR ALL WORK AND MATERIALS.

WORK THIS STANDARD WITH STANDARD PLAN R-49-SERIES AND WHEN APPLICABLE R-33-SERIES AND R-76-SERIES.
**Concrete Barrier, Single Face, Type B**

*(In Line with Bridge Columns or Abutment)*

*NOTE:*

Epoxy coated dowel bars shall be #6 deformed bars 1'-3" long spaced at 1'-6" with 6" embedment in footing or concrete shoulder starting at 1'-6" from the beginning of the barrier. Spacing shall be no closer than 1'-6" from any transverse joint. Spacing may be adjusted to avoid any conflict.

**Section D - D**

Concrete Barrier, Single Face, Type B (shown)

(In Front of Bridge Columns or Abutments)

**Section E - E**

Concrete Barrier, Single Face, Type B (shown)

(In Line with Bridge Columns or Abutments)

**Michigan Department of Transportation**

Bureau of Development Standard Plan for

Concrete Barrier, Single Face

3-29-2018 1-4-2018 R-54-I Sheet 2 of 4
**Concrete Barrier, Single Face, Type C**

*Guardrail Anchorage, Bridge* (see standard plan R-67-series)

*Guardrail Approach Terminal* (see standard plan R-61-series)

**Flare Chart**

<table>
<thead>
<tr>
<th>Maximum Flare</th>
<th>Design Speed (MPH)</th>
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</thead>
<tbody>
<tr>
<td>1:20</td>
<td>70</td>
</tr>
<tr>
<td>1:18</td>
<td>60</td>
</tr>
<tr>
<td>1:16</td>
<td>55</td>
</tr>
<tr>
<td>1:14</td>
<td>50</td>
</tr>
<tr>
<td>1:12</td>
<td>45</td>
</tr>
<tr>
<td>1:10</td>
<td>40</td>
</tr>
<tr>
<td>1:8</td>
<td>30</td>
</tr>
</tbody>
</table>

The maximum flare rate of the concrete barrier is limited by its length and the maximum allowable departure angle for the specified design speed. The flare rate of the concrete barrier is limited by its length and maximum 15' offset.

**Concrete Barrier, Single Face, Type C**

(with guardrail ending)

**Elevation View**

**Cross Section View**

Concrete Barrier, Single Face, Type C

(in line with bridge columns or abutment)
CURVES, AND SHALL BE FREE OF HUMPS, SAGS, AND OTHER IRREGULARITIES. WHEN CHECKED WITH A 10' STRAIGHTEDGE, EXCEPT AT GRADE CHANGES AND THE TOP AND FACES OF THE BARRIER SHALL NOT VARY MORE THAN \( \frac{1}{8} \) IN 10'.

In a cut section, the concrete barrier shall be ended by burying it 2\( ^\prime\) deep and shall be edged.

Joints in the concrete footing shall coincide with the joints in the concrete barrier.

Plane of weakness joints in the concrete barrier shall be at least 2\( ^\prime\)\( ^2\) deep and shall be edged.

In a cut section, the concrete barrier shall be ended by burying it in the side slope.

In fill sections, the concrete barrier shall be ended with guardrail anchorage, bridge, detail T1 and guardrail approach terminal type 1B. The guardrail anchorages shall be built according to standard plan R-67-series. The guardrail approach terminal shall be built according to standard plan R-61-series. The bridge approach curb & gutter will be either detail 1, 2, or 3, as specified on the plans and constructed according to standard plan R-32-series.

The top and faces of the barrier shall not vary more than 1\( ^\prime\) in 10\( ^\prime\) when checked with a 10' straightedge, except at grade changes and curves, and shall be free of humps, sags, and other irregularities.

"Concrete barrier, single face, type A" is concrete barrier cast monolithic with concrete footings. Type B is concrete barrier dowelled to nonreinforced concrete shoulders or to a separate base; Type C is concrete barrier placed on concrete post footings, with no backfill to support the back side of the barrier wall. When "Concrete barrier, single face, type A" is designated on the plans, the barrier may be constructed using dowels and a widened base as specified for the "Concrete barrier, single face, type B". The dowels, extra width of base, or any extra work required will be included in the pay item "cond barrier, single face, type A".

The underdrain, located behind the concrete barrier and at the elevation of the top of shoulder, is a minimum 4" diameter foundation underdrain wrapped with geotextile. Class II AA granular material must be placed around the underdrain and at least 12" above it. The remainder of the fill will be according to current specifications.

For details of the shoulder section, see typical cross-sections in the road plans. Barrier reflector markers are to be spaced at the following intervals:

1) 50'-0" on tangent sections and curves with a radius of 1150' or more.
2) 25'-0" on curves with a radius less than 1150'.

Barrier reflector markers shall match color of edge line.

**NOTES:**

The side configuration specified on this plan conforms to the single slope shape as specified on standard plan R-49-series.

Place 1" expansion joints in the concrete barrier at approximately 400' intervals. Also place 1" expansion joints at structures (including sign supports, light standard foundations, bridge piers, or any structure with a foundation). Location of expansion joints should be adjusted to match expansion joints in the shoulder.

Plane of weakness joint spacing shall be 20' maximum and 10' minimum except when the barrier is on a concrete shoulder. Plane of weakness joint spacing shall coincide with contraction joints in the shoulder.

Joints in the concrete footing shall coincide with the joints in the concrete barrier.

Plane of weakness joints in the concrete barrier shall be at least 2\( ^\prime\)\( ^2\) deep and shall be edged.

In a cut section, the concrete barrier shall be ended by burying it in the side slope.

In fill sections, the concrete barrier shall be ended with guardrail anchorage, bridge, detail T1 and guardrail approach terminal type 1B. The guardrail anchorages shall be built according to standard plan R-67-series. The guardrail approach terminal shall be built according to standard plan R-61-series. The bridge approach curb & gutter will be either detail 1, 2, or 3, as specified on the plans and constructed according to standard plan R-32-series.

The top and faces of the barrier shall not vary more than 1\( ^\prime\) in 10\( ^\prime\) when checked with a 10' straightedge, except at grade changes and curves, and shall be free of humps, sags, and other irregularities.

"Concrete barrier, single face, type A" is concrete barrier cast monolithic with concrete footings. Type B is concrete barrier dowelled to nonreinforced concrete shoulders or to a separate base; Type C is concrete barrier placed on concrete post footings, with no backfill to support the back side of the barrier wall. When "Concrete barrier, single face, type A" is designated on the plans, the barrier may be constructed using dowels and a widened base as specified for the "Concrete barrier, single face, type B". The dowels, extra width of base, or any extra work required will be included in the pay item "cond barrier, single face, type A".

The underdrain, located behind the concrete barrier and at the elevation of the top of shoulder, is a minimum 4" diameter foundation underdrain wrapped with geotextile. Class II AA granular material must be placed around the underdrain and at least 12" above it. The remainder of the fill will be according to current specifications.

For details of the shoulder section, see typical cross-sections in the road plans. Barrier reflector markers are to be spaced at the following intervals:

1) 50'-0" on tangent sections and curves with a radius of 1150' or more.
2) 25'-0" on curves with a radius less than 1150'.

Barrier reflector markers shall match color of edge line.
**FILLER WALLS AT BRIDGE PIER COLUMNS**

**FILLER WALLS USING SLOPE PROTECTION HEADER AS FOOTING**

**ELEVATION**

- 3/4" BEVEL (TYP.)
- 1'-0" SPACING TYPICAL
- #6 REINFORCING STEEL
- **ADHESIVE ANCHORED HORIZONTAL OR VERTICAL BAR INSTALLATION DETAIL**
  (UNLESS OTHERWISE DETAILED)
  - REINFORCING STEEL SHALL BE TESTED ACCORDING TO THE CURRENT SPECIFICATIONS PRIOR TO BENDING. THE REINFORCING STEEL SHALL THEN BE FIELD BENT RADIALLY TO CIRCULAR PIERS AND PARALLEL TO THE FILLER WALL. FIELD BENDING SHALL BE ACCORDING TO THE CURRENT SPECIFICATIONS. ANY DAMAGE TO THE EPOXY COATING DURING TESTING OR BENDING SHALL BE REPAIRED AT THE CONTRACTORS EXPENSE.
  - **PLACE ONE 2" x 4" WEEP HOLE IN EACH FILLER WALL SECTION. (MAY BE RANDOMLY LOCATED)**

**PLAN**

- PIER FOOTING
- 1/4" JOINT FILLER (TYP.)
- 1/2" BEVEL (TYP.) SQUARE COLUMNS
- #4 BARS AT 1'-6" SPACINGS, BOTH SIDES
- **ADHESIVE ANCHORED HORIZONTAL BAR (TYP.)**
- **ADHESIVE ANCHORED VERTICAL BAR INSTALLATION DETAIL**
  - **ADHESIVE ANCHORED HORIZONTAL OR VERTICAL BAR INSTALLATION DETAIL**
    (UNLESS OTHERWISE DETAILED)
  - **PLACE ONE 2" x 4" WEEP HOLE IN EACH FILLER WALL SECTION. (MAY BE RANDOMLY LOCATED)**

**SKETCH OF FILLER WALLS AT SQUARE PIER COLUMNS**

- **SKETCH OF FILLER WALLS AT CIRCULAR PIER COLUMNS**

**END**
CONCRETE BARRIER, DOUBLE FACE TRANSITION SECTION

ELEVATION VIEW

GUARDRAIL ANCHORAGE, MEDIAN

6'-3" TYPICAL POST SPACING
GUARDRAIL, TYPE TD

* GUARDRAIL TYPE, MGS-80

25'-0"

3'-6" 15" POST SPACING
4 SPACES

1'-6 3/4" POST SPACING
3 SPACES

3'-1 1/2" POST SPACING
1 SPACE

34' TYPE TD
(SEE STANDARD PLAN R-60-SERIES
FOR POST SPACING AND GUARDRAIL
LAYOUT TO TRANSITION FROM
GUARDRAIL, TYPE MGS-80 TO
GUARDRAIL ANCHORAGE, MEDIAN.

ELEVATION VIEW

THREE BEAM TERMINAL CONNECTOR
(SEE STANDARD PLAN R-67-SERIES)

THREE BEAM EXPANSION SECTION
(SEE STANDARD PLAN R-67-SERIES)

SECTION A-A

SECTION B-B

SECTION C-C

UNIFORMLY TRANSITION THE BARRIER FACES
FROM SINGLE SLOPE SHAPE TO VERTICAL WALL

HIGH STRENGTH 3/8" DIAMETER x 26" LONG HEX HEAD
BOLTS WITH 2" MINIMUM THREAD LENGTH AND NUTS WITH
ROUND WASHERS FRONT AND BACK SHALL BE USED TO
CONNECT GUARDRAIL TO CONCRETE BARRIER, DOUBLE FACE
TRANSITION SECTION.

DETAILS FOR CONNECTING GUARDRAIL TO CONCRETE BARRIER, DOUBLE FACE

NOTES:

SEE STANDARD PLANS R-60-SERIES AND R-67-SERIES. FOR DETAILS OF
CURRENT GUARDRAIL HARDWARE, AND STANDARD PLAN R-49-SERIES FOR
CONCRETE BARRIER.

CONCRETE BARRIER, DOUBLE FACE TRANSITION SECTION SHALL BE INCLUDED
IN THE PAY ITEM "CONCRETE BARRIER, DOUBLE FACE, TYPE ...".
WOODEN BUMPER RAIL
(FOR ANGLE PARKING)

CONCRETE PARKING RAIL
WOOD MAILBOX POST

WOOD GUARD POST

RUSTIC GUIDE POST

NOTES:

POSTS AND RAILS SHALL CONFORM TO THE CURRENT STANDARD SPECIFICATIONS FOR CONSTRUCTION, WHICH INCLUDES ALLOWABLE SPECIES AND PRESERVATION TREATMENT.

RUSTIC GUIDE POST SHALL BE ACCORDING TO THE CURRENT STANDARD SPECIFICATIONS FOR RUSTIC CONSTRUCTION.

COUNTERSUNK BOLTS USED IN WOODEN BUFFER RAILS SHALL NOT EXTEND BEYOND POST SURFACE NOR SHALL THE THREADS EXTEND LESS THAN 1/8" BEYOND THE NUT. PLACE ONE WASHER EACH BEHIND THE BOLT HEAD AND NUT.

CONCRETE PAVING RAIL SHALL BE CONSTRUCTED IN 8'-0" LENGTHS UNLESS OTHERWISE INDICATED ON THE PLANS. HOLES DRILLED IN CONCRETE PAVING FOR ANCHOR PINS WILL BE PAID FOR AS PART OF CONSTRUCTION OF PAVING RAIL.

ALTERNATE MAILBOX SUPPORT DESIGNS MEETING THE PERFORMANCE CRITERIA OF NCHRP REPORT 350 MAY BE USED AS APPROVED BY THE ENGINEER.

REST AREA GUIDE POST

6" X 8" POST SHOULD NOT BE MIXED WITH RUSTIC (ROUND) GUIDE POSTS. PLACE SO THAT 8" DIMENSION FACES THE PAVED AREA.

ROADSIDE CONTROL GUARD POST

PLACE SO THAT 8" DIMENSION FACES THE PAVED AREA (PARALLEL TO DIRECTION OF TRAFFIC)

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY TECHNICAL SERVICES

BUMPER & PARKING RAILS,
AND MISC. WOOD POSTS
CONCRETE GLARE SCREEN CROSS - SECTION

MATCH JOINTS IN CONCRETE BARRIER (SEE NOTES)

1'-0" 1'-0"

4 "D" BARS EQUALLY SPACED WHEN JOINT SPACING IS LESS THAN 20'

5 "D" BARS EQUALLY SPACED WHEN JOINT SPACING IS LESS THAN 20" OR GREATER

2'-6"

EPOXY COATED #4 "D" BAR (TYP)

ELEVATION VIEW OF
CONCRETE GLARE SCREEN REINFORCED WITH "D" BARS

MATCH JOINTS IN CONCRETE BARRIER (SEE NOTES)

3" 3'-0"

6 DOWEL BARS EQUALLY SPACED WHEN JOINT SPACING IS 20" OR LESS

7 DOWEL BARS EQUALLY SPACED WHEN JOINT SPACING IS GREATER THAN 20"

3"

EPOXY COATED #4 BAR

EPOXY COATED #4 BAR 1'-1" LONG (TYP)

ELEVATION VIEW OF
CONCRETE GLARE SCREEN REINFORCED WITH DOWELS AND LONGITUDINAL BARS

DEPARTMENT DIRECTOR
Kim T. Stouder

KIMBERLY
AVERY
DIRECTOR, BUREAU OF FIELD SERVICES

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

CONCRETE GLARE SCREEN

PREPARED BY
REINFORCED WITH DOWELS

APPROVED BY:
DIRECTOR, BUREAU OF FIELD SERVICES

3-29-2018
F.H.W.A. APPROVAL

R-76-E SHEET
1 OF 3

CHECKED BY: M.R.P.

DRAWN BY: R.L.T.

APPROVED BY:
DIRECTOR, BUREAU OF DEVELOPMENT

3-22-2017 PLAN DATE
PLAN VIEW AT BRIDGE PIERS

SECTION A-A

LOCATION OF CONCRETE GLARE SCREEN THROUGH WIDENED PORTIONS OF MEDIAN BARRIERS AT PIERS

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR
CONCRETE GLARE SCREEN

CONCRETE BARRIER
CONCRETE BARRIER - SPLIT AND CONCRETE GLARE SCREEN - SPLIT

8'-0" TAPERED SECTION

DIRECTION OF TRAFFIC

2" CLEARANCE FOR SLIP-FORMING (TYP)

4" CONCRETE FILLER SLAB

1/4" FIBER JOINT FILLER (TYP)

TO BE FILLED WITH GRANULAR MATERIAL CLASS II OR OTHER MATERIAL APPROVED BY THE ENGINEER (SEE NOTES)

9'6" 7'6"

7'6" 9'6"

1 1/4" R. (TYP)

GLARE SCREEN, CONCRETE, SPLIT

CONCRETE BARRIER, SPLIT

2017-03-29

CONCRETE BARRIER - SPLIT AND CONCRETE GLARE SCREEN - SPLIT

CONCRETE GLARE SCREEN

F.H.W.A. APPROVAL
PLAN DATE
R-76-E SHEET
2 OF 3
CONCRETE GLARE SCREEN ENDINGS

(USE SAME ENDING WHEN REINFORCEMENT IS OMITTED)

NOTES:

CONTRACTION JOINTS SHALL BE FORMED AND EDGED TO A DEPTH OF AT LEAST 1" ON BOTH SIDES.

MATCH CONTRACTION JOINTS IN CONCRETE GLARE SCREEN WITH PLANE OF WEAKNESS JOINTS IN CONCRETE BARRIER, AND MATCH EXPANSION JOINTS IN CONCRETE GLARE SCREEN WITH EXPANSION JOINTS IN CONCRETE BARRIER.


EXPANSION JOINTS SHALL BE CONSTRUCTED BY INSERTING A 1" FIBER JOINT FILLER IN LINE WITH EXPANSION JOINTS IN THE CONCRETE BARRIERS. ALL EDGES AND JOINTS SHALL BE ROUNDED, EXCEPT THE BASE WHEN IT IS LESS THAN THE WIDTH OF THE CONCRETE BARRIER.

WHEN THE LONGITUDINAL BAR IS FED IN CONTINUOUSLY IN LIEU OF TYING TO THE DOWEL BAR, CONTRACTION JOINTS SHALL BE SAWSED, CUTTING REINFORCING STEEL, AFTER CONCRETE HAS BEEN ALLOWED TO HARDEN.

SIDE SLOPE OF THE CONCRETE GLARE SCREEN SHALL MATCH SIDE SLOPE OF ADJOINING CONCRETE BARRIER.

REINFORCEMENT IN CONCRETE GLARE SCREEN SHALL BE GRADE 40 STEEL.

KINKED LONGITUDINAL BARS SHALL NOT BE USED.

WHEN CONCRETE GLARE SCREEN IS INCLUDED IN THE SAME CONTRACT WITH CONCRETE BARRIER AND CONCRETE BARRIER, SPLIT, THE TWO STRUCTURES SHALL BE CAST MONOLITHICALLY; NO STEEL REINFORCEMENT IS REQUIRED. WHEN CONCRETE GLARE SCREEN IS TO BE PLACED ON CONCRETE BARRIERS HAVING VARIABLE HEIGHT, THE CONTRACTOR WILL HAVE THE OPTION OF CASTING MONOLITHICALLY OR SEPARATELY. WHEN CAST SEPARATELY, THE GLARE SCREEN WILL BE REINFORCED AS SPECIFIED ON SHEET 1 OF THIS PLAN.
GRANULAR BLANKET TYPE 1

MATERIAL FOR "GRANULAR BLANKET" SHALL BE GRANULAR MATERIAL CLASS II

SOIL

POSSIBLE SEEPAGE PLANE

POSSIBLE SEEPAGE PLANE (TYP.)

DRAINAGE LAYER

GRANULAR MATERIAL CLASS II

2" LAYER OF OPEN-GRADED AGGREGATE WITH GEOTEXTILE BLANKET ABOVE AND BELOW, OR THREE DIMENSIONAL MESH WITH GEOTEXTILE BLANKET ABOVE AND BELOW, OR OTHER APPROVED GEOCOMPOSITE SECTION

GRANULAR MATERIAL CLASS II

12" MINIMUM DEPTH

BANK UNDERDRAIN (PIPE SHALL BE WRAPPED WITH GEOTEXTILE)

THE BOTTOM EDGE OF THE PREFABRICATED DRAINAGE GEOCOMPOSITE SHALL BE FLUSH WITH THE SURFACE AT A MINIMUM OF 6" ABOVE DITCH BOTTOM

NOTE: OPTION 1, 2, OR 3 WILL BE DETERMINED BY THE ENGINEER BASED ON THE PROJECT CONDITIONS.

GRANULAR BLANKET TYPE 2

MATERIAL FOR "GRANULAR BLANKET" SHALL BE GRANULAR MATERIAL CLASS II

POSSIBLE SEEPAGE PLANE

POSSIBLE SEEPAGE PLANE (TYP.)

DRAINAGE LAYER

GRANULAR MATERIAL CLASS II

3" NOMINAL DEPTH

GRANULAR MATERIAL CLASS II

6" MINIMUM DEPTH

BANK UNDERDRAIN (PIPE SHALL BE WRAPPED WITH GEOTEXTILE)

BANK UNDERDRAIN (ALTERNATE LOCATION) (PIPE SHALL BE WRAPPED WITH GEOTEXTILE)

BANK UNDERDRAIN (PIPE SHALL BE WRAPPED WITH GEOTEXTILE)