May 28, 2020

Dear Standard Plan Book Holders:


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

**Standard Plan R-1-G**
Added the term “minimum” to the wall thicknesses in the typical manhole detail on sheet one. On sheet two, eliminated the structure sizes on the details for the catch basin, inlet, and the two larger precast sumps and revised a note to reference the manhole details for size options. On sheet four, expanded the table of dimensions and revised the notes related to the details to cover the larger structure sizes added on sheets five through eight. Revised notes in the note section to allow the holes in a riser to be formed by scribing and specifying the maximum allowable pipe sizes entering or exiting drainage structures.

**Standard Plan R-22-F**

**Standard Plan R-23-E**

**Standard Plan R-24-F**
Added a detail for a ductile iron grate which is an alternative to the standard gray iron grate. Also, added a note, regarding optional bolting capability.

**Standard Plan R-35-E**
Revised section A-A on sheet two to show the curb ending a short distance down the slope, instead of extending the length of the spillway.

**Standard Plan R-45-J**
Revised the distance from the edge of slab farthest away from the bridge to the edge of longitudinal steel from 1’ to 1’-6”. Reduced the distance from the edge of the slab nearest the bridge to the center line of the nearest reinforcing bar from 9” to 6”, which provides 3” of overhang, in addition to 3” of cover. Added “Detail B” for pavement/shoulder seats greater than 12” in depth.

**Standard Plan R-84-A**
New “detail” for mechanical joints for box culverts.

**Standard Plan R-86-F**
Revised notes on sheet two (joint & footing requirements) to address joint separation at culvert end sections. Also defined the meaning of the asterisks in the table of dimensions.

**Standard Plan R-95-G**
Revised a note on sheet three, regarding the required geotextile at the joint between the culvert and the sloped end section. Also revised a note on sheet six to call for a ¼” inscription depth (instead of ½”) for the outfall label for a concrete sloped end section.
On sheets two and four, made minor modifications to the interchange delineator detail and the delineator legend. On sheet five, revised the curve spacing chart to address more curve radii, added a new curve chart based on speed for layout when the curve radius is not known, and revised the order of the “S” distances for delineator location. On sheet eight, changed the post and reflector hole diameters to 3/8”, revised the number of holes required on a post to a minimum number, replaced references to a “normal” shoulder with an “aggregate shoulder”, and made minor grammatical changes to clarify the language. In the note section, provided an alternate method for determining delineator offsets in the field.

Updated expansion splice details for HSS 2” x 2” x 1/8” tube on page seven of eight. (This update has no structural bearing on the railing system.)

Special Instructions:
For those choosing to maintain a loose leaf hard copy of the Standard Plans, the following assembly instructions are provided. In addition to removing and replacing the appropriate standard plans with the enclosed revisions remove standard plans R-15-F, R-27-E, R-32-E, R-33-F (a special detail has superseded these plans) and R-51-E (obsolete plan).

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

MDOT-Bridge-Design-Standards@michigan.gov

Sincerely,

Kristin Schuster
Engineer of Design

Enclosures

BOD:DD:QA:WKP:raw

cc: C. Libiran W. Pikka V. Zokvic J. Hinkle R. Welter
<table>
<thead>
<tr>
<th>STANDARD PLAN NUMBER</th>
<th>NUMBER OF SHEETS</th>
<th>TITLE</th>
<th>F.H.W.A. APPROVAL DATE OR * SPECIAL DETAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-1-G</td>
<td>9</td>
<td>DRAINAGE STRUCTURES</td>
<td>5-18-2020</td>
</tr>
<tr>
<td>R-2-D</td>
<td>4</td>
<td>MANHOLE BASE TYPE 1</td>
<td>9-14-2001</td>
</tr>
<tr>
<td>R-3-B</td>
<td>2</td>
<td>PRECAST MANHOLE TEES</td>
<td>12-21-2001</td>
</tr>
<tr>
<td>R-4-D</td>
<td>3</td>
<td>MANHOLE BASE TYPE 2</td>
<td>9-14-2001</td>
</tr>
<tr>
<td>R-7-F</td>
<td>2</td>
<td>COVER B</td>
<td>9-30-2014</td>
</tr>
<tr>
<td>R-8-D</td>
<td>3</td>
<td>COVER C</td>
<td>9-30-2014</td>
</tr>
<tr>
<td>R-8X-D</td>
<td>3</td>
<td>COVER CX</td>
<td>9-30-2014</td>
</tr>
<tr>
<td>R-9-D</td>
<td>2</td>
<td>COVER D</td>
<td>9-30-2014</td>
</tr>
<tr>
<td>R-9X-E</td>
<td>2</td>
<td>COVER DX</td>
<td>9-30-2014</td>
</tr>
<tr>
<td>R-10-D</td>
<td>1</td>
<td>COVER E</td>
<td>9-30-2014</td>
</tr>
<tr>
<td>R-11-E</td>
<td>1</td>
<td>MONUMENT BOXES</td>
<td>9-30-2014</td>
</tr>
<tr>
<td>R-12-E</td>
<td>1</td>
<td>COVER G</td>
<td>9-30-2014</td>
</tr>
<tr>
<td>R-14-D</td>
<td>2</td>
<td>COVER J</td>
<td>9-30-2014</td>
</tr>
<tr>
<td>* R-15-G</td>
<td></td>
<td>COVER K</td>
<td>Special Detail</td>
</tr>
<tr>
<td>R-18-F</td>
<td>2</td>
<td>COVER Q</td>
<td>9-30-2014</td>
</tr>
<tr>
<td>R-20-D</td>
<td>2</td>
<td>COVER R</td>
<td>9-30-2014</td>
</tr>
<tr>
<td>R-20X-D</td>
<td>2</td>
<td>COVER RX</td>
<td>9-30-2014</td>
</tr>
<tr>
<td>R-22-F</td>
<td>4</td>
<td>COVER V</td>
<td>5-18-2020</td>
</tr>
<tr>
<td>R-23-E</td>
<td>3</td>
<td>COVER W</td>
<td>5-18-2020</td>
</tr>
<tr>
<td>R-24-F</td>
<td>3</td>
<td>COVER VG</td>
<td>5-18-2020</td>
</tr>
<tr>
<td>* R-27-F</td>
<td></td>
<td>BRIDGE APPROACH CURB &amp; GUTTER (USING EXISTING CATCH BASIN)</td>
<td>Special Detail</td>
</tr>
<tr>
<td>* R-28-J</td>
<td></td>
<td>CURB RAMP AND DETECTABLE WARNING DETAILS</td>
<td>Special Detail</td>
</tr>
<tr>
<td>R-29-I</td>
<td>4</td>
<td>DRIVEWAY OPENINGS &amp; APPROACHES, AND CONCRETE SIDEWALK</td>
<td>9-30-2014</td>
</tr>
<tr>
<td>R-30-G</td>
<td>2</td>
<td>CONCRETE CURB AND CONCRETE CURB &amp; GUTTER</td>
<td>9-30-2014</td>
</tr>
<tr>
<td>R-31-F</td>
<td>2</td>
<td>INTEGRAL CURB AND INTEGRAL CURB &amp; GUTTER</td>
<td>1-25-2013</td>
</tr>
</tbody>
</table>

* SPECIAL DETAILS WILL BE INCLUDED IN THE CONSTRUCTION PLANS
<table>
<thead>
<tr>
<th>STANDARD PLAN NUMBER</th>
<th>NUMBER OF SHEETS</th>
<th>TITLE</th>
<th>F.H.W.A. APPROVAL DATE OR * SPECIAL DETAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>* R-32-F</td>
<td></td>
<td>APPROACH CURB &amp; GUTTER DOWNSPOUTS (FOR BRIDGE BARRIER ON RURAL HIGHWAYS)</td>
<td>Special Detail</td>
</tr>
<tr>
<td>* R-33-G</td>
<td></td>
<td>CONCRETE VALLEY GUTTER AND URBAN FREEWAY CURB</td>
<td>Special Detail</td>
</tr>
<tr>
<td>R-35-E</td>
<td>2</td>
<td>CONCRETE SHOULDER GUTTER AND SPILLWAY</td>
<td>5-18-2020</td>
</tr>
<tr>
<td>R-37-B</td>
<td>2</td>
<td>ISOLATION JOINT DETAILS</td>
<td>9-10-2010</td>
</tr>
<tr>
<td>R-38-C</td>
<td>2</td>
<td>CONCRETE DIVIDER</td>
<td>1-25-2013</td>
</tr>
<tr>
<td>R-39-K</td>
<td>5</td>
<td>TRANSVERSE PAVEMENT JOINTS (PLAIN CONCRETE PAVEMENT)</td>
<td>2-21-2018</td>
</tr>
<tr>
<td>R-40-H</td>
<td>4</td>
<td>LOAD TRANSFER ASSEMBLIES FOR TRANSVERSE JOINTS</td>
<td>9-10-2010</td>
</tr>
<tr>
<td>R-41-H</td>
<td>2</td>
<td>LONGITUDINAL PAVEMENT JOINTS</td>
<td>9-30-2014</td>
</tr>
<tr>
<td>R-42-F</td>
<td>6</td>
<td>TYPICAL JOINT LAYOUTS FOR CONCRETE PAVEMENT</td>
<td>1-25-2013</td>
</tr>
<tr>
<td>R-43-I</td>
<td>2</td>
<td>LOCATION OF TRANSVERSE JOINTS IN PLAIN CONCRETE PAVEMENT</td>
<td>1-25-2013</td>
</tr>
<tr>
<td>R-44-F</td>
<td>6</td>
<td>CONCRETE PAVEMENT REPAIR</td>
<td>9-10-2010</td>
</tr>
<tr>
<td>R-45-J</td>
<td>2</td>
<td>PAVEMENT REINFORCEMENT FOR BRIDGE APPROACH</td>
<td>5-18-2020</td>
</tr>
<tr>
<td>R-46-D</td>
<td>2</td>
<td>PAVED AND COBBLE DITCHES, &amp; DRAINAGE TREATMENT DETAILS</td>
<td>9-10-2010</td>
</tr>
<tr>
<td>R-49-G</td>
<td>9</td>
<td>CONCRETE BARRIER</td>
<td>3-29-2018</td>
</tr>
<tr>
<td>R-50-G</td>
<td>6</td>
<td>LIGHT STANDARD FOUNDATION (CONCRETE BARRIER, DOUBLE FACE)</td>
<td>3-29-2018</td>
</tr>
<tr>
<td>* R-53-A</td>
<td></td>
<td>TEMPORARY CONCRETE BARRIER LIMITED DEFLECTION</td>
<td>Special Detail</td>
</tr>
<tr>
<td>R-54-I</td>
<td>4</td>
<td>CONCRETE BARRIER, SINGLE FACE</td>
<td>3-29-2018</td>
</tr>
<tr>
<td>R-55-G</td>
<td>4</td>
<td>FILLER WALLS AT BRIDGE PIER COLUMNS</td>
<td>9-10-2010</td>
</tr>
<tr>
<td>* R-56-F</td>
<td></td>
<td>GUARDRAIL MEDIAN OBJECT PROTECTION</td>
<td>Special Detail</td>
</tr>
<tr>
<td>R-59-E</td>
<td>6</td>
<td>GUARDRAIL AT BRIDGES AND EMBANKMENTS</td>
<td>11-14-2003</td>
</tr>
</tbody>
</table>

* SPECIAL DETAILS WILL BE INCLUDED IN THE CONSTRUCTION PLANS
<table>
<thead>
<tr>
<th>STANDARD PLAN NUMBER</th>
<th>NUMBER OF SHEETS</th>
<th>TITLE</th>
<th>F.H.W.A. APPROVAL DATE OR SPECIAL DETAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>* R-60-J</td>
<td></td>
<td>GUARDRAIL, TYPES A, B, BD, T, TD, MGS-8, &amp; MGS-8D</td>
<td>Special Detail</td>
</tr>
<tr>
<td>* R-62-H</td>
<td></td>
<td>GUARDRAIL APPROACH TERMINAL TYPE 2M</td>
<td>Special Detail</td>
</tr>
<tr>
<td>* R-63-C</td>
<td></td>
<td>GUARDRAIL APPROACH TERMINAL TYPES 3B &amp; 3T</td>
<td>Special Detail</td>
</tr>
<tr>
<td>* R-66-E</td>
<td></td>
<td>GUARDRAIL DEPARTING TERMINAL TYPES B, T, &amp; MGS</td>
<td>Special Detail</td>
</tr>
<tr>
<td>* R-67-G</td>
<td></td>
<td>GUARDRAIL ANCHORAGE, BRIDGE, DETAILS</td>
<td>Special Detail</td>
</tr>
<tr>
<td>R-70-C</td>
<td>10</td>
<td>LOW TENSION 3-CABLE BARRIER</td>
<td>4-26-2007</td>
</tr>
<tr>
<td>R-71-C</td>
<td>1</td>
<td>GUARDRAIL ANCHORAGE, MEDIAN</td>
<td>3-29-2018</td>
</tr>
<tr>
<td>* R-72-D</td>
<td></td>
<td>GUARDRAIL LONG SPAN INSTALLATIONS</td>
<td>Special Detail</td>
</tr>
<tr>
<td>* R-73-F</td>
<td></td>
<td>GUARDRAIL OVER BOX OR SLAB CULVERTS</td>
<td>Special Detail</td>
</tr>
<tr>
<td>R-74-D</td>
<td>2</td>
<td>BUMPER &amp; PARKING RAILS, AND MISC. WOOD POSTS</td>
<td>9-14-2001</td>
</tr>
<tr>
<td>R-76-E</td>
<td>3</td>
<td>CONCRETE GLARE SCREEN</td>
<td>3-29-2018</td>
</tr>
<tr>
<td>R-80-E</td>
<td>8</td>
<td>GRANULAR BLANKET, UNDERDRAINS, OUTLET ENDINGS FOR UNDERDRAINS, AND SEWER BULKHEADS</td>
<td>1-25-2013</td>
</tr>
<tr>
<td>R-82-D</td>
<td>2</td>
<td>BEDDING AND FILLING AROUND PIPE CULVERTS</td>
<td>11-14-2003</td>
</tr>
<tr>
<td>R-83-C</td>
<td>5</td>
<td>UTILITY TRENCHES</td>
<td>7-25-2017</td>
</tr>
<tr>
<td>R-84-A</td>
<td>1</td>
<td>BOX CULVERT JOINT TIE ASSEMBLIES</td>
<td>5-18-2020</td>
</tr>
<tr>
<td>R-85-D</td>
<td>2</td>
<td>OUTLET HEADWALLS</td>
<td>11-17-2005</td>
</tr>
<tr>
<td>R-86-F</td>
<td>2</td>
<td>PRECAST CONCRETE END SECTION FOR PIPE CULVERT</td>
<td>5-18-2020</td>
</tr>
<tr>
<td>R-88-D</td>
<td>4</td>
<td>STEEL END SECTION</td>
<td>11-17-2005</td>
</tr>
<tr>
<td>R-92-C</td>
<td>6</td>
<td>STEEL GRATES FOR END SECTIONS</td>
<td>9-14-2001</td>
</tr>
<tr>
<td>R-95-G</td>
<td>7</td>
<td>CULVERT SLOPED END SECTIONS</td>
<td>5-18-2020</td>
</tr>
<tr>
<td>R-96-E</td>
<td>6</td>
<td>SOIL EROSION &amp; SEDIMENTATION CONTROL MEASURES</td>
<td>9-10-2010</td>
</tr>
<tr>
<td>R-97-C</td>
<td>4</td>
<td>HIGH TENSILE EIGHT WIRE FENCE</td>
<td>9-14-2001</td>
</tr>
<tr>
<td>R-98-B</td>
<td>2</td>
<td>CHAIN LINK FENCE (USING TENSION WIRE)</td>
<td>9-14-2001</td>
</tr>
</tbody>
</table>

* SPECIAL DETAILS WILL BE INCLUDED IN THE CONSTRUCTION PLANS
<table>
<thead>
<tr>
<th>STANDARD PLAN NUMBER</th>
<th>NUMBER OF SHEETS</th>
<th>TITLE</th>
<th>F.H.W.A. APPROVAL DATE OR * SPECIAL DETAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-100-H</td>
<td>4</td>
<td>SEEDING AND TREE PLANTING</td>
<td>9-30-2014</td>
</tr>
<tr>
<td>R-101-B</td>
<td>3</td>
<td>WOVEN WIRE FENCE</td>
<td>9-14-2001</td>
</tr>
<tr>
<td>R-102-B</td>
<td>1</td>
<td>INSTALLATION OF WOVEN WIRE FENCE (AT STRUCTURES)</td>
<td>9-14-2001</td>
</tr>
<tr>
<td>R-103-C</td>
<td>7</td>
<td>TREATMENT OF PEAT MARSHES</td>
<td>10-21-2008</td>
</tr>
<tr>
<td>R-105-D</td>
<td>6</td>
<td>GRADING CROSS-SECTIONS</td>
<td>11-14-2003</td>
</tr>
<tr>
<td>R-107-H</td>
<td>7</td>
<td>SUPERELEVATION AND PAVEMENT CROWNS</td>
<td>9-10-2010</td>
</tr>
<tr>
<td>R-110-A</td>
<td>3</td>
<td>PAVEMENT SAFETY EDGE</td>
<td>1-27-2015</td>
</tr>
<tr>
<td>R-112-I</td>
<td>9</td>
<td>SHOULDER AND CENTER LINE CORRUGATIONS</td>
<td>2-21-2018</td>
</tr>
<tr>
<td>R-113-C</td>
<td>2</td>
<td>TEMPORARY CROSSES FOR DIVIDED ROADWAYS</td>
<td>10-27-2004</td>
</tr>
<tr>
<td>R-121-B</td>
<td>4</td>
<td>TRACK CROSSINGS</td>
<td>9-14-2001</td>
</tr>
<tr>
<td>R-122-C</td>
<td>2</td>
<td>RAILROAD CROSSING SIGNALS</td>
<td>9-16-2009</td>
</tr>
<tr>
<td>* R-126-I</td>
<td></td>
<td>PLACEMENT OF TEMPORARY CONCRETE BARRIER AND TEMPORARY STEEL BARRIER</td>
<td>Special Detail</td>
</tr>
<tr>
<td>R-127-G</td>
<td>8</td>
<td>DELINEATOR INSTALLATIONS</td>
<td>5-18-2020</td>
</tr>
</tbody>
</table>

* SPECIAL DETAILS WILL BE INCLUDED IN THE CONSTRUCTION PLANS

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 Bureau of Bridges & Structures, Structure Design Section will provide special details for inclusion in construction plans for MDOT projects. To assure prompt delivery, request must be made in advance. Contact: MDOT-VanlerbergSquad@michigan.gov

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).
<table>
<thead>
<tr>
<th>STANDARD PLAN NUMBER</th>
<th>NUMBER OF SHEETS</th>
<th>TITLE</th>
<th>F.H.W.A. APPROVAL DATE OR * SPECIAL DETAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>B-17-D</td>
<td>1</td>
<td>BRIDGE BARRIER RAILING, TYPE 4</td>
<td>10-21-2008</td>
</tr>
<tr>
<td>B-20-D</td>
<td>1</td>
<td>BRIDGE BARRIER RAILING, TYPE 5</td>
<td>10-21-2008</td>
</tr>
<tr>
<td>B-21-J</td>
<td>4</td>
<td>BRIDGE RAILING, 2 TUBE</td>
<td>5-20-2016</td>
</tr>
<tr>
<td>* B-22-E</td>
<td></td>
<td>BRIDGE RAILING, THRIE BEAM RETROFIT (R4 TYPE BRIDGE RAILING)</td>
<td>Special Detail</td>
</tr>
<tr>
<td>* B-23-F</td>
<td></td>
<td>BRIDGE RAILING, THRIE BEAM RETROFIT (OPEN PARAPET TYPE BRIDGE RAILING)</td>
<td>Special Detail</td>
</tr>
<tr>
<td>B-25-K</td>
<td>8</td>
<td>BRIDGE RAILING, AESTHETIC PARAPET TUBE</td>
<td>7-25-2017</td>
</tr>
<tr>
<td>B-26-F</td>
<td>8</td>
<td>BRIDGE RAILING, 4 TUBE</td>
<td>5-18-2020</td>
</tr>
<tr>
<td>B-27-A</td>
<td>7</td>
<td>BRIDGE RAILING, 3 TUBE WITH PICKETS</td>
<td>11-8-2016</td>
</tr>
<tr>
<td>* B-28-A</td>
<td></td>
<td>BRIDGE BARRIER RAILING, TYPE 7</td>
<td>Special Detail</td>
</tr>
<tr>
<td>* B-29-A</td>
<td></td>
<td>BRIDGE BARRIER RAILING, TYPE 6</td>
<td>Special Detail</td>
</tr>
<tr>
<td>B-32-D</td>
<td>2</td>
<td>FENCING FOR PEDESTRIAN STRUCTURE EXISTING OPEN PARAPET</td>
<td>1-25-2013</td>
</tr>
<tr>
<td>B-33-D</td>
<td>2</td>
<td>FENCING FOR PEDESTRIAN STRUCTURE EXISTING METAL RAILING – R4 POST</td>
<td>1-25-2013</td>
</tr>
<tr>
<td>B-34-C</td>
<td>2</td>
<td>FENCING FOR PEDESTRIAN STRUCTURE EXISTING METAL RAILING – R5 OR R9 POST</td>
<td>9-29-2003</td>
</tr>
<tr>
<td>B-35-D</td>
<td>2</td>
<td>FENCING FOR PEDESTRIAN STRUCTURE EXISTING SOLID PARAPET</td>
<td>1-25-2013</td>
</tr>
<tr>
<td>B-37-C</td>
<td>2</td>
<td>FENCING FOR PEDESTRIAN STRUCTURE 2 OR 5 TUBE STEEL RAILING</td>
<td>9-29-2003</td>
</tr>
<tr>
<td>B-38-D</td>
<td>2</td>
<td>FENCING FOR PEDESTRIAN STRUCTURE EXISTING TYPE 4 &amp; 5 BARRIER</td>
<td>1-25-2013</td>
</tr>
<tr>
<td>B-39-C</td>
<td>2</td>
<td>FENCING FOR PEDESTRIAN STRUCTURE NEW TYPE 4 &amp; 5 BARRIER</td>
<td>9-29-2003</td>
</tr>
<tr>
<td>B-40-A</td>
<td>3</td>
<td>FENCING FOR BRIDGE RAILING, 4 TUBE</td>
<td>9-29-2003</td>
</tr>
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<td>3</td>
<td>FENCING FOR BRIDGE RAILING, AESTHETIC PARAPET TUBE</td>
<td>10-21-2008</td>
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<tr>
<td>* B-50-A</td>
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<td>BRIDGE RAILING, CONCRETE BLOCK RETROFIT</td>
<td>Special Detail</td>
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<tr>
<td>* B-101-G</td>
<td></td>
<td>DRAIN CASTING ASSEMBLY DETAILS</td>
<td>Special Detail</td>
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<tr>
<td>B-102-C</td>
<td>2</td>
<td>STANDARD SLOPE PAVING DETAILS</td>
<td>11-26-2001</td>
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<tr>
<td>B-103-E</td>
<td>1</td>
<td>MOLDING, BEVEL, LIGHT STANDARD ANCHOR BOLT ASSEMBLY AND NAME PLATE DETAILS</td>
<td>10-21-2008</td>
</tr>
</tbody>
</table>

* SPECIAL DETAILS WILL BE INCLUDED IN THE CONSTRUCTION PLANS
PLAN VIEW

TOP STEP TO BE 1'-6" BELOW TOP OF CASTING

3" MIN. EMBEDMENT (TYP.)

CONCRETE FOOTING SHALL BE 8" THICK FOR DEPTHS TO 25'-0" AND 1'-0" THICK FOR DEPTHS OVER 25'-0"

SEPARATE BASE OPTION

INTEGRAL BASE OPTION

STEEL REINFORCEMENT (SEE NOTES)

SECTION A - A

TYPICAL MANHOLE

PRECAST REINFORCRED CONCRETE SHOWN
OTHER OPTIONS INCLUDE CONCRETE BLOCK, BRICK, OR CAST-IN-PLACE WALL SECTIONS
SEE TYPICAL WALL SECTIONS FOR WALL THICKNESS

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT

DRAINAGE STRUCTURES
HALF SECTION A - A

TOP OF MASONRY STRUCTURE OR BOTTOM OF CASTING

PLACE CASTING ON INLET AS SPECIFIED ON PLANS

FOR PLACEMENT OF STEPS SEE MANHOLE DETAILS

STRUCTURE DIA.

CONCRETE FOOTING

SEE MANHOLE DETAILS FOR SIZE AND BASE OPTIONS
SECTION B - B
INLET

HALF SECTION A - A

TOP OF MASONRY STRUCTURE OR BOTTOM OF CASTING

PLACE CASTING ON CATCH BASIN AS SPECIFIED ON PLANS

FOR PLACEMENT OF STEPS SEE MANHOLE DETAILS

STRUCTURE DIA.

CONCRETE FOOTING

SEE MANHOLE DETAILS FOR SIZE AND BASE OPTIONS
SECTION B - B
CATCH BASIN

HALF SECTION A - A

PLACE CASTING ON LEACHING BASIN AS SPECIFIED ON PLANS

PLACE CASTING ON CATCH BASIN AS SPECIFIED ON PLANS

1/2" CEMENT PLASTER COAT ON TOP 5'-0" OF BRICK OR CONCRETE BLOCK CONSTRUCTION

4'-0" DIA.

GRANULAR MATERIAL
CLASS II LODGE

3'-4" LEASHING BASIN

SEE MANHOLE DETAILS FOR BASE OPTIONS
SECTION B - B

PRECAST SUMP
FOR PRECAST RISERS

STRUCTURE DIA.

LIFT PIN HOLE (TYP.)

SECTION A - A

SEE MANHOLE DETAILS FOR SIZE AND BASE OPTIONS

PRECAST SUMP FOR BRICK OR BLOCK CONSTRUCTION

STRUCTURE DIA.

LIFT PIN HOLE (TYP.)

SECTION A - A

SEE TYPICAL BRICK AND BLOCK SECTION FOR SIZE AND BASE OPTIONS

6" OR 8"

2'-0" DIA.

6" 2'-0" DIA.

SECtion A - A

PRECAST SUMP FOR 2'-0" DIA. STRUCTURES

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT
STANDARD PLAN FOR

DRAINAGE STRUCTURES

**Precast Flat Slab Top for Precast Concrete Structure, 2' x 4' Casting**

**Precast Flat Slab Top for Masonry Structure, 2' x 4' Casting**

**Plan (showing bottom layer of reinforcement)**

- #5 bars on top of bottom bars
- #5 bars in the bottom centered between the bottom bars (see table for bar size)
- One additional bar in the bottom center between the first and second bar next to hole (see table for bar size)
- Three handling holes at 120° spacing

**Table of Dimensions**

<table>
<thead>
<tr>
<th>Structure Diameter</th>
<th>Cover Diameter</th>
<th>T</th>
<th>K</th>
<th>L</th>
<th>Bar Maximum Spacing (bottom each way)</th>
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</thead>
<tbody>
<tr>
<td>4'-0&quot;</td>
<td>58&quot;</td>
<td>6&quot;</td>
<td>6&quot;</td>
<td>6&quot;</td>
<td>#5 at 6&quot;</td>
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<tr>
<td>5'-0&quot;</td>
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<td>7&quot;</td>
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<td>#5 at 7&quot;</td>
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<td>6'-0&quot;</td>
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<td>8&quot;</td>
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<td>#5 at 6&quot;</td>
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<td>7'-0&quot;</td>
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<td>11&quot;</td>
<td>#5 at 5&quot;</td>
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<td>8'-0&quot;</td>
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<td>12&quot;</td>
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<td>11&quot;</td>
<td>#6 at 6&quot;</td>
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<tr>
<td>9'-0&quot;</td>
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<td>12&quot;</td>
<td>10&quot;</td>
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<td>#5 at 6&quot;</td>
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<td>10'-0&quot;</td>
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<td>12&quot;</td>
<td>10&quot;</td>
<td>13&quot;</td>
<td>#5 at 6&quot;</td>
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*Only bottom layers of steel necessary*
PRECAST REDUCER CAP

PRECAST FLAT SLAB TOP

SEPARATE BASE OPTION

REDUCER CAP DIMENSIONS

<table>
<thead>
<tr>
<th>STRUCTURE DIAMETER</th>
<th>CAP DIAMETER &quot;A&quot;</th>
<th>B</th>
<th>CAP DEPTH &quot;D1&quot;</th>
<th>CAP DEPTH &quot;D2&quot;</th>
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</thead>
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<tr>
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<td>1'-5&quot;</td>
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<tr>
<td>8'-0&quot;</td>
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<td>9&quot;</td>
<td>1'-5&quot;</td>
<td>12&quot;</td>
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<tr>
<td>9'-0&quot;</td>
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<td>10&quot;</td>
<td>1'-5&quot;</td>
<td>12&quot;</td>
</tr>
<tr>
<td>10'-0&quot;</td>
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FLAT SLAB TOP DIMENSIONS

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<th>STRUCTURE DIAMETER</th>
<th>COVER DIAMETER &quot;A&quot;</th>
<th>B</th>
<th>COVER DEPTH &quot;D1&quot;</th>
<th>COVER DEPTH &quot;D2&quot;</th>
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<td>8½&quot;</td>
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<tr>
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<tr>
<td>9'-0&quot;</td>
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BASE AND RISER DIMENSIONS

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<th>STRUCTURE DIAMETER</th>
<th>BASE DIAMETER &quot;A1&quot;</th>
<th>BASE DIAMETER &quot;A2&quot;</th>
<th>MIN. WALL THICKNESS &quot;T&quot;</th>
<th>BASE DEPTH &quot;D1&quot;</th>
<th>BASE DEPTH &quot;D2&quot;</th>
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<td>101½&quot;</td>
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<td>12&quot;</td>
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<tr>
<td>8'-0&quot;</td>
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<td>128&quot;</td>
<td>8&quot;</td>
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<tr>
<td>9'-0&quot;</td>
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<td>10'-0&quot;</td>
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MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

DRAINAGE STRUCTURES
PRECAST MANHOLE

SECTION B - B
SHOWING REDUCER CAP

SECTION B - B
SHOWING FLAT SLAB TOP

TOP OF MASONRY STRUCTURE OR BOTTOM OF CASTING

DEPTH AS SPECIFIED ON PLANS

4"-0" DIA.

STRUCTURE DIAMETER

A1

A1

D1

D1

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR
DRAINAGE STRUCTURES

F.R.N.A. APPROVAL 9-19-2019 R-1-G SHEET 6 OF 9
PRECAST INLET

SECTION B - B
SHOWING REDUCER CAP

SECTION B - B
SHOWING FLAT SLAB TOP

TOPOF MASONRY STRUCTURE OR BOTTOM OF CASTING

4'-0" DIA.
PRECAST CATCH BASIN

SECTION B - B
SHOWING REDUCER CAP

SECTION B - B
SHOWING FLAT SLAB TOP
NOTE: PRECAST RISER SHALL FULLY ENGAGE THE TONGUE OF THE RISER PIPE.

PRECAST RISER RING
( FOR 2'-0" DIAMETER STRUCTURE)

NOTES:

THE DRAINAGE STRUCTURE COVERS ALLOWED FOR USE ON THESE DRAINAGE STRUCTURES ARE SPECIFIED IN SUBSEQUENT STANDARD PLANS AND ARE INTERCHANGEABLE ON ANY STRUCTURE.

THE TOPS OF MASONRY STRUCTURES SHALL BE SUFFICIENTLY LOW TO PERMIT PROPER ADJUSTMENT OF COVER TO GRADE USING MORTAR OR BRICK AS DIRECTED BY THE ENGINEER.

PREMIUM JOINTS ARE REQUIRED ON ALL SANITARY MANHOLES. SEE ASTM DESIGNATION C-923.

GRANULAR MATERIAL CLASS III SHALL BE USED IN BACKFILLING AROUND ALL STRUCTURES THAT FALL WITHIN THE 1:1 INFLUENCE LINES FROM THE EDGE OF PAVEMENT OR BACK OF CURB.

STEPS FOR DRAINAGE STRUCTURES SHALL BE OF AN APPROVED DESIGN AND MADE FROM CAST IRON, ALUMINUM, OR PLASTIC COATED STEEL. RUNGS SHALL BE A MINIMUM OF 10" IN CLEAR LENGTH, DESIGNED TO PREVENT THE FOOT FROM SLIPPING OFF THE END. THE MINIMUM HORIZONTAL PULL OUT LOAD SHALL BE 400 LBS. THE MINIMUM VERTICAL LOAD SHALL BE 800 LBS.

THE BELL SHALL BE REMOVED FOR THE FIRST LENGTH OF OUTLET PIPE PROJECTING THROUGH THE WALL OF THE MANHOLE.

PRECAST CONCRETE SECTIONS, SLIPS, BASE SECTIONS, AND FLAT TOP SLABS SHALL BE BUILT ACCORDING TO CURRENT ASTM C-478 AND ACCORDING TO DETAILS SPECIFIED ON THIS PLAN. PRECAST REINFORCED CONCRETE FLAT TOP SLAB SHALL BE MARKED TO SHOW LOCATION OF REINFORCEMENT. THE WALLS OF THE PRECAST UNITS MAY HAVE A SLIGHT TAPER TO ALLOW FOR FORM REMOVAL. PRECAST CONCRETE 2'-0" DIAMETER DRAINAGE STRUCTURES SHALL HAVE A MINIMUM 3" WALL THICKNESS WITH A 6" MINIMUM BEARING SURFACE ON TOP. SEE PRECAST RISER RING FOR 2'-0" DIAMETER STRUCTURE.

THE MAXIMUM INSIDE DIAMETER OF PIPES ENTERING OR LEAVING PRECAST DRAINAGE STRUCTURES SHALL BE 2'-0" LESS THAN THE INSIDE DIAMETER OF THE DRAINAGE STRUCTURE. A PIPE LEAVING A 2'-0" DIAMETER DRAINAGE STRUCTURE IS ALLOWED TO HAVE 1'-0" INSIDE DIAMETER OR LESS.

THE NUMBER OF PIPE OPENINGS IN A RISER SHALL BE DETERMINED BY THE DESIGNER. SPACING BETWEEN OPENINGS SHALL BE 1'-0" MINIMUM. OPENINGS MAY BE CONSTRUCTED BY CASTING OR SCRIBING IN PRECAST STRUCTURES DURING FABRICATION OR BY COREING THE CURED CONCRETE.

PRECAST CONCRETE FOOTINGS OR BASES SHALL BE REINFORCED WITH #4 BARS SPACED AT 1'-0" BOTH WAYS OR WITH TWO LAYERS OF WELDED WIRE FABRIC OF EQUIVALENT CROSS SECTIONAL AREA LAID AT RIGHT ANGLES AND WIRED TOGETHER. REINFORCEMENT SHALL BE PLACED IN TOP OF FOOTING AND SHALL BE MARKED.

PRECAST CONCRETE FOOTINGS SHALL BE SUPPORTED BY A COMPACTED 6" GRANULAR SUBBASE.

THE MINIMUM WALL THICKNESS FOR ALL 2'-0", 4'-0", 5'-0", AND 6'-0" DRAINAGE STRUCTURES USING CONCRETE BLOCK, BRICK, OR CAST-IN-PLACE CONCRETE SHALL BE AS SPECIFIED IN TYPICAL WALL SECTIONS.

THE CONICAL SECTION OF MANHOLES OR CATCH BASINS CONSTRUCTED OF BLOCK OR BRICK SHALL BE SPOUTED WITH GEOTEXTILE FABRIC TO A MINIMUM DEPTH OF 5'-0" OR THROUGH THE FROST ZONE. ENOUGH GEOTEXTILE MATERIAL SHALL BE LEFT ON THE TOP (8" OR MORE) TO ROLL OVER THE TOP OF THE CONE.

PREFORMED HIGH DENSITY POLYSTYRENE FILLER PIECES MAY BE USED TO CHANNEL FLOW IN THE BOTTOM OF MANHOLES PROVIDED THEY HAVE AT LEAST 2" OF CONCRETE COVER. THE USE OF THIS MATERIAL FOR CHANNEL FLOW IS RESTRICTED TO MANHOLES WHERE THE BOTTOM SECTION IS NOT SUBJECT TO FREEZING. THE USE OF THIS MATERIAL MUST BE APPROVED BY THE ENGINEER.
### MANHOLE BASE TYPE 1 FOR 48" DIAMETER PIPE

**SECTION A - A**

**Concrete and Steel Quantities**

<table>
<thead>
<tr>
<th>Existing Sewer Size</th>
<th>Bar</th>
<th>Dimensions</th>
<th>Length</th>
<th>Number Req'd</th>
<th>Bar Weight (lbs)</th>
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<tr>
<td>48&quot;</td>
<td>A1</td>
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<td>47</td>
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<tr>
<td></td>
<td>A2</td>
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<td>38</td>
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<td>A4</td>
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<td>V1</td>
<td>14'-4&quot;</td>
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<td>1</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>V2</td>
<td>17'-0&quot;</td>
<td>1'-0&quot;</td>
<td>1</td>
<td>20</td>
</tr>
</tbody>
</table>

2.6 CYO of concrete

Total Weight of Steel = 135 lbs

All steel reinforcement shall be A5 bars.

---

**MDOT**

**ENGINEER OF DESIGN**

**ENGINEER OF CONSTRUCTION**

**ENGINEER OF MAINTENANCE**

**BUREAU OF HIGHWAY TECHNICAL SERVICES**

**MANHOLE BASE TYPE 1**

**F.R.W.A. APPROVAL**

**PLAN DATE**

**R-2-D**

**SHEET 1 OF 4**
MICHIGAN DEPARTMENT OF TRANSPORTATION

OF SHEET DATE

F.H.W.A. APPROVAL

BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

R-14-D

SECTION A - A

SECTION X - X SECTION Y - Y

PLAN VIEW OF GRATE

SECTION B - B

NOTES:

THE CASTINGS SHALL MEET THE REQUIREMENTS OF THE CURRENT STANDARD SPECIFICATION FOR GRAY IRON CASTINGS.

ALL CASTINGS SHALL BE CLEANED BY CURRENT APPROVED BLASTING METHODS.

THE SEATING FACE OF THE GRATE AND THE SEAT FOR THE SAME ON THE FRAME SHALL BE GROUND OR MACHINED SO THAT THE GRATE WILL HAVE AN EVEN BEARING ON ITS SEAT TO PREVENT ROCKING OR TILTING.

THE CASTINGS SHALL BE FREE OF POURING FAULTS, BLOW HOLES, CRACKS AND OTHER IMPERFECTIONS. THEY SHALL BE SOUND, TRUE TO FORM AND THICKNESS, CLEAN AND NEATLY FINISHED, AND SHALL BE COATED WITH COAL TAR PITCH VARNISH.

THIS COVER IS DESIGNED TO FIT ON ANY INLET, CATCH BASIN OR ON ANY EXISTING SIMILAR STRUCTURE WHEN SO DESIGNATED ON THE PLANS.

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

COVER J
FOR USE WITH CONCRETE CURB & GUTTER DETAIL B

9-30-2014  4-16-2014  R-14-D  2 OF 2
FOUR \( \frac{3}{4} " \) DIAMETER HOLES ON 32\( \frac{3}{4} " \) DIAMETER BOLT CIRCLE.

**TOP VIEW OF FRAME**

**FRAME SECTION**

**DIAMETER BOLT CIRCLE**

**FOUR \( \frac{3}{4} " \) DIAMETER HOLES ON 32\( \frac{3}{4} " \) DIAMETER BOLT CIRCLE**

**23\( \frac{3}{4} " \) DIA.**

**22\( \frac{3}{4} " \) DIA.**

**24\" INSIDE DIAMETER OF GROOVE**

**26\( \frac{1}{2} " \)**

**24\" DIA.**

**28\( \frac{3}{4} " \)**

**36" DIAMETER**

**Michigan Department of Transportation**

**DEPARTMENT DIRECTOR**

Kirk T. Staudte

**APPROVED BY:**

**DIRECTOR, BUREAU OF FIELD SERVICES**

Randall L. Fulton

**APPROVED BY:**

**DIRECTOR, BUREAU OF HIGHWAY DEVELOPMENT**

Mark A. Van Puymbroeck

**MICHIGAN DEPARTMENT OF TRANSPORTATION**

**BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR**

**COVER Q**

**FOR USE ON MANHOLES OR SANITARY SEWERS WHERE VENT HOLES ARE NOT DESIRED**

**9-30-2014**

**3-12-2014**

**R-18-F**
MICHIGAN DEPARTMENT OF TRANSPORTATION

BUREAU OF HIGHWAY DEVELOPMENT

STANDARD PLAN FOR

2014

PLAN VIEW OF GRATE

SECTION C - C

FRONT ELEVATION

OF GRATE

NOTES:

THE CASTINGS SHALL MEET THE REQUIREMENTS OF THE CURRENT STANDARD SPECIFICATION FOR GRAY IRON CASTINGS.

ALL CASTINGS SHALL BE CLEANED BY CURRENT APPROVED BLASTING METHODS.

THE SEATING FACE OF THE GRATE AND THE SEAT FOR THE SAME ON THE FRAME SHALL BE GROUND OR MACHINED SO THAT THE GRATE WILL HAVE AN EVEN BEARING ON ITS SEAT TO PREVENT ROCKING OR TILTING.

THE CASTINGS SHALL BE FREE OF POURING FAULTS, BLOW HOLES, CRACKS AND OTHER IMPERFECTIONS. THEY SHALL BE SOUND, TRUE TO FORM AND THICKNESS, CLEAN AND NEATLY FINISHED, AND SHALL BE COATED WITH COAL TAR PITCH VARNISH.

THIS COVER IS DESIGNED TO FIT ON ANY INLET, CATCH BASIN OR ON ANY EXISTING SIMILAR STRUCTURE WHEN SO DESIGNATED ON THE PLANS.

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

COVER RX
FOR USE ON MANHOLES

9-30-2014  3-12-2014  R-20X-D
F.H.W.A. APPROVAL  PLAN DATE  SHEET 2 OF 2
PLAN OF FRAME

NOTE:
FRAME MAY BE CAST MONOLITHICALLY OR IN TWO PIECES AS SHOWN. FRAMES CAST IN TWO PIECES SHALL BE TIGHTLY BOLTED TOGETHER WHEN DELIVERED.

SECTION A - A

(2) 3/8" DIA. CORED HOLES FOR 1/2" DIA. BOLTS (BOTH SIDES OF FRAME WHEN CAST IN TWO PIECES)
SECTION B1 - B1
(CAST MONOLITHICALLY)

SECTION B2 - B2
(CAST IN TWO PIECES)
PLAN OF GRATE

SECTION C - C

ALTERNATE PROFILES PERMITTED

SECTION D - D

GRAY IRON CASTING
PLAN OF GRATE

SECTION E - E

SECTION F - F

DUCTILE IRON CASTING

NOTES:
The castings shall meet the requirements of the current standard specification for gray iron or ductile iron castings.

All castings shall be cleaned by current approved blasting methods.

The castings shall be free of pouring faults, blow holes, cracks and other imperfections. They shall be sound, true to form and thickness, clean and neatly finished, and shall be coated with coal tar pitch varnish.

The seating face of grate and the seat for the same on the frame shall be ground or machined so that the grate will have an even bearing on its seat to prevent rocking or tilting.

This cover is designed to fit on any inlet, catch basin or on any existing similar structure when so designated on the plans.

Grate may be provided with bolting capability. Provide (4) counter bored holes, one at each corner of the grate and a frame with (4) threaded holes to sufficiently receive grate bolts. Hole diameters and bolts shall conform to the manufacturer’s details and specifications.
PLAN OF GRATE

SECTION C - C

ALTERNATE PROFILES PERMITTED

SECTION D - D

GRAY IRON CASTING
DUCTILE IRON CASTING

NOTES:

THE CASTINGS SHALL MEET THE REQUIREMENTS OF THE CURRENT STANDARD SPECIFICATION FOR GRAY IRON OR DUCTILE IRON CASTINGS.

ALL CASTINGS SHALL BE CLEANED BY CURRENT APPROVED BLASTING METHODS.

THE CASTINGS SHALL BE FREE OF POURING FAULTS, BLOW HOLES, CRACKS AND OTHER IMPERFECTIONS. THEY SHALL BE SOUND, TRUE TO FORM AND THICKNESS, CLEAN AND NEATLY FINISHED, AND SHALL BE COATED WITH COAL TAR PITCH VARNISH.

THE SEATING FACE OF GRATE AND THE SEAT FOR THE SAME ON THE FRAME SHALL BE GROUND OR MACHINED SO THAT THE GRATE WILL HAVE AN EVEN BEARING ON ITS SEAT TO PREVENT ROCKING OR TILTING.

THIS COVER IS DESIGNED TO FIT ON ANY INLET, CATCH BASIN OR ON ANY EXISTING SIMILAR STRUCTURE WHEN SO DESIGNATED ON THE PLANS.

GRATE MAY BE PROVIDED WITH BOLTING CAPABILITY. PROVIDE (4) COUNTER BORED HOLES, ONE AT EACH CORNER OF THE GRATE AND A FRAME WITH (4) THREADED HOLES TO SUFICIENTLY RECEIVE GRATE BOLTS. HOLE DIAMETERS AND BOLTS SHALL CONFORM TO THE MANUFACTURER’S DETAILS AND SPECIFICATIONS.
PLAN OF GRATE

SECTION C - C

SECTION D - D

GRAY IRON CASTING
DUCTILE IRON CASTING

NOTES:

THE CASTINGS SHALL MEET THE REQUIREMENTS OF THE CURRENT STANDARD SPECIFICATION FOR GRAY IRON OR DUCTILE IRON CASTINGS.

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**LOCATION OF JOINTS IN CONCRETE SIDEWALK**

- Sidewalk intersections shall be cast monolithically with joint lines placed as near to perpendicular as possible with sidewalks edge, to avoid narrow or pointed pieces of concrete.
- Where a permanent structure is located in sidewalk, place expansion material around structure and adjust joint pattern to intersect structure as illustrated.

**TYPICAL SIDEWALK JOINT LAYOUTS**

- 1" expansion joint shall be placed between sidewalk and rigid structure.
- When directed by the engineer the joint shall be placed 1'-0" from property line.
- Insofar as possible, sidewalk shall be divided into square unit areas by means of cut joints not more than 36 SFT or less than 16 SFT.

**4" CONCRETE SIDEWALK**

- Walk width as specified on plans.
- 1.5% (2.0% maximum) toward street.

*See Notes*
INTEGRAL CURB & GUTTER, DETAIL B

SECTION C - C

1'-2"

COVER R

INTEGRAL CURB & GUTTER, DETAIL C

SECTION C - C

9"

COVER R

INTEGRAL CURB & GUTTER, DETAIL D

SECTION C - C

8'/4"

COVER R

INTEGRAL CURB & GUTTER, DETAIL F

SECTION C - C

1'-2"

COVER R

PLAN IN CATCH BASIN AREA
SEE STANDARD PLAN R-37-SERIES FOR REINFORCING DETAILS

NOTES:

DETAILS OF CURB FACES ARE SPECIFIED ON STANDARD PLAN R-30-SERIES.

WHEN THE CURB PORTION IS POURED SEPARATE FROM THE INTEGRAL PAVEMENT AND GUTTER, AND DELAY EXCEEDS 30 MINUTES, EPOXY COATED #4 VERTICAL BARS SPACED AT 1'-0" CENTER TO CENTER SHALL BE USED TO TIE CURB AND UNDERLYING CONCRETE.

AGGREGATE BASE, WHEN SPECIFIED ON TYPICAL CROSS SECTIONS, SHALL EXTEND 2'-0" BEYOND THE BACK OF INTEGRAL CURB AND GUTTER, EVEN IF THE GRADING SECTION MUST BE MODIFIED TO DO SO. NO PAYMENT WILL BE MADE FOR THE ADDITIONAL AGGREGATE BASE THAT IS REQUIRED TO CONSTRUCT THE INTEGRAL CURB AND GUTTER ALTERNATE.

TRANSVERSE JOINTS IN THE INTEGRAL CURB SHALL BE AS SPECIFIED ON THIS STANDARD PLAN.

FIBER FILLER USED FOR PAVEMENT EXPANSION JOINTS SHALL EXTEND TO BACK OF CURB.

CATCH BASIN "COVER R" OR OTHER APPROVED COVERS SHALL BE SUBSTITUTED FOR COVERS SPECIFIED ON THE PLANS ONLY WHEN THE INTEGRAL CURB AND GUTTER ALTERNATE IS USED.
SECTION A - A

SECTION B - B

NOTES:

A GRADUAL UNIFORM TRANSITION SHALL BE MADE FROM THE STANDARD CONCRETE CURB AND GUTTER TO THE CONCRETE SPILLWAY.

PLATE OF WEAKNESS JOINT SPACING SHALL BE AT UNIFORM INTERVALS OF APPROXIMATELY 4'-0".

THE SPILLWAY SHOULDERS AND FORESLOPES WILL BE UNDERLAIW WITH GEOTEXTILE LINER FROM THE BACK SIDE OF CURB TO THE FAR END OF THE PLAIN RIPRAP INCLUDING THE ENTIRE FOOTPRINT OF THE PLAIN RIPRAP.


THE SPILLWAY SHALL BE GIVEN A TRANSVERSE COARSE BROOM FINISH.

WHILE CONCRETE SPILLWAY IS SHOWN ON THE FORESLOPES, IT MAY BE USED ON THE BACKSLOPE, AS SPECIFIED ON THE PLANS. CONCRETE SHOULDER GUTTER WOULD BE CORRESPONDINGLY OMITTED.

THE CURB AND GUTTER SHALL BE ALIGNED WITH THE BEAM GUARDRAIL AS SPECIFIED ON STANDARD PLAN R-67-SERIES. THE LOCATION OF GUARDRAIL POSTS SHOULD BE DETERMINED PRIOR TO LOCATING THE SPILLWAY OR DOWNSPOUT HEADER.
LONGITUDINAL JOINT
FOR USE WHEN STRUCTURE IS ON OR NEAR THE JOINT

DIAGONAL BOX OUT OPTION
FOR USE WHEN STRUCTURE IS ON OR NEAR THE JOINT
* IF NECESSARY, ADJUST LONGITUDINAL JOINT LOCATION TO INTERSECT BOX OUT AS APPROVED BY THE ENGINEER.

MULTIPLE STRUCTURES WITHIN SLAB
FOR SLABS WITH MULTIPLE STRUCTURES INCLUSIVE, REINFORCE THE SLAB JOINT TO JOINT. IF A BOX OUT OPTION IS USED WITHIN THE SLAB (FOR CONSTRUCTION PURPOSES), FOLLOW BOX OUT DETAIL WITH REINFORCEMENT.
NOTES:
- EXPANSION CAPS SHALL BE ACCORDING TO STANDARD PLAN R-40-SERIES.
- THE SAME TYPE JOINT SHALL EXTEND ACROSS ADJACENT LANE REPAIRS.
- WHEN JOINTS ARE PLACED ADJACENT TO CONCRETE CURB AND GUTTER THAT IS NOT REQUIRED TO BE REMOVED, AN ESC JOINT SHALL BE CONSTRUCTED IN THE CURB AND GUTTER.
- AFTER GROUTING IN-PLACE, RC-250 OR AN APPROVED BOND BREAKER SHALL BE APPLIED TO THAT PORTION OF CURB AND GUTTER DOWEL BARS THAT EXTEND INTO THE CAST CONCRETE.
- REPAIRED CONCRETE PAVEMENTS REQUIRE THAT 1" OF EXPANSION JOINTS BE DISTRIBUTED THROUGHOUT A GIVEN 1000' SECTION.

PRESSURE RELIEF JOINT

TRANSVERSE CONTRACTION Cp AND EXPANSION E2 JOINTS SHALL BE ACCORDING TO STANDARD PLAN R-39P-SERIES.

DOWEL AND DEFORMED BARS USED IN TRG, CRG, AND ERG JOINTS SHALL BE EPOXY COATED ACCORDING TO THE CURRENT STANDARD SPECIFICATIONS.

DOWEL BARS AND DEFORMED BARS FOR TIED JOINTS SHALL BE GROUTED INTO EXISTING PAVEMENT WITH A GROUT SELECTED FROM THE PREQUALIFIED MATERIALS LISTED IN THE DEPARTMENT’S “MATERIALS SOURCE GUIDE” UNDER ADHESIVE SYSTEMS FOR GROUTING DOWEL BARS AND TIE BARS FOR FULL-DEPTH CONCRETE PAVEMENT REPAIRS.

THE BACKER ROD SHALL MEET THE REQUIREMENTS OF THE STANDARD SPECIFICATIONS FOR CONSTRUCTION.

THE SAME TYPE JOINT SHALL EXTEND ACROSS ADJACENT LANE REPAIRS.

WHERE THERE ARE NO REPAIR LOCATIONS WITHIN A 1000' LENGTH, NO EXPANSION SPACE WILL BE PROVIDED.

EXPANSION JOINT FILLER SHALL EXTEND THE FULL DEPTH OF THE REPAIR AND BE FLUSH WITH THE EXISTING PAVEMENT SURFACE. PRIOR TO SEALING, THE JOINT FIBER FILLER AT THE PAVEMENT SURFACE SHALL BE REMOVED BY CUTTING 1" WIDE AND 1 1/2" DEEP TO PERMIT THE PLACEMENT OF THE HOT-POURED RUBBER ASPHALT SEALANT. HOLES IN EXPANSION JOINT FILLER SHALL BE 1 1/2" MAXIMUM DIAMETER AND SHALL BE ALIGNED TO FIT DRILLED HOLES IN CONCRETE.

Erg JOINTS SHALL BE CONSTRUCTED ONLY WHEN THEY EXTEND ACROSS ALL LANES, RAMPS, OR SHOULDERS.

WHEN ERO JOINTS ARE PLACED ADJACENT TO CONCRETE CURB AND GUTTER THAT IS NOT REQUIRED TO BE REMOVED, AN ERO JOINT SHALL BE CONSTRUCTED IN THE CURB AND GUTTER.

JOINT RESERVOIRS FOR THE HOT-POURED RUBBER-ASPHALT SEALANT SHALL BE ABRASIVE BLAST CLEANED, FOLLOWED BY A FINAL CLEANING OF OIL-FREE COMPRESSED AIR PRIOR TO SEALING.

LANE TIES (TO ADJACENT PAVEMENT LANE, WHEN REQUIRED) SHALL BE SPACED ACCORDING TO STANDARD PLAN R-41-SERIES, EXCEPT THAT THE FIRST LANE TIE ADJACENT TO A TRANSVERSE JOINT SHALL BE INSTALLED AT A DISTANCE OF 5'-0" FROM THE JOINT. WHEN BOTH SIDES OF A LONGITUDINAL JOINT ARE Poured INTEGRALLY, LANE TIES SHALL BE STRAIGHT DEFORMED EPOXY COATED BARS CAST-IN-PLACE AS SPECIFIED ON STANDARD PLAN R-41-SERIES. WHEN ADJACENT LANES ARE CAST SEPARATELY, LANE TIES SHALL BE GROUTED-IN-PLACE AS SPECIFIED ON THIS PLAN. THE GROUT SHALL BE SELECTED FROM THE PREQUALIFIED MATERIALS LISTED IN THE DEPARTMENT’S "MATERIALS SOURCE GUIDE", UNDER LANE TIES.

THE MONTH AND YEAR OF CASTING AND STATION NUMBER (IF REMOVED) SHALL BE STENCILLED ON EACH CONCRETE REPAIR.

ALL REPAIRS WILL BE JOINTED PLAIN CONCRETE PAVEMENT.

CONCRETE PAVEMENT REPAIR
Skewed bridges where slab is squared off will require transverse reinforcement to be fanned in or the use of cut bars will be required. Maintain reinforcement spacing at acutte corner and fan in at obtuse corner.

**REINFORCEMENT DETAIL**

### STEEL REINFORCEMENT

#### LONGITUDINAL REINFORCEMENT

<table>
<thead>
<tr>
<th>Pavement/Shoulder Slab Width</th>
<th>Top Reinforcement #4 Bars at 1'-6&quot; Max.</th>
<th>Bottom Reinforcement #6 Bars at 6&quot; (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10'-0&quot;</td>
<td>7</td>
<td>19</td>
</tr>
<tr>
<td>11'-0&quot;</td>
<td>8</td>
<td>21</td>
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<td>12'-0&quot;</td>
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<td>5</td>
<td>13</td>
</tr>
<tr>
<td>9'-0&quot;</td>
<td>7</td>
<td>17</td>
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</tbody>
</table>

#### TRANSVERSE REINFORCEMENT

<table>
<thead>
<tr>
<th>Top Reinforcement #4 Bars at 1'-6&quot; Max.</th>
<th>Bottom Reinforcement #6 Bars at 1'-6&quot; Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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**MDOT**

**DEPARTMENT DIRECTOR**

Paul C. Ajegba

**APPROVED BY:**

Gregg Brunner, P.E.  Gregg Brunner  Jul 24 2019 11:23 AM

**DIRECTOR, BUREAU OF FIELD SERVICES**

**APPROVED BY:**

Bradley C. Waferich  Bradley C. Waferich  Jul 3 2019 9:03 AM

**DIRECTOR, BUREAU OF DEVELOPMENT**

**MICHIGAN DEPARTMENT OF TRANSPORTATION**

**BUREAU OF DEVELOPMENT STANDARD PLAN FOR**

**PAVEMENT REINFORCEMENT FOR BRIDGE APPROACH**

5-18-2020  6-25-2019  R-45-J  SHEET 1 OF 2
PAVEMENT AND SHOULDERT SLABS ADJACENT TO STRUCTURES

DETAIL A

DETAIL B

NOTES:

SEE STANDARD PLANS R-39-SERIES AND R-40-SERIES FOR DETAILS OF JOINTS AND LOAD TRANSFER ASSEMBLIES.
GROUTED COBBLE DITCH shall be the same as the plain cobble ditches, except the cobblestones shall be laid in a layer of cement mortar according to the current standard specifications.

INTERMEDIATE ANCHOR

STEEL REINFORCEMENT

EXPANDED METAL MESH CONFORMING TO THE FOLLOWING MINIMUM REQUIREMENTS:

- Epoxy coated #4 bars, 4"-2" long, spaced 6" center to center, shall be bent as illustrated and shall be used at end anchors only.
- Two plane of weakness joints equally spaced shall be placed between anchors and shall be constructed according to the current standard specifications.

CONCRETE PAVED DITCH

HMA PAVED DITCH

PLAIN COBBLE DITCH

GROUTED COBBLE DITCH

MIchigan Department of Transportation

Bureau of Highway Development Standard Plan for

PAVED AND COBBLE DITCHES, & DRAINAGE TREATMENT DETAILS

PREPARED FOUNDATION

Cobblestone 6" least dimension

Backslope as specified on plans

Mulch blanket see notes 1'-6" min.

Slope as specified on plans

Width as specified on plans
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>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>#5</td>
<td>11'-6&quot;</td>
<td>24</td>
<td>288</td>
</tr>
<tr>
<td>A2</td>
<td>#5</td>
<td>5'-6&quot;</td>
<td>44</td>
<td>252</td>
</tr>
<tr>
<td>D</td>
<td>#4</td>
<td>6'-5&quot;</td>
<td>44</td>
<td>190</td>
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</table>

TOTAL WEIGHT OF STEEL = 730 LBS

CONCRETE QUANTITIES

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>FOOTING</td>
<td>2.7 CYD</td>
</tr>
<tr>
<td>VERTICAL WALL SECTION</td>
<td>4.9 CYD</td>
</tr>
<tr>
<td>TRANSITION SECTIONS (TYPE A)</td>
<td>5.9 CYD</td>
</tr>
<tr>
<td>TRANSITION SECTIONS (TYPE B)</td>
<td>6.2 CYD</td>
</tr>
</tbody>
</table>

ANALYST BOLT DETAIL

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.
CONCRETE BARRIER, SINGLE FACE, TYPE A

12'-0" TRANSITION SECTION

SEE CHART FOR MAXIMUM FLARE RATE

CONTRACTION JOINT

1" EXPANSION JOINT

SECTION A - A

UNIFORMLY TRANSITION BARRIER FACE TO VERTICAL

VARIES

1'-4"

8"

3'-4"

2'-4" ± 1"

ES JOINT

SECTION B - B

SECTION C - C

CONCRETE BARRIER, SINGLE FACE, TYPE A

(IN LINE WITH BRIDGE COLUMNS OR ABUTMENT)
**NOTES:**

BACKFILLING SHALL BE ACCORDING TO THE STANDARD SPECIFICATION.

SUFFICIENT TRENCH WIDTH SHALL BE PROVIDED TO ALLOW FREE WORKING SPACE AND TO PERMIT COMPACTING THE BACKFILL AROUND THE PIPE.

THE FOLLOWING ARE MINIMUM TRENCH WIDTHS:

<table>
<thead>
<tr>
<th>I.D. PIPE SIZE (INCHES)</th>
<th>LESS THAN 18</th>
<th>21</th>
<th>24</th>
<th>30</th>
<th>36</th>
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<tbody>
<tr>
<td>&quot;W&quot; TRENCH WIDTH (FEET)</td>
<td>3.0</td>
<td>3.5</td>
<td>4.0</td>
<td>5.0</td>
<td>6.0</td>
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<tr>
<td>I.D. PIPE SIZE (INCHES)</td>
<td>42</td>
<td>48</td>
<td>54</td>
<td>60</td>
<td>66</td>
</tr>
<tr>
<td>&quot;W&quot; TRENCH WIDTH (FEET)</td>
<td>7.0</td>
<td>8.0</td>
<td>9.5</td>
<td>10.0</td>
<td>10.5</td>
</tr>
</tbody>
</table>

| I.D. PIPE SIZE (INCHES) | 78 | 84 | 90 | 96 | 102 | 108 |
| "W" TRENCH WIDTH (FEET) | 11.5|12.0|12.5|13.0|13.5|14.0 |

ESTIMATED PAVEMENT REMOVAL WIDTH IS TO BE TRENCH WIDTH "W" PLUS 1'-'0" EACH SIDE OF THE TRENCH (6'-0" MINIMUM).
SECTION A-A
SINGLE CONNECTION TIE

SECTION A-A
DOUBLE CONNECTION TIE

DETAIL A

BOX CULVERT TIE HOLE LOCATION

NOTES:

JOINT TIE ASSEMBLIES ARE LOCATED ON THE SIDES OF CULVERTS ONLY.

JOINT TIE ASSEMBLIES TO BE USED TO ONLY HOLD CULVERT SECTIONS TOGETHER, NOT FOR PULLING SECTIONS TIGHT.
**SLOPE DETAIL**

**TABLE OF DIMENSIONS**

<table>
<thead>
<tr>
<th>PIPE DIAMETER (INCHES)</th>
<th>APPROX. SLOPE</th>
<th>T (INCHES)</th>
<th>A (INCHES)</th>
<th>B (INCHES)</th>
<th>C (INCHES)</th>
<th>D (INCHES)</th>
<th>E (INCHES)</th>
<th>G (INCHES)</th>
<th>R (INCHES)</th>
<th>X (INCHES)</th>
<th>Y (INCHES)</th>
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</thead>
<tbody>
<tr>
<td>12</td>
<td>2.4 to 1</td>
<td>2</td>
<td>4</td>
<td>24</td>
<td>49</td>
<td>73</td>
<td>24</td>
<td>2</td>
<td>9</td>
<td>8</td>
<td>18</td>
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<td>2.4 to 1</td>
<td>2(\frac{1}{4})</td>
<td>6</td>
<td>27</td>
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<td>73</td>
<td>30</td>
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<tr>
<td>18</td>
<td>2.3 to 1</td>
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<td>27</td>
<td>46</td>
<td>73</td>
<td>36</td>
<td>2(\frac{1}{2})</td>
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<td>18</td>
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<tr>
<td>21</td>
<td>2.4 to 1</td>
<td>2(\frac{3}{4})</td>
<td>9</td>
<td>36</td>
<td>37(\frac{1}{2})</td>
<td>73(\frac{1}{4})</td>
<td>42</td>
<td>2(\frac{3}{4})</td>
<td>13</td>
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<tr>
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<td>43(\frac{3}{4})</td>
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<td>48</td>
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<td>10(\frac{1}{2})</td>
<td>49(\frac{1}{4})</td>
<td>24(\frac{1}{2})</td>
<td>73(\frac{1}{4})</td>
<td>54</td>
<td>3(\frac{1}{2})</td>
<td>14(\frac{1}{2})</td>
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<td>3(\frac{3}{4})</td>
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<td>12</td>
<td>24</td>
<td></td>
</tr>
</tbody>
</table>

* AS FURNISHED BY THE MANUFACTURER

**NOTES:**

Concrete in these end sections shall be the same grade and strength as specified for reinforced concrete pipe, A.S.T.M. Designation C 66 class II except as modified by the standard specification.

Reinforcement in the "C" portion shall be the same as specified for reinforced concrete, A.S.T.M. Designation C 66 class II for the size of connecting pipe.

Reinforcement in the "B" portion shall have a cross-sectional area equal to that of one layer of steel in the "C" portion.

The end of the pipe culvert shall be placed in the concrete end section so that the flow lines are flush. The joint must be completely filled with mortar on the inside and outside and struck flush. The joint must be wrapped with geotextile blanket 36" wide with a 12" overlap.

To change the fill slope to the slope of the end section use a transition slope of approximately 10' in length to provide a pleasing appearance.

Variations in dimensions - the thickness of concrete, the position of steel, and the internal diameter of the pipe shall conform with the variations in dimensions as provided in the specifications for reinforced concrete culvert, storm drains, and sewer pipe, A.S.T.M. Designation C 76.

Place concrete footing as shown.

Outlet label to be used only where stormwater will discharge directly to the waters of the state.
PLAN VIEW

NOTE: FOR SECTION A-A AND SECTION B-B SEE SHEET 4 OF 4

END VIEW

NOTE: SEE SHEET 3 FOR CONNECTION DETAILS

LONGITUDINAL VIEW

STEEL END SECTION FOR CORRUGATED STEEL CIRCULAR PIPE
PLAN VIEW

LONGITUDINAL VIEW

END VIEW

GRATE FOR 24" DIAMETER PIPE WITH STEEL END SECTION
137 LBS STEEL REQUIRED PER GRATE

NOTES:

ALL MATERIALS AND WORKMANSHIP SHALL BE ACCORDING TO THE CURRENT STANDARD SPECIFICATIONS.

FABRICATION OF GRATE SHALL BE BY WELDING EACH BAR INTERSECTION.

SEE STANDARD PLAN R-86-SERIES FOR PRECAST CONCRETE END SECTIONS.

PRECAST CONCRETE END SECTIONS FROM DIFFERENT MANUFACTURERS VARY IN EXACT WIDTH AND SHAPE OF THE OPENING. IT WILL BE THE RESPONSIBILITY OF THE CONTRACTOR TO ENSURE THAT THE GRATE WILL ADEQUATELY COVER THE OPENING.

SEE STANDARD PLAN R-88-SERIES FOR STEEL END SECTIONS.
METAL CULVERT SLOPED END SECTION FOR ELLIPTICAL CONCRETE PIPE

METAL CULVERT SLOPED END SECTION AND CONNECTION TO CIRCULAR CONCRETE PIPE
TAPERED SLEEVE FOR ELLIPTICAL PIPE
(METAL END SECTION)

TAPERED SLEEVE FOR CIRCULAR PIPE
(METAL END SECTION)

NOTE:
TAPERED SLEEVE SHALL BE MADE TO FIT TONGUE OR GROOVE END OF PIPE.
THE CONNECTION JOINT BETWEEN THE EXISTING PIPE AND THE METAL SLOPED END SECTION MUST BE WRAPPED WITH GEOTEXTILE BLANKET 36" WIDE WITH A 12" OVERLAP.

TOP VIEW OF TAPERED SLEEVE FOR CONNECTING METAL CULVERT SLOPED END SECTION TO CONCRETE PIPE OR CORRUGATED POLYETHYLENE PIPE
TYPE 1A CONNECTOR
FOR USE ON CIRCULAR PIPE DIAMETERS 15" THROUGH 24"

TYPE 2 CONNECTOR
FOR USE ON CIRCULAR PIPE DIAMETERS 27" THROUGH 60"
AND FOR ALL ARCH AND ELLIPTICAL PIPE SIZES

SECTION A - A
FOR PLAN VIEW SEE SHEETS 1 AND 2

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR
CULVERT
SLOPED END SECTIONS
( CONCRETE AND METAL )
NOTE:
IN TRANVERSE DRAINAGE SITUATIONS, NO TUBES ARE REQUIRED WHEN THE "W" DIMENSION IS 36" OR LESS. CROSS TUBES ARE REQUIRED WHEN THE CLEAR SPAN DIMENSION IS LARGER THAN 30". THE NUMBER OF CROSS TUBES WILL VARY DEPENDING ON THE LENGTH OF THE LONGITUDINAL TUBE REQUIRED. WHEN THE "W" DIMENSION IS 36" TO 60", ONE LONGITUDINAL TUBE IS REQUIRED. WHEN THE "W" DIMENSION IS LARGER THAN 60", TWO LONGITUDINAL TUBES ARE REQUIRED. LONGITUDINAL TUBES SHALL BE WELDED TO CROSS TUBES TO ATTAIN A SINGLE PIECE STRUCTURE.

METAL CULVERT SLOPED END SECTION SHOWING CROSS TUBES AND LONGITUDINAL TUBE USED FOR TRANVERSE DRAINAGE INSTALLATIONS (CONNECTED TO CONCRETE PIPE SHOWN)
CONCRETE CULVERT SLOPED END SECTIONS FOR 30" AND 36" DIAMETER PIPES WILL HAVE A 3" LONGITUDINAL BAR IN THE MIDDLE WHEN LOCATED TRANSVERSE TO THE ROADWAY.

PLAN VIEW

CROSS BAR ATTACHMENT DETAIL

3" CROSS BAR (TYP.)

GROOVED END ON OUTLET END SECTION
TONGUE END ON INLET END SECTION
GROOVE ON TONGUE TO BE THE SAME AS
ON STANDARD REINFORCED CONCRETE
PIPE A.S.T.M. DESIGNATION C 706.

SIDE VIEW

OUTFALL LABEL INSCRIBED INTO CONCRETE
(LABEL PLACED ON THE INSIDE OF THE END
SECTION AT THE SPRINGLINE OF THE PIPE)
(LETTERING: 1½" HIGH x 1" WIDE x 1½" DEEP)
SEE NOTES

END VIEW

CONCRETE CULVERT SLOPED END FOR CIRCULAR PIPE

CONCRETE SLOPED END SECTIONS
FOR CIRCULAR PIPES

<table>
<thead>
<tr>
<th>PIPE DIA. (INCHES)</th>
<th>SLOPE</th>
<th>DIMENSIONS (INCHES)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>6:1</td>
<td>D: 25 L: 57 W: 25 T: 5 H: 8</td>
</tr>
<tr>
<td>18</td>
<td>4:1</td>
<td>D: 28 L: 55 W: 28 T: 8</td>
</tr>
<tr>
<td></td>
<td>6:1</td>
<td>D: 28 L: 75 W: 28 T: 5 H: 8</td>
</tr>
<tr>
<td>24</td>
<td>4:1</td>
<td>D: 34 L: 79 W: 36 T: 5 H: 8</td>
</tr>
<tr>
<td></td>
<td>6:1</td>
<td>D: 34 L: 111 W: 36 T: 5 H: 8</td>
</tr>
<tr>
<td>30</td>
<td>4:1</td>
<td>D: 40 L: 104 W: 43 T: 5 H: 8</td>
</tr>
<tr>
<td></td>
<td>6:1</td>
<td>D: 40 L: 147 W: 43 T: 5 H: 8</td>
</tr>
<tr>
<td>36</td>
<td>4:1</td>
<td>D: 47 L: 127 W: 51 T: 5½ H: 8</td>
</tr>
<tr>
<td></td>
<td>6:1</td>
<td>D: 47 L: 183 W: 51 T: 5½ H: 8</td>
</tr>
</tbody>
</table>

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT
STANDARD PLAN FOR
CULVERT
SLOPED END SECTIONS
(Concrete and Metal)
STEEL REINFORCEMENT FOR CONCRETE CULVERT SLOPED END

NOTES:

GALVANIZED STEEL SHALL MEET THE REQUIREMENTS IN THE CURRENT STANDARD SPECIFICATIONS FOR CONSTRUCTION.

GALVANIZED TOE PLATE EXTENSIONS ARE REQUIRED ON METAL CULVERT SLOPED END SECTIONS WHEN INDICATED ON THE PLANS OR BY AUTHORIZATION WHEN EITHER HEIGHT OF FILL IS 10'-0" OR MORE OR WHEN THE CULVERT GRADE IS 10% OR MORE. THEY SHALL BE WELDED-PUNCH ED TO FIT HOLES IN THE PLATE AND SUPPLIED LOOSE COMPLETE WITH 3/8" DIAMETER GALVANIZED BOLTS. TOE PLATE EXTENSIONS SHALL BE THE SAME THICKNESS AS THE METAL CULVERT SLOPED END SECTION. LENGTH OF TOE PLATE EXTENSION IS "OVERALL WIDTH" LESS 6".

CORRUGATED METAL PIPES, ARCHED PIPES, AND SMOOTH TAPERED SLEEVES THAT ARE SHOWN ON THIS PLAN HAVE 200' x 1/2" CORRUGATIONS. EQUIVALENT PIPE AND SLEEVE SIZES WITH 3" x 1" OR 5" x 1" CORRUGATIONS WILL BE ALLOWED.

FOR BOTH METAL AND CONCRETE CULVERT SLOPED END SECTIONS, CROSS AND LONGITUDINAL BARS/TUBES SHALL BE SCHEDULE 40 GALVANIZED PIPES, A.S.T.M. AS43. WHEN PARALLEL BARS/TUBES ARE WELDED TO CROSS TUBES, DAMAGED GALVANIZED SURFACES SHALL BE REPAIRED ACCORDING TO SECTION 716 OF THE STANDARD SPECIFICATIONS.

SLOTTED HOLES FOR PARALLEL TUBE ATTACHMENT SHALL BE PROVIDED FOR ALL METAL CULVERT SLOPED END SECTIONS.

SMOOTH TAPERED SLEEVES (FOR METAL END SECTIONS) SHALL BE GALVANIZED AND HAVE A MINIMUM THICKNESS AS FOLLOWS:
- 0.079" FOR NOMINAL PIPE DIAMETERS LESS THAN 27"
- 0.109" FOR NOMINAL PIPE DIAMETERS 27" AND LARGER
- 0.079" FOR ELLIPTICAL PIPES LESS THAN 24" x 38"
- 0.109" FOR ELLIPTICAL PIPES 24" x 36" AND LARGER

ANY SEAMS IN SMOOTH TAPERED SLEEVES SHALL BE BUTT WELDED.

A TYPE 2 CONNECTOR (FOR METAL END SECTIONS) DESIGNATED FOR ROUND PIPES 27" AND LARGER MAY BE USED ON SMALLER PIPE SIZES.

OUTFALL LABEL TO BE USED ONLY WHERE STORMWATER WILL DISCHARGE DIRECTLY TO THE WATERS OF THE STATE.

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

CULVERT SLOPED END SECTIONS
(Concrete and Metal)
### Applicable Soil Erosion and Sedimentation Control Measures

(Comprehensive details are located in Section 6 of the Soil Erosion & Sedimentation Control Manual)

<table>
<thead>
<tr>
<th>Key</th>
<th>Detail</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>SLOPES</td>
<td>Retains existing root mat which assists in stabilizing slopes.</td>
</tr>
<tr>
<td>B</td>
<td>STREAMS AND WATERWAYS</td>
<td>Assists in the revegetation process by providing sprout growth.</td>
</tr>
<tr>
<td>C</td>
<td>SURFACE DRAINAGEWAYS</td>
<td>Reduces sheet flow velocities preventing rilling and gullying.</td>
</tr>
<tr>
<td>D</td>
<td>ENCLOSED DRAINAGE (INLET &amp; OUTFALL CONTROL)</td>
<td>Discourages off-road vehicle use.</td>
</tr>
<tr>
<td>E</td>
<td>LARGE FLAT SURFACE AREAS</td>
<td>Reduces sheet flow velocities preventing rilling and gullying.</td>
</tr>
<tr>
<td>F</td>
<td>BORROW AND STOCKPILE AREAS</td>
<td>Assists in the establishment of a permanent vegetative cover.</td>
</tr>
<tr>
<td>G</td>
<td>DNRE PERMIT MAY BE REQUIRED</td>
<td></td>
</tr>
</tbody>
</table>

**Comprehensive Details**

- **Turbidity Curtain**: Used when slack water area is necessary to isolate construction activities from the watercourse. The still water area contains the sediments within the construction limits.
- **Grubbing Omitted**: Retains existing root mat which assists in stabilizing slopes. Assists in the revegetation process by providing sprout growth. Reduces sheet flow velocities preventing rilling and gullying. Discourages off-road vehicle use.
- **Permanent/Temporary Seeding**: Inexpensive but effective erosion control measure to stabilize flat areas and mild slopes. Permits runoff to infiltrate soil, reducing runoff volumes. Proper preparation of the seed bed, fertilizing, mulching and watering is critical to its success.
- **Dust Control**: Dust control can be accomplished by watering, and/or applying calcium chloride. The disturbed areas should be kept to a minimum. Permanent/Temporary Seeding (Key 3) should be applied as soon as possible.
- **Sodding**: Provides immediate vegetative cover such as at spillways and ditch bottoms. Proper preparation of the topsoil, placement of the sod, and watering is critical to its success.
FLASHER WITH HALF ROAD GATE

NOTES:

SIGNALS AND GATE ASSEMBLIES SHALL BE ACCORDING TO THE RULES AND REGULATIONS OF THE STATE OF MICHIGAN AND SHALL CONFORM TO THE CURRENT RECOMMENDED PRACTICES OF THE ASSOCIATION OF AMERICAN RAILROADS AND THE AMERICAN RAILWAY ENGINEERING ASSOCIATION EXCEPT AS OTHERWISE PROVIDED BY INDIVIDUAL MICHIGAN ORDERS.

SIGNS ON SUCH ASSEMBLIES SHALL BE BLACK LEGENDS ON WHITE BACKGROUND AND CONFORM TO THE MICHIGAN MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES REQUIREMENTS FOR RAILROAD CROSSING SIGNS.

GATE ARMS MAY BE MOUNTED ON SEPARATE POSTS.

CURB AND GUTTER ADJACENT TO SIGNAL SHALL BE BARRIER TYPE. ROLL CURB SHALL NOT BE USED. CONCRETE CURB AND GUTTER ENDING SHALL BE INSTALLED ACCORDING TO STANDARD PLANS R-30-SERIES AND R-121-SERIES.

A LONGITUDINAL GUARDRAIL SHOULD NOT BE USED TO PROTECT TRAFFIC CONTROL DEVICES AT THE CROSSING UNLESS THE GUARDRAIL IS OTHERWISE WARRANTED, AS FOR A STEEP EMBANKMENT.
TYPICAL FOR ALL 2-LANE MERGES EXCEPT WHERE THERE IS A MERGE FROM THE RIGHT AND NO OFFSET IN THE THROUGH LANES

200' TYPICAL SPACING (YELLOW DELINEATORS)

TYPICAL FOR DIVERGING ROADWAYS WHEN WIDENING IS ON BOTH SIDES

200' TYPICAL SPACING (WHITE DELINEATORS)

TYPICAL FOR DIVERGING ROADWAYS WHEN WIDENING IS ON RIGHT SIDE

TYPICAL FOR DIVERGING ROADWAYS WHEN WIDENING IS ON LEFT SIDE

DELINERATION OF FREeway TO FREeway CONNECTIONS

* WHEN THE PAVED SHOULDER WIDTH IS 12', PLACE DELINEATOR 14' FROM THE EDGE OF TRAVELED WAY. THE WIDTH OF THE PAVED CORE WILL BE INCREASED TO 24'.

DELINERATOR REFERENCE POINTS FOR NORMAL 10' SHOULders
(9' OR 10' PAVED)
5 Delineators with red on back (both sides of roadway) at 400' mainline spacing

Beginning of deceleration lane taper

Delineator reference point

Delineator also on the left of right-curving ramp when radius is less than 1000' (typical)

When the ramp radius is less than or equal to 480', use flexible yellow sheeting delineators at all locations

See notes for delineator overlap (typical)

Delineator reference points

End of acceleration lane taper

Beginning of deceleration lane taper

5 Delineators with red on back (both sides of roadway) at 400' mainline spacing

Interchange delineation
LEGEND

DELINEATORS INSTALLED ON RIGID STEEL POSTS

- WHITE PANEL DELINEATORS:
  - 400' maximum spacing on tangent and curves with a radius greater than 3500'
  - 200' maximum spacing in interchange areas
  - 100' maximum spacing on interchange ramps

- YELLOW PANEL DELINEATORS:
  - 200' maximum spacing in merge or diverge areas of major roadways
  - 100' maximum spacing on interchange ramps

- BACK TO BACK WHITE PANEL DELINEATORS:
  - 400' maximum spacing on tangent and curves with a radius greater than 3500'
  - 100' maximum spacing along right turn lanes

- RED PANEL DELINEATORS ON BACK OF WHITE PANEL DELINEATORS

- RED PANEL DELINEATORS ON BACK OF YELLOW PANEL DELINEATORS

- GREEN PANEL DELINEATORS

DELINEATORS INSTALLED ON FLEXIBLE POSTS

- 3" x 12" WHITE SHEETING DELINEATORS:
  - 200' maximum spacing in interchange areas
  - 100' maximum spacing on interchange ramps

- 3" x 12" YELLOW SHEETING DELINEATORS:
  - 200' maximum spacing in merge or diverge areas of major roadways
  - 100' maximum spacing on interchange ramps

- 3" x 12" RED SHEETING ON BACK OF 3" x 12" WHITE SHEETING DELINEATORS

- 3" x 12" RED SHEETING ON BACK OF 3" x 12" YELLOW SHEETING DELINEATORS

- BACK TO BACK 3" x 12" WHITE SHEETING DELINEATORS

NOTE:

When the above spacing conflicts with the curve charts on Sheet S, use whichever value results in the closer spacing.
The spacing \( s \) is found using the formula
\[ s = 3 \sqrt{R} - 50 \]
where \( R \) is the radius of the curve in feet.

Delineator Location on Freeway and Divided Roadway Curves

Delineator Location on Two Lane Two Way Roadway Curves

Michigan Department of Transportation
Bureau of Development Standard Plan for

Delineator Installations
<table>
<thead>
<tr>
<th>GUARDRAIL APPROACH TERMINAL</th>
<th>DELINEATOR LOCATED</th>
</tr>
</thead>
<tbody>
<tr>
<td>TYPE 1</td>
<td>1 FOOT BEHIND</td>
</tr>
<tr>
<td>TYPE 2</td>
<td>LAST POST</td>
</tr>
<tr>
<td></td>
<td>(FROM APPROACH END)</td>
</tr>
<tr>
<td></td>
<td>FIRST POST</td>
</tr>
<tr>
<td></td>
<td>(FROM APPROACH END)</td>
</tr>
</tbody>
</table>

**DIRECTION OF TRAFFIC**

**OUTSIDE EDGE OF TRAVELED LANE**

**GUARDRAIL DEPARTING TERMINAL TYPES B, T, & MGS**

**GREEN DELINEATORS AT GUARDRAIL INSTALLATIONS**
MAINTENANCE CROSSOVER

INTERSECTION
NOTE: MAY BE OMITTED AT FREEWAY RAMP TERMINALS DUE TO THE PRESENCE OF OTHER DELINEATORS

AT CATCH BASINS IN YARDS AND FIELDS

Curb & Gutter and Catch Basins

Green Delineator Locations
INSTALLATION OF DELINEATOR REFLECTORS ON RIGID STEEL POST

INSTALLATION OF REFLECTIVE SHEETING ON FLEXIBLE POST

DELINATE PROTOR REFLECTOR DETAIL

NOTES:

DELINATE PROTOR SHOULD BE PLACED 2'-0" BEYOND THE AGGREGATE SHOULDER, 2'-0" BEYOND THE FACE OF A BARRIER CURB, IMMEDIATELY BEHIND THE GUARDRAIL POST, OR AS NEAR AS POSSIBLE BEHIND CONCRETE BARRIER. DELINATE PROTOR INSTALLED ON FLEXIBLE POSTS SHALL NOT BE PLACED BEHIND GUARDRAIL.

FLEXIBLE POST DELINATE PROTORS SHALL BE INSTALLED ACCORDING TO THE CURRENT SPECIFICATIONS AND INSTALLED AT ALL LOCATIONS SPECIFIED ON THIS STANDARD PLAN OR WHERE DIRECTED BY THE ENGINEER.

ON RAMPS, WHITE DELINATE PROTORS SHALL BE PLACED ON THE RIGHT AND YELLOW DELINATE PROTORS SHALL ALSO BE PLACED ON THE LEFT FOR A RIGHT-CURVING RAM WITH A RADIUS OF 1000' OR LESS.

WHERE DELINATE PROTOR ON ONE SIDE OF THE ROADWAY OR RAM ENDS AND DELINATE PROTOR ON THE OTHER SIDE APPEARS, AN OVERLAP OF TWO DELINATE PROTOR INSTALLATIONS SHALL BE USED.

RED DELINATE PROTORS SHALL BE LOCATED ON THE BACK OF RAM DELINATE PROTORS TO FACE WRONG-WAY TRAFFIC MOVEMENTS. PLACEMENT SHALL START AT RAM TERMINAL AND ENDS IN A MILE IN ADVANCE OF THE DECELERATION LANE.

DELINATE PROTORS SHALL BE PLACED ON ALL RAMS AT RURAL INTERCHANGES WHETHER OR NOT THE INTERCHANGES ARE LIGHTED. DELINATE PROTORS SHALL BE OMITTED ALONG THE THROUGH ROADWAY BETWEEN INTERCHANGES WHERE FIXED SOURCE LIGHTING EXISTS.

DELINATE PROTOR PLACEMENT SHOULD CONTINUE WHERE GUARDRAIL OR CONCRETE BARRIER IS PRESENT. DO NOT PLACE DELINATE PROTORS BEHIND GUARDRAIL APPROACH TERMINALS EXCEPT AS SHOWN ON SHEET 6 OF THIS STANDARD. IF TERRAIN OR OTHER FACTORS PROHIBIT POST MOUNTED DELINATE PROTOR PLACEMENT, INSTALLATION OF GUARDRAIL OR BARRIER MOUNTED ENHANCED DELINATE PROTORS IS RECOMMENDED.

ALTERNATE DELINATE PROTOR LOCATION METHOD:
THE FIRST DELINATE PROTOR ON EACH SIDE OF THE ROADWAY IS LOCATED FROM THE AGGREGATE SHOULDER. A NEW OFFSET REFERENCE IS GENERATED BY MEASURING FROM THE LOCATED DELINATE PROTOR TO THE STRIPED EDGELINE. THIS MEASUREMENT CAN BE USED TO LOCATE THE OTHER DELINATE PROTORS IN A CORRIDOR OF SIMILAR CROSS SECTION.

RIGID STEEL POST DETAIL

RESTRICTED TO BE PLACED BEHIND GUARDRAIL APPROACH TERMINALS EXCEPT AS SHOWN ON SHEET 6 OF THIS STANDARD.

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

DELINATE PROTOR INSTALLATIONS

5-18-2020  3-4-2019  R-127-G
F.H.W.A. APPROVAL  PLAN DATE  SHEET
8 OF 8
SECTION L-L

HSS 4" x 3" x \( \frac{3}{8} " \), A500 Grade B

6" x 4" x \( \frac{3}{8} " \) (4" long) angle

\( \frac{5}{8} " \) x 2" slotted hole in rail.

\( \frac{5}{8} " \) x \( \frac{5}{8} " \) slotted round head bolts with plate washer, lock washer, and hex nut (typ.)

SECTION M-M

HSS 4" x 3" x \( \frac{3}{8} " \) rail

HSS 4" x 3" x \( \frac{3}{8} " \) rail

HSS 4" x 3" x \( \frac{3}{8} " \) angle

\( \frac{5}{8} " \) x \( \frac{5}{8} " \) hole in rail.

\( \frac{5}{8} " \) x \( \frac{3}{8} " \) slotted hole in rail.

\( \frac{5}{8} " \) x \( \frac{3}{8} " \) slotted round head bolts with hex nut, flat washer, lock washer (typ.)
PEDESTRIAN BRIDGE RAILING

1.4" X 1'-4" POST STUD WITH 1 FLAT WASHER, 1 LOCK WASHER, HEX NUTS, AND JAMB NUT (TYP.)
1'-4" X 9/16" SPACER PLATE (SEE SHEET 8 OF 8)
8" X 5'-0" RAIL POST
1'-2" X 10" X 1" BASE PLATE
1'-7" (LEVEL)
1'-2" X 10" X 1" RAILING BAR (TYP.)
HSS 4" X 4" X 1/4" RAILING BAR (TYP.)

BICYCLE BRIDGE RAILING

1.4" X 1'-0" POST STUD WITH 1 FLAT WASHER, 1 LOCK WASHER, HEX NUTS, AND JAMB NUT (TYP.)
8" X 5'-0" RAIL POST
1'-2" X 10" X 1" BASE PLATE
1'-7" (LEVEL)
1'-2" X 10" X 1" RAILING BAR (TYP.)
HSS 4" X 4" X 1/4" RAILING BAR (TYP.)

NOTES:

DETAILS SHOWN ARE ACCORDING TO CURRENT AASHTO SPECIFICATIONS.

ALL WORK AND MATERIALS SHALL BE ACCORDING TO THE STANDARD SPECIFICATIONS.

THE BICYCLE BRIDGE RAILING SHALL BE USED ONLY WITH THE BRUSH BLOCK SHOWN ON THIS SHEET.

FOR LIGHT STANDARD ANCHOR BOLT ASSEMBLIES, SEE STANDARD PLAN B-103-SERIES.

USE THE HSS 2" X 2" X 1/4" RAIL AND CORRESPONDING DETAILS ONLY WHEN A SIDEWALK IS LOCATED BEHIND THE 4 TUBE RAILING. SEE SHEETS 2, 3 AND 4.

ALL LABOR, MATERIALS AND EQUIPMENT REQUIRED TO INSTALL THE HSS 2" X 2" X 1/4" RAIL SHALL BE INCLUDED IN THE BID ITEM "BRIDGE RAILING, 4 TUBE".

POST DETAILS

BRIDGE RAILING, 4 TUBE

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

DEPARTMENT DIRECTOR
Paul C. Agerda

APPROVED BY:
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Jul 19 2019 8:33 AM

DIRECTOR, BUREAU OF BRIDGES AND STRUCTURES
Gregg Brunner, P.E.
Gregg Brunner
Jul 18 2019 10:53 AM

DIRECTOR, BUREAU OF FIELD SERVICES
Bradley C. Wieferich
Bradley C. Wieferich
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APPROVED BY:

APPROVED BY:
DIRECTOR, BUREAU OF DEVELOPMENT

PREPARED BY: B.L.T.

CHECKED BY: V.T.

5-18-2020
5-22-2018
B-26-F

F.H.W.A. APPROVAL
PLAN DATE
SHEET 1 OF 8
PLAN
HSS 2" x 2" x 1/8"

SECTION G-G
HSS 2" x 2" x 1/8"

FIXED SPLICE DETAILS

PLAN
HSS 2" x 2" x 1/8"

SECTION N-N
HSS 2" x 2" x 1/8"

EXPANSION SPLICE DETAILS

SECTION H-H

SECTION J-J

SECTION K-K

END OF RAIL

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

BRIDGE RAILING, 4 TUBE
5\(\frac{1}{8}\)" Ø ROUND HEAD BOLT
WITH PLATE WASHER (SEE DETAIL A),
LOCK WASHER AND HEX NUT

ANCHOR STUD LAYOUT
NOTE: SURFACE UNDER POST IS
TO BE FINISHED LEVEL

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

BRIDGE RAILING, 4 TUBE