



STATE OF MICHIGAN
DEPARTMENT OF TRANSPORTATION
LANSING

GRETCHEN WHITMER
GOVERNOR

PAUL C. AJEGBA
DIRECTOR

April 25, 2022

Dear Standard Plan Book Holders:

Subject: Standard Plans R-4-E, R-15-G, R-20X-E, R-27-F, R-28-J, R-33-G, R-40-I, R-102-C,
B-22-E, B-23-F, B-50-A, & B-101-G

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

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|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Standard Plan R-4-E | Eliminated an outdated reference to Grade P2 concrete in favor of the current Standard Specifications for Construction. |
| Standard Plan R-15-G | Added an optional lift hole (and detail) to the frame. |
| Standard Plan R-20X-E | Eliminated “For use on manholes” in the title block. |
| Standard Plan R-27-F | Eliminated Detail 4 (with the 12” curb height) since this height is not allowed with the new MASH compliant anchorages. Revised Detail 4A (with the 4” curb height) for use on both approach and departing ends. Also, revised the shape of the barrier (end of bridge railing) and added text indicating use with the Detail “M” anchorages and the required number of drainage structures based on a hydrological analysis of the area and size of bridge deck. |
| Standard Plan R-28-J | “Turning spaces” were renamed “landings” and Sidewalk Ramps” were renamed “Curb Ramps”. On sheet two (and illustrated on sheet 6), added reinforcing bars in the curb ramp opening and a tie bar from the pavement to the curb ramp opening with a note stating reinforcement as in adjacent curb and gutter, see Standard Plan R-30-series. Modified the detail at the bottom of sheet two (section through curb ramp opening) to emphasize the slopes required in the curb ramp opening area. Maximum vertical dimensions from the curb invert to the two edges of the curb and gutter opening (labeled “A” & “B”) were provided (Table) for various curb types. On sheets two and six, the term “curb cut” or “curb & gutter” were revised to “curb ramp opening” and “ramp” was changed to “ramp run”. A landing was eliminated in the Ramp Type C sketch on page three. Eliminated notes in the note section on providing turning spaces where pedestrian turning movements are required and transitioning the gutter pan cross section. Clarified a note in the note section regarding the running slope and the 15’ maximum length of a ramp. Eliminated a portion of the |

	“*” note on sheets one through four in favor of a note in the note section.
Standard Plan R-33-G	Modified the barrier shape to the single slope barrier.
Standard Plan R-40-I	On sheet four in the note section, revised a note regarding dowel bar coating to reference the Standard Specifications for Construction instead of an AASHTO specification.
Standard Plan R-102-C	Added a note in the note section and text in Detail #1 referencing the proper placement of fence in the presence of mechanically stabilized earth (MSE) walls.
Standard Plan B-22-E	Added the MGS-8 to the guardrail types which connect to Bridge Railing Thrie Beam Retrofit. Updated details with new guardrail approach sections, Detail A3 (Guardrail Type MGS-8), A4 (Guardrail Type T) and A5 (Guardrail Type B). Revised the term “thrie beam transition” (panel) to “symmetrical thrie beam transition”.
Standard Plan B-23-F	Added the MGS-8 to the guardrail types which connect to Bridge Railing Thrie Beam Retrofit. Updated details with new guardrail approach sections, Detail A3 (Guardrail Type MGS-8), A4 (Guardrail Type T) and A5 (Guardrail Type B). Revised the term “thrie beam transition” (panel) to “symmetrical thrie beam transition”.
Standard Plan B-50-A	New bridge railing to be used with >10” brush block or sidewalk. The concrete block is located at the face of the brush block or sidewalk and protects the existing railing, or the existing railing is removed.
Standard Plan B-101-G	Updated notes, as most of the information is now covered in the 2020 Standard Specifications. Updated note on sheet 2, Section B-B, for steel beam connection regarding installation (snug tightening) of brackets. Updated allowable concrete beam insert types and material requirements.

Standard Plan Book Holders
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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-43-I, R-45-J, R-80-E, R-100-H, R-110-A, R-112-I (a special detail has superseded these plans) and B-17-D and B-20-D (obsolete plans).

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 to the road details can be directed to MDOT-Road-Design-Standards@michigan.gov.

Questions regarding revisions to the bridge details can be directed to MDOT-Bridge-Design-Standards@michigan.gov.

Sincerely,

Kristin Schuster Kristin Schuster
Apr 21 2022 3:33 PM

Kristin Schuster
Engineer of Design

Enclosures

cc: C. Libiran
W. Pikka
V. Zokvic

BOD:DD:QA:WKP;jlh



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STANDARD PLAN NUMBER	NUMBER OF SHEETS	TITLE	F.H.W.A. APPROVAL DATE OR * SPECIAL DETAIL
R-1-G	9	DRAINAGE STRUCTURES	5-18-2020
R-2-D	4	MANHOLE BASE TYPE 1	9-14-2001
R-3-B	2	PRECAST MANHOLE TEES	12-21-2001
R-4-E	4	MANHOLE BASE TYPE 2	4-7-2022
R-7-F	2	COVER B	9-30-2014
R-8-D	3	COVER C	9-30-2014
R-8X-D	3	COVER CX	9-30-2014
R-9-D	2	COVER D	9-30-2014
R-9X-E	2	COVER DX	9-30-2014
R-10-D	1	COVER E	9-30-2014
R-11-E	1	MONUMENT BOXES	9-30-2014
R-12-E	1	COVER G	9-30-2014
R-14-D	2	COVER J	9-30-2014
R-15-G	3	COVER K	4-7-2022
R-18-F	2	COVER Q	9-30-2014
R-20-D	2	COVER R	9-30-2014
R-20X-E	2	COVER RX	4-7-2022
R-22-F	4	COVER V	5-18-2020
R-23-E	3	COVER W	5-18-2020
R-24-F	3	COVER VG	5-18-2020
R-27-F	1	BRIDGE APPROACH CURB & GUTTER (USING EXISTING CATCH BASIN)	4-7-2022
R-28-J	7	CURB RAMP AND DETECTABLE WARNING DETAILS	4-7-2022
R-29-I	4	DRIVEWAY OPENINGS & APPROACHES, AND CONCRETE SIDEWALK	9-30-2014
R-30-G	2	CONCRETE CURB AND CONCRETE CURB & GUTTER	9-30-2014
R-31-F	2	INTEGRAL CURB AND INTEGRAL CURB & GUTTER	1-25-2013

* SPECIAL DETAILS WILL BE INCLUDED IN THE CONSTRUCTION PLANS



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STANDARD PLAN NUMBER	NUMBER OF SHEETS	TITLE	F.H.W.A. APPROVAL DATE OR * SPECIAL DETAIL
* R-32-F		APPROACH CURB & GUTTER DOWNSPOUTS (FOR BRIDGE BARRIER ON RURAL HIGHWAYS)	Special Detail
R-33-G	2	CONCRETE VALLEY GUTTER AND URBAN FREEWAY CURB	4-7-2022
R-35-E	2	CONCRETE SHOULDER GUTTER AND SPILLWAY	5-18-2020
R-37-B	2	ISOLATION JOINT DETAILS	9-10-2010
R-38-C	2	CONCRETE DIVIDER	1-25-2013
R-39-K	5	TRANSVERSE PAVEMENT JOINTS (PLAIN CONCRETE PAVEMENT)	2-21-2018
R-40-I	4	LOAD TRANSFER ASSEMBLIES FOR TRANSVERSE JOINTS	4-7-2022
R-41-H	2	LONGITUDINAL PAVEMENT JOINTS	9-30-2014
R-42-F	6	TYPICAL JOINT LAYOUTS FOR CONCRETE PAVEMENT	1-25-2013
* R-43-J		LOCATION OF TRANSVERSE JOINTS IN PLAIN CONCRETE PAVEMENT	Special Detail
R-44-F	6	CONCRETE PAVEMENT REPAIR	9-10-2010
* R-45-K		PAVEMENT REINFORCEMENT FOR BRIDGE APPROACH	Special Detail
R-46-D	2	PAVED AND COBBLE DITCHES, & DRAINAGE TREATMENT DETAILS	9-10-2010
R-49-G	9	CONCRETE BARRIER	3-29-2018
R-50-G	6	LIGHT STANDARD FOUNDATION (CONCRETE BARRIER, DOUBLE FACE)	3-29-2018
* R-53-A		TEMPORARY CONCRETE BARRIER LIMITED DEFLECTION	Special Detail
R-54-I	4	CONCRETE BARRIER, SINGLE FACE	3-29-2018
R-55-G	4	FILLER WALLS AT BRIDGE PIER COLUMNS	9-10-2010
* R-56-F		GUARDRAIL MEDIAN OBJECT PROTECTION	Special Detail
R-59-E	6	GUARDRAIL AT BRIDGES AND EMBANKMENTS	11-14-2003

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

* SPECIAL DETAILS WILL BE INCLUDED IN THE CONSTRUCTION PLANS



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STANDARD PLAN NUMBER	NUMBER OF SHEETS	TITLE	F.H.W.A. APPROVAL DATE OR * SPECIAL DETAIL
* R-100-I		SEEDING AND TREE PLANTING	Special Detail
R-101-B	3	WOVEN WIRE FENCE	9-14-2001
R-102-C	1	INSTALLATION OF WOVEN WIRE FENCE (AT STRUCTURES)	4-7-2022
R-103-C	7	TREATMENT OF PEAT MARSHES	10-21-2008
R-105-D	6	GRADING CROSS-SECTIONS	11-14-2003
R-107-H	7	SUPERELEVATION AND PAVEMENT CROWNS	9-10-2010
* R-110-B		PAVEMENT SAFETY EDGE	Special Detail
* R-112-J		SHOULDER AND CENTER LINE CORRUGATIONS	Special Detail
R-113-C	2	TEMPORARY CROSSOVERS FOR DIVIDED ROADWAYS	10-27-2004
R-121-B	4	TRACK CROSSINGS	9-14-2001
R-122-C	2	RAILROAD CROSSING SIGNALS	9-16-2009
* R-126-I		PLACEMENT OF TEMPORARY CONCRETE BARRIER AND TEMPORARY STEEL BARRIER	Special Detail
R-127-G	8	DELINEATOR INSTALLATIONS	5-18-2020

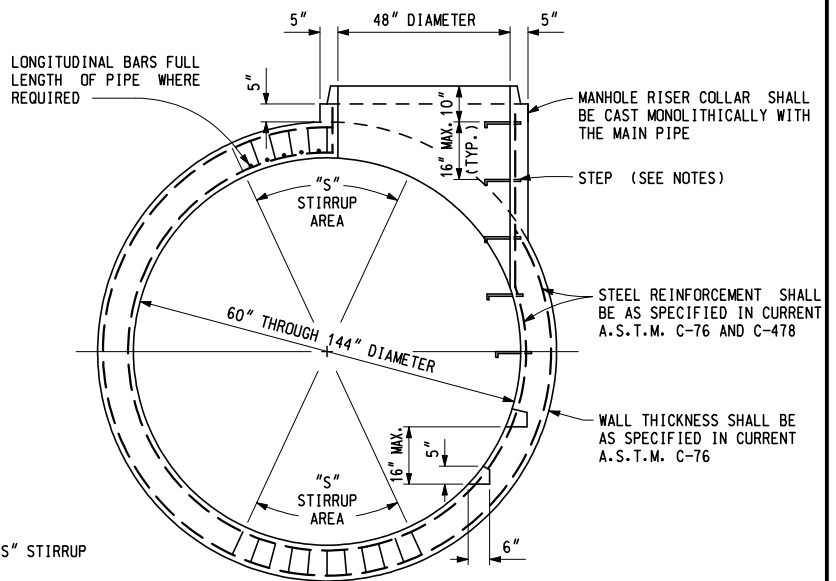
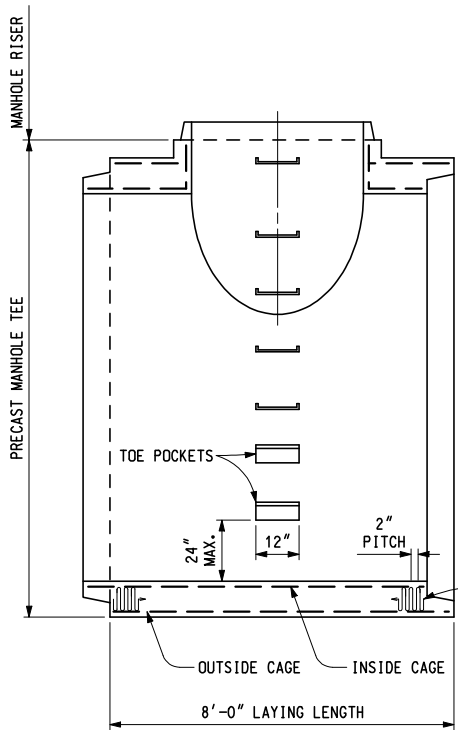
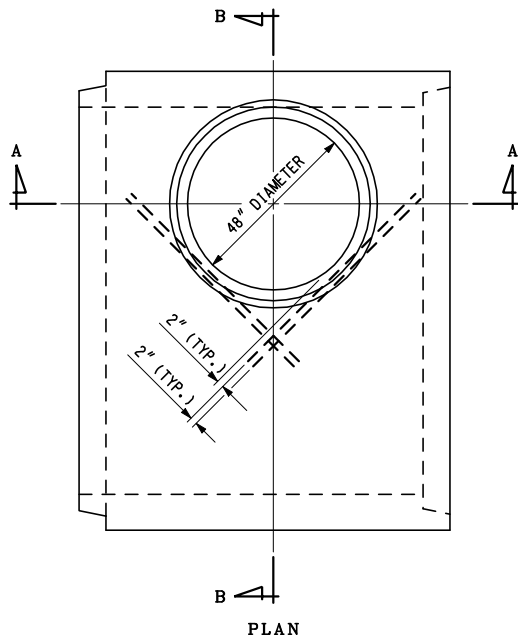
*** SPECIAL DETAILS WILL BE INCLUDED IN THE CONSTRUCTION PLANS**

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-TriezenbergSquad@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).

STANDARD PLAN NUMBER	NUMBER OF SHEETS	TITLE	F.H.W.A. APPROVAL DATE OR * SPECIAL DETAIL
B-21-J	4	BRIDGE RAILING, 2 TUBE	5-20-2016
B-22-E	5	BRIDGE RAILING, THRIE BEAM RETROFIT (R4 TYPE BRIDGE RAILING)	4-7-2022
B-23-F	6	BRIDGE RAILING, THRIE BEAM RETROFIT (OPEN PARAPET TYPE BRIDGE RAILING)	4-7-2022
B-25-K	8	BRIDGE RAILING, AESTHETIC PARAPET TUBE	7-25-2017
B-26-F	8	BRIDGE RAILING, 4 TUBE	5-18-2020
B-27-A	7	BRIDGE RAILING, 3 TUBE WITH PICKETS	11-8-2016
* B-28-A		BRIDGE BARRIER RAILING, TYPE 7	Special Detail
* B-29-A		BRIDGE BARRIER RAILING, TYPE 6	Special Detail
B-32-D	2	FENCING FOR PEDESTRIAN STRUCTURE EXISTING OPEN PARAPET	1-25-2013
B-33-D	2	FENCING FOR PEDESTRIAN STRUCTURE EXISTING METAL RAILING – R4 POST	1-25-2013
B-34-C	2	FENCING FOR PEDESTRIAN STRUCTURE EXISTING METAL RAILING – R5 OR R9 POST	9-29-2003
B-35-D	2	FENCING FOR PEDESTRIAN STRUCTURE EXISTING SOLID PARAPET	1-25-2013
B-37-C	2	FENCING FOR PEDESTRIAN STRUCTURE 2 OR 5 TUBE STEEL RAILING	9-29-2003
B-38-D	2	FENCING FOR PEDESTRIAN STRUCTURE EXISTING TYPE 4 & 5 BARRIER	1-25-2013
B-39-C	2	FENCING FOR PEDESTRIAN STRUCTURE NEW TYPE 4 & 5 BARRIER	9-29-2003
B-40-A	3	FENCING FOR BRIDGE RAILING, 4 TUBE	9-29-2003
B-41-C	3	FENCING FOR BRIDGE RAILING, AESTHETIC PARAPET TUBE	10-21-2008
B-50-A	3	BRIDGE RAILING, CONCRETE BLOCK RETROFIT	4-7-2022
B-101-G	2	DRAIN CASTING ASSEMBLY DETAILS	4-7-2022
B-102-C	2	STANDARD SLOPE PAVING DETAILS	11-26-2001
B-103-E	1	MOLDING, BEVEL, LIGHT STANDARD ANCHOR BOLT ASSEMBLY AND NAME PLATE DETAILS	10-21-2008

* SPECIAL DETAILS WILL BE INCLUDED IN THE CONSTRUCTION PLANS



60" THROUGH 144" PRECAST MANHOLE TEE

NOTES:

STACK SECTIONS SHALL BE ACCORDING TO STANDARD PLAN R-1-SERIES UNLESS OTHERWISE NOTED ON THIS PLAN.

STACK SECTIONS SHALL BE LOCATED ON LEFT OR RIGHT SIDE OF SEWER AS SPECIFIED ON THE PLANS.

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

STEPS 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.

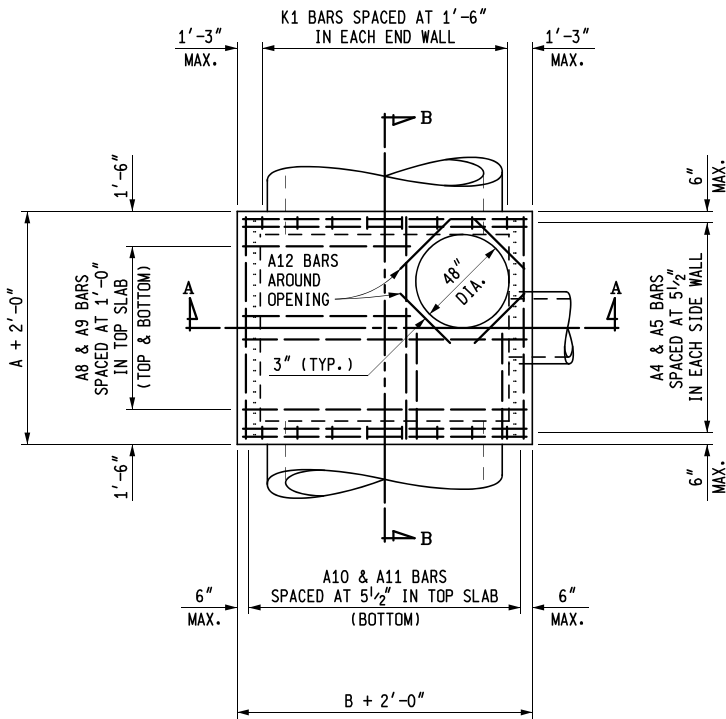
ALL SIZES AND FLOW LINES OF PIPES, AND ELEVATIONS FOR TOP AND BOTTOM OF STRUCTURES, SHALL BE DETERMINED FROM THE PLANS AND CONSTRUCTIONS REQUIREMENTS.

PRECAST MANHOLE TEE SHALL BE THE SAME CLASS AS THE EXISTING CONCRETE SEWER. THE PIPE SHALL CONFORM TO A.S.T.M. C-76 AND THE RISER TO A.S.T.M. C-478.

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY TECHNICAL SERVICES STANDARD PLAN FOR

PRECAST MANHOLE TEES

12-21-2001 F.H.W.A. APPROVAL	2-26-2001 PLAN DATE	R-3-B	SHEET 2 OF 2
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PLAN

NOTES:

STACK SECTIONS SHALL BE ACCORDING TO STANDARD PLAN R-1-SERIES UNLESS OTHERWISE NOTED ON THIS PLAN.

STACK SECTIONS SHALL BE LOCATED ON LEFT OR RIGHT SIDE OF SEWER AS SPECIFIED ON THE PLANS.

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

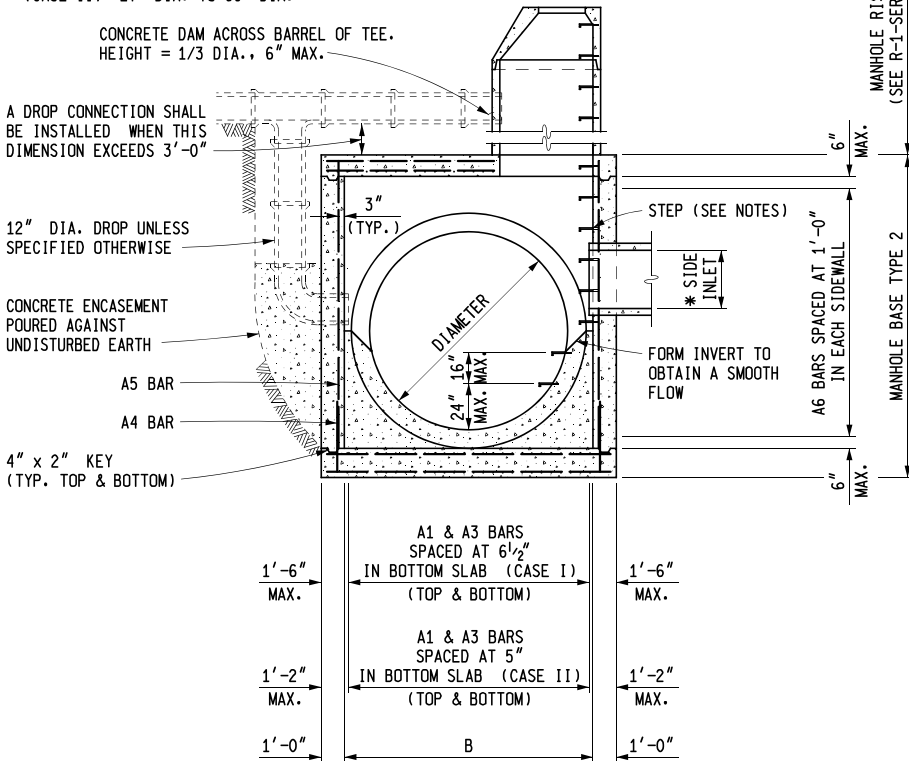
STEPS SHALL BE OF AN APPROVED DESIGN AND MADE FROM CAST IRON, ALUMINUM, OR PLASTIC COATED STEEL. RUNGS SHALL BE A MINIMUM OF 10" IN CLEAR LENGTH, DESIGNED TO PREVENT THE FOOT FROM SLIPPING OFF THE END. THE MINIMUM HORIZONTAL PULL OUT LOAD SHALL BE 400 LBS. THE MINIMUM VERTICAL LOAD SHALL BE 800 LBS.

ALL SIZES, FLOW LINES OF PIPES, AND ELEVATIONS FOR TOP AND BOTTOM OF STRUCTURES SHALL BE DETERMINED FROM THE PLANS AND CONSTRUCTION REQUIREMENTS.

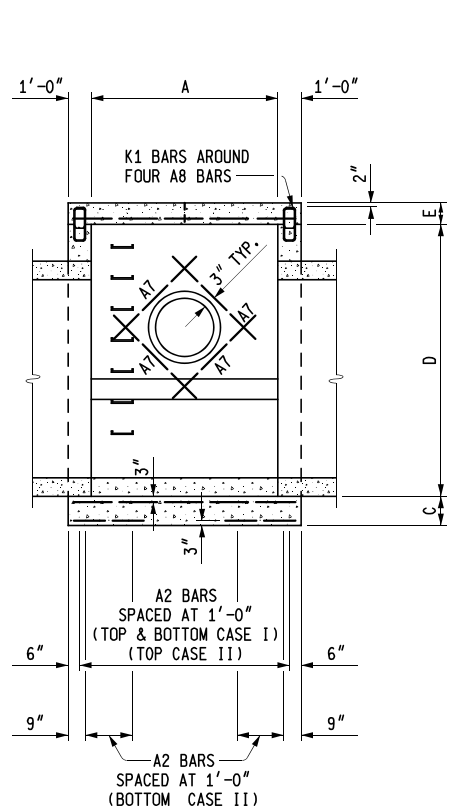
NO DEDUCTIONS HAVE BEEN MADE IN CONCRETE QUANTITIES FOR SIDE INLETS.

CONCRETE GRADE AS SPECIFIED IN THE STANDARD SPECIFICATIONS FOR CONSTRUCTION.

* (CASE I) 24" DIA. OR LESS
 (CASE II) 27" DIA. TO 60" DIA.



SECTION A - A



SECTION B - B

MDOT
 Michigan Department of Transportation

PREPARED BY
 DESIGN DIVISION

DRAWN BY: B.L.T.

CHECKED BY: W.K.P.

DEPARTMENT DIRECTOR
 Paul C. Ajegba

APPROVED BY: Gregg Brunner, P.E. Gregg Brunner
 Oct 14 2021 12:30 PM
 DIRECTOR, BUREAU OF FIELD SERVICES

APPROVED BY: Bradley C. Wiefelrich Bradley C. Wiefelrich
 Oct 14 2021 11:00 AM
 DIRECTOR, BUREAU OF DEVELOPMENT

MICHIGAN DEPARTMENT OF TRANSPORTATION
 BUREAU OF DEVELOPMENT STANDARD PLAN FOR

MANHOLE BASE TYPE 2

4-7-2022 F.H.W.A. APPROVAL	7-27-2021 PLAN DATE	R-4-E	SHEET 1 OF 4
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DIMENSIONS						
CASE I (SIDE INLET 24" DIAMETER OR LESS)						
SEWER DIAMETER	MANHOLE DEPTH	A	B	C	D	E
48" - 60"	8' OR LESS	4'-0"	6'-0"	1'-0"	7'-0"	10"
66" - 78"	8' OR LESS	4'-0"	7'-10"	1'-1"	8'-10"	10"
84" - 96"	8' OR LESS	4'-0"	9'-6"	1'-2"	10'-6"	10"
102" - 108"	8' OR LESS	4'-0"	10'-8"	1'-3"	11'-8"	10"

CONCRETE QUANTITIES						
CASE I (SIDE INLET 24" DIAMETER OR LESS)						
SEWER DIAMETER	MANHOLE DEPTH	BOTTOM SLAB (CYD)	WALLS (CYD)	TOP SLAB (CYD)	INVERT (CYD)	TOTAL (CYD)
48"	8' OR LESS	1.30	4.63	1.09	1.19	8.2
54"	8' OR LESS	1.30	4.28	1.09	1.20	7.9
60"	8' OR LESS	1.30	3.89	1.09	1.18	7.5
66"	8' OR LESS	1.77	6.30	1.43	2.02	11.5
72"	8' OR LESS	1.77	5.83	1.43	2.01	11.0
78"	8' OR LESS	1.77	5.32	1.43	1.98	10.5
84"	8' OR LESS	2.27	7.78	1.74	2.95	14.7
90"	8' OR LESS	2.27	7.20	1.74	2.93	14.1
96"	8' OR LESS	2.27	6.57	1.74	2.88	13.5
102"	8' OR LESS	2.70	8.25	1.96	3.67	16.6
108"	8' OR LESS	2.70	7.55	1.96	3.61	15.8

DIMENSIONS						
CASE II (27" DIAMETER THROUGH 60" DIAMETER SIDE INLET)						
SEWER DIAMETER	MANHOLE DEPTH	A	B	C	D	E
48" - 60"	8' OR LESS	8'-0"	6'-0"	1'-0"	7'-0"	11"
	OVER 8' TO 15'	8'-0"	6'-0"	1'-2"	7'-0"	1'-1"
	OVER 15' TO 25'	8'-0"	6'-0"	1'-5"	7'-0"	1'-4"
66" - 78"	8' OR LESS	8'-0"	7'-10"	1'-1"	8'-10"	11"
	OVER 8' TO 15'	8'-0"	7'-10"	1'-2"	8'-10"	1'-1"
	OVER 15' TO 25'	8'-0"	7'-10"	1'-5"	8'-10"	1'-4"
84" - 96"	8' OR LESS	8'-0"	9'-6"	1'-2"	10'-6"	11"
	OVER 8' TO 15'	8'-0"	9'-6"	1'-2"	10'-6"	1'-1"
	OVER 15' TO 25'	8'-0"	9'-6"	1'-5"	10'-6"	1'-4"
102" - 108"	8' OR LESS	8'-0"	10'-8"	1'-3"	11'-8"	11"
	OVER 8' TO 15'	8'-0"	10'-8"	1'-3"	11'-8"	1'-1"
	OVER 15' TO 25'	8'-0"	10'-8"	1'-5"	11'-8"	1'-4"

CONCRETE QUANTITIES						
CASE II (27" DIAMETER THROUGH 60" DIAMETER SIDE INLET)						
SEWER DIAMETER	MANHOLE DEPTH	BOTTOM SLAB (CYD)	WALLS (CYD)	TOP SLAB (CYD)	INVERT (CYD)	TOTAL (CYD)
48"	8' OR LESS	2.33	6.66	2.29	2.38	13.7
	OVER 8' TO 15'	2.72	6.66	2.71	2.38	14.5
	OVER 15' TO 25'	3.31	6.66	3.33	2.38	15.7
54"	8' OR LESS	2.33	6.31	2.29	2.40	13.3
	OVER 8' TO 15'	2.72	6.31	2.71	2.40	14.1
	OVER 15' TO 25'	3.31	6.31	3.33	2.40	15.4
60"	8' OR LESS	2.33	5.92	2.29	2.35	12.9
	OVER 8' TO 15'	2.72	5.92	2.71	2.35	13.7
	OVER 15' TO 25'	3.31	5.92	3.33	2.35	14.9
66"	8' OR LESS	3.19	8.70	2.91	4.03	18.8
	OVER 8' TO 15'	3.44	8.70	3.44	4.03	19.6
	OVER 15' TO 25'	4.17	8.70	4.24	4.03	21.1
72"	8' OR LESS	3.19	8.24	2.91	4.03	18.4
	OVER 8' TO 15'	3.44	8.24	3.44	4.03	19.2
	OVER 15' TO 25'	4.17	8.24	4.24	4.03	20.7
78"	8' OR LESS	3.19	7.73	2.91	3.96	17.8
	OVER 8' TO 15'	3.44	7.73	3.44	3.96	18.6
	OVER 15' TO 25'	4.17	7.73	4.24	3.96	20.1
84"	8' OR LESS	4.08	10.40	3.48	5.90	23.9
	OVER 8' TO 15'	4.08	10.40	4.11	5.90	24.5
	OVER 15' TO 25'	4.96	10.40	5.06	5.90	26.3
90"	8' OR LESS	4.08	9.81	3.48	5.86	23.2
	OVER 8' TO 15'	4.08	9.81	4.11	5.86	23.9
	OVER 15' TO 25'	4.96	9.81	5.06	5.86	25.7
96"	8' OR LESS	4.08	9.18	3.48	5.76	22.5
	OVER 8' TO 15'	4.08	9.18	4.11	5.76	23.1
	OVER 15' TO 25'	4.96	9.18	5.06	5.76	25.0
102"	8' OR LESS	4.86	10.85	3.87	7.34	26.9
	OVER 8' TO 15'	4.86	10.85	4.58	7.34	27.6
	OVER 15' TO 25'	5.51	10.85	5.63	7.34	29.3
108"	8' OR LESS	4.86	10.14	3.87	7.23	26.1
	OVER 8' TO 15'	4.86	10.14	4.58	7.23	26.8
	OVER 15' TO 25'	5.51	10.14	5.63	7.23	28.5

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

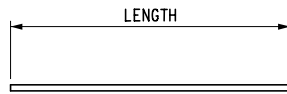
MANHOLE BASE TYPE 2

4-7-2022
F.H.W.A. APPROVAL

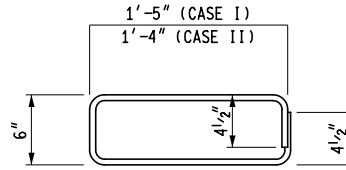
7-27-2021
PLAN DATE

R-4-E

SHEET
2 OF 4



A BARS



K BARS

BAR DETAILS

STEEL REINFORCEMENT QUANTITIES															
CASE I (SIDE INLET 24" DIAMETER OR LESS)															
SEWER DIAMETER		48" - 60"			66" - 78"			84" - 96"			102" - 108"				
BAR	BAR SIZE	NUMBER REQUIRED	LENGTH	WEIGHT (LBS)	NUMBER REQUIRED	LENGTH	WEIGHT (LBS)	NUMBER REQUIRED	LENGTH	WEIGHT (LBS)	NUMBER REQUIRED	LENGTH	WEIGHT (LBS)		
A1	#7	12	5'-6"	132	15	5'-6"	165	18	5'-6"	198	20	5'-6"	221		
A2	#5	12	7'-6"	95	12	9'-4"	119	12	11'-0"	140	12	12'-2"	155		
A3	#7	12	5'-6"	132	15	5'-6"	165	18	5'-6"	198	20	5'-6"	221		
A4	#7	24	1'-6"	72	24	1'-7"	76	24	1'-8"	80	24	1'-9"	84		
A5	#7	24	7'-7"	365	24	9'-5"	453	24	11'-1"	533	24	12'-3"	589		
A6	#5	14	5'-6"	82	18	5'-6"	105	22	5'-6"	128	24	5'-6"	140		
A7	#5	4	3'-0"	13	4	3'-0"	13	4	3'-0"	13	4	3'-0"	13		
A8	#7	12	7'-6"	180	12	9'-4"	225	12	11'-0"	265	12	12'-2"	293		
A9	#4	4	2'-6"	7	4	4'-4"	12	4	6'-0"	17	4	7'-2"	20		
A10	#6	8	5'-6"	66	12	5'-6"	99	15	5'-6"	123	17	5'-6"	140		
A12	#5	4	3'-0"	13	4	3'-0"	13	4	3'-0"	13	4	3'-0"	13		
K1	#4	10	4'-2"	29	12	4'-2"	35	14	4'-2"	41	16	4'-2"	47		
TOTAL STEEL WEIGHT				1186					1480					1749	1936

STEEL REINFORCEMENT QUANTITIES															
CASE II (27" DIAMETER THROUGH 60" DIAMETER SIDE INLET)															
SEWER DIAMETER		48" - 60"			66" - 78"			84" - 96"			102" - 108"				
BAR	BAR SIZE	NUMBER REQUIRED	LENGTH	WEIGHT (LBS)	NUMBER REQUIRED	LENGTH	WEIGHT (LBS)	NUMBER REQUIRED	LENGTH	WEIGHT (LBS)	NUMBER REQUIRED	LENGTH	WEIGHT (LBS)		
A1	#8	15	9'-6"	369	19	9'-6"	467	23	9'-6"	566	26	9'-6"	639		
A2	#5	16	7'-6"	127	16	9'-4"	158	16	11'-0"	187	16	12'-2"	206		
A3	#8	30	3'-0"	233	38	3'-0"	295	46	3'-0"	357	52	3'-0"	404		
A4	#7	42	3'-0"	253	42	3'-0"	253	42	3'-0"	253	42	3'-0"	253		
A5	#7	42	7'-8"	646	42	9'-6"	800	42	11'-2"	940	42	12'-4"	1039		
A6	#5	14	9'-6"	141	18	9'-6"	181	22	9'-6"	222	24	9'-6"	242		
A7	#5	4	5'-0"	21	4	5'-0"	21	4	5'-0"	21	4	5'-0"	21		
A8	#5	20	7'-6"	159	20	9'-4"	198	20	11'-0"	233	20	12'-2"	258		
A9	#5	4	2'-6"	11	4	4'-4"	18	4	6'-0"	25	4	7'-2"	30		
A10	#8	8	9'-6"	197	12	9'-6"	295	15	9'-6"	369	17	9'-6"	418		
A11	#8	9	4'-6"	105	9	4'-6"	105	9	4'-6"	105	9	4'-6"	105		
A12	#5	4	3'-0"	13	4	3'-0"	13	4	3'-0"	13	4	3'-0"	13		
K1	#4	10	4'-0"	28	12	4'-0"	34	14	4'-0"	39	16	4'-0"	45		
TOTAL STEEL WEIGHT				2303					2838					3330	3673

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

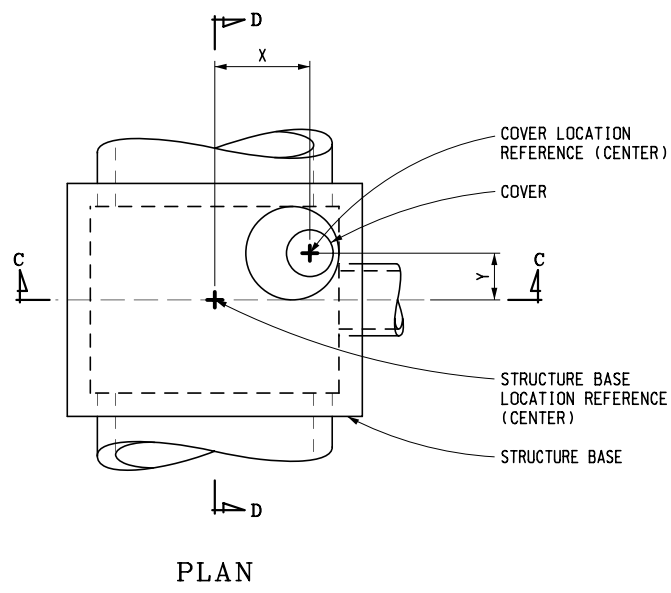
MANHOLE BASE TYPE 2

4-7-2022
F.H.W.A. APPROVAL

7-27-2021
PLAN DATE

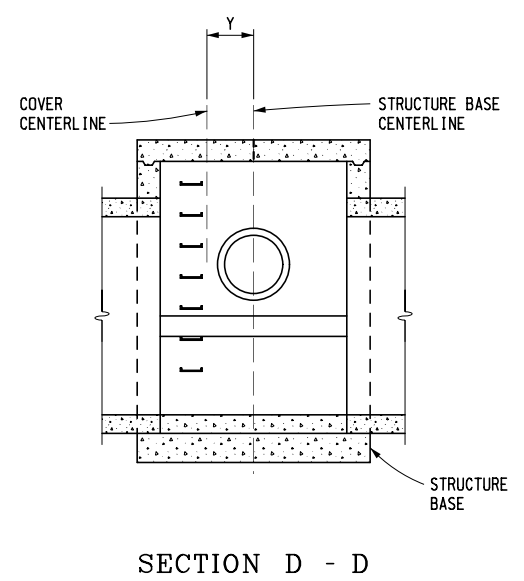
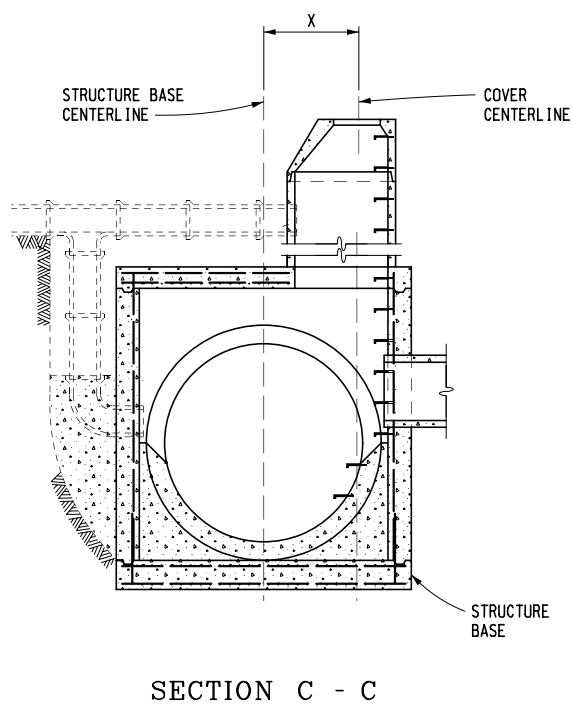
R-4-E

SHEET
3 OF 4



OFFSET DIMENSIONS			
CASE I			
SEWER DIAMETER	X		Y
	24" OPENING	27" OPENING	
48" - 60"	21"	19½"	0"
66" - 78"	32"	30½"	0"
84" - 96"	42"	40½"	0"
102" - 108"	49"	47½"	0"

OFFSET DIMENSIONS			
CASE II			
SEWER DIAMETER	X		Y
	24" OPENING	27" OPENING	
48" - 60"	21"	19½"	24"
66" - 78"	32"	30½"	24"
84" - 96"	42"	40½"	24"
102" - 108"	49"	47½"	24"

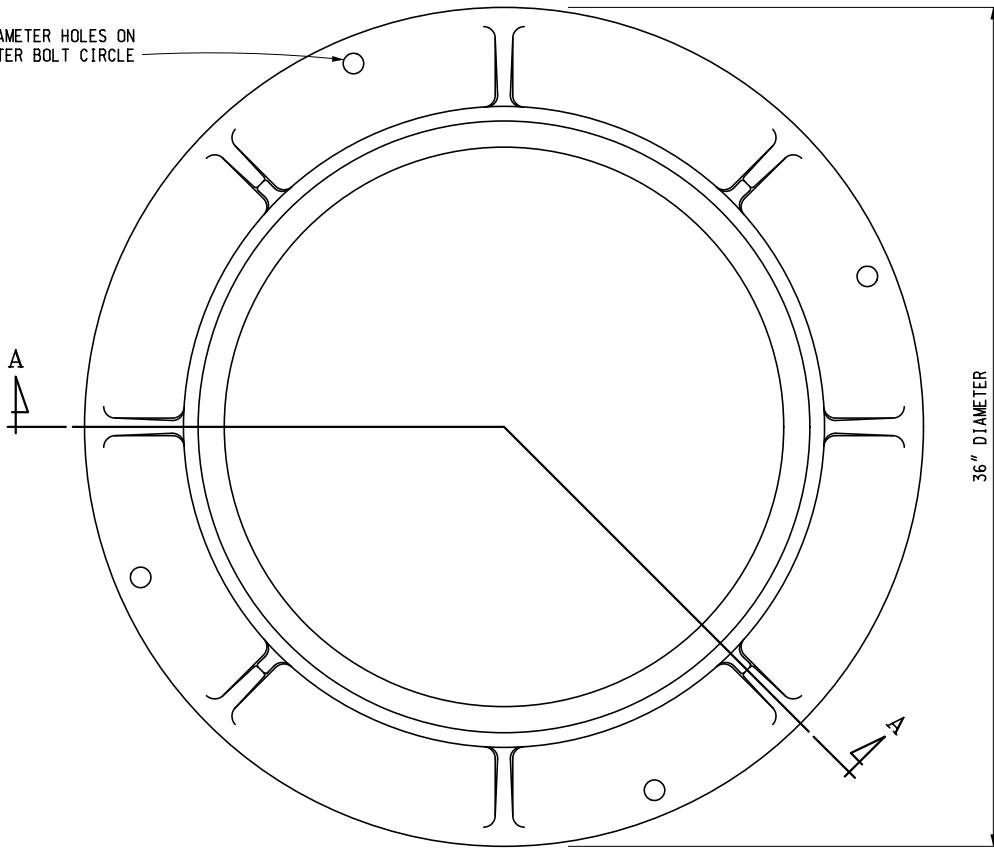


MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

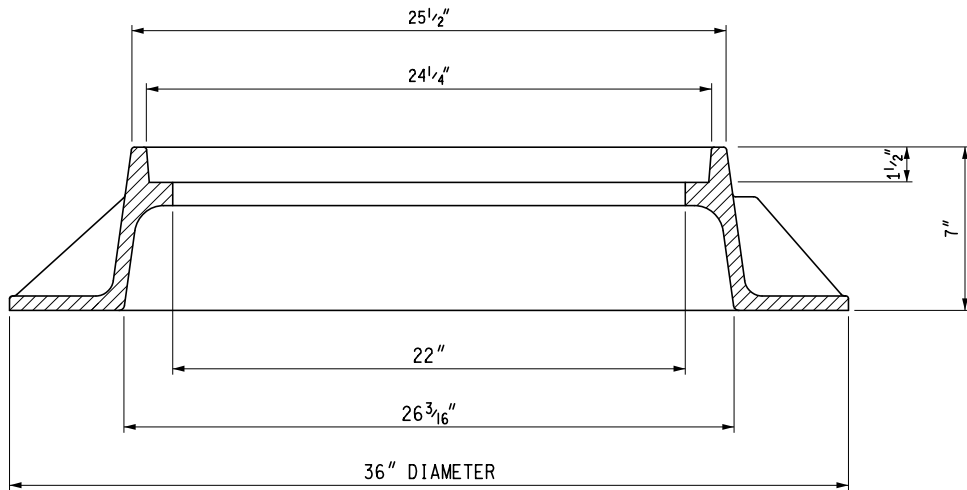
MANHOLE BASE TYPE 2

4-7-2022 F.H.W.A. APPROVAL	7-27-2021 PLAN DATE	R-4-E	SHEET 4 OF 4
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FOUR $\frac{7}{8}$ " DIAMETER HOLES ON
 $33\frac{3}{4}$ " DIAMETER BOLT CIRCLE



TOP VIEW OF FRAME



SECTION A - A



PREPARED
 BY
 DESIGN DIVISION

DRAWN BY: B.L.T.

CHECKED BY: W.K.P.

DEPARTMENT DIRECTOR
 Kirk T. Steudle

APPROVED BY: *Randy V. Pfeiffer*
 DIRECTOR, BUREAU OF FIELD SERVICES

APPROVED BY: *Mark A. Van Pelt*
 DIRECTOR, BUREAU OF HIGHWAY DEVELOPMENT

MICHIGAN DEPARTMENT OF TRANSPORTATION
 BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

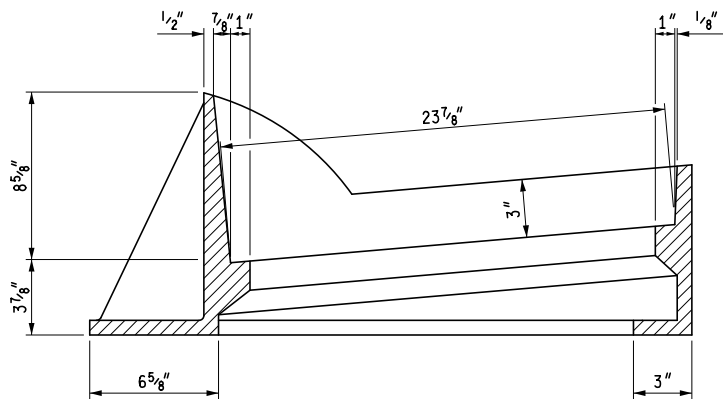
COVER B
 FOR USE ON MANHOLES

9-30-2014
 F.H.W.A. APPROVAL

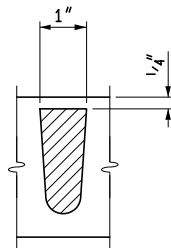
3-7-2014
 PLAN DATE

R-7-F

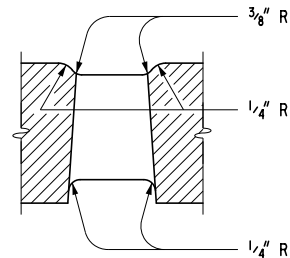
SHEET
 1 OF 2



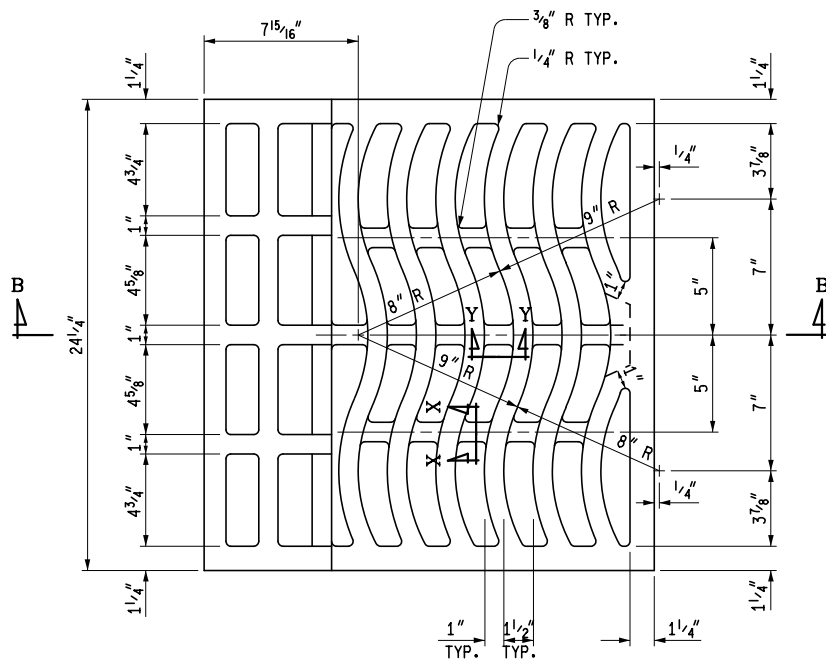
SECTION A - A



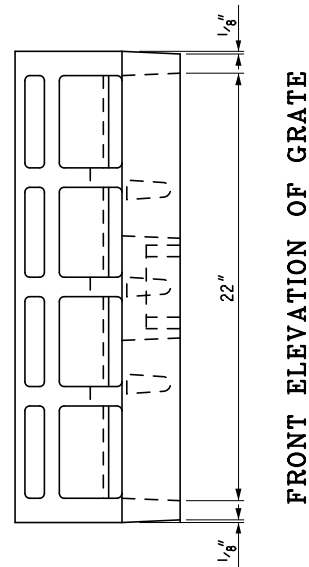
SECTION X - X



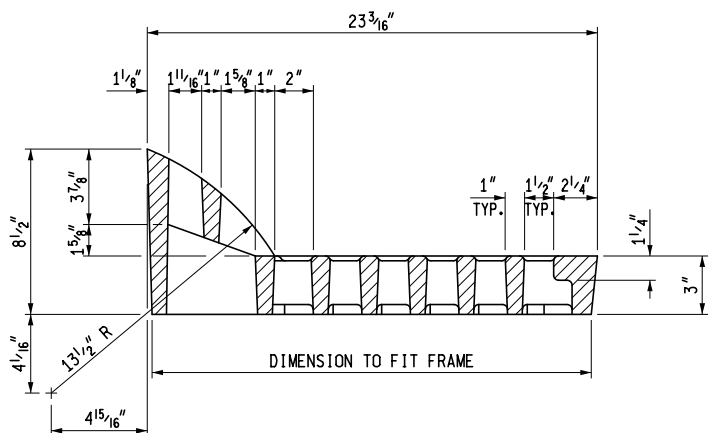
SECTION Y - Y



PLAN VIEW OF GRATE



FRONT ELEVATION 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

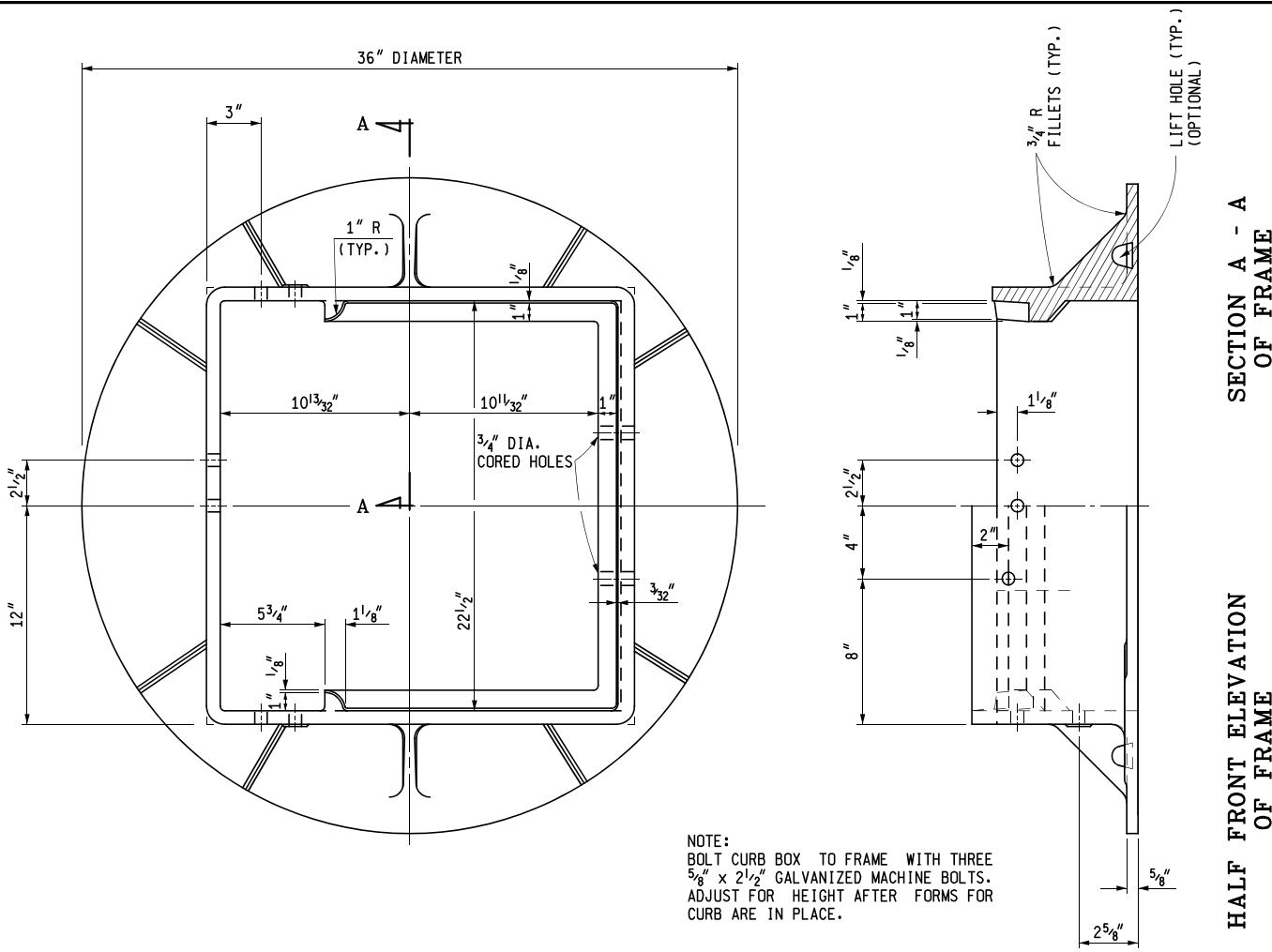
COVER J
FOR USE WITH
CONCRETE CURB & GUTTER DETAIL B

9-30-2014
F.H.W.A. APPROVAL

4-16-2014
PLAN DATE

R-14-D

SHEET
2 OF 2

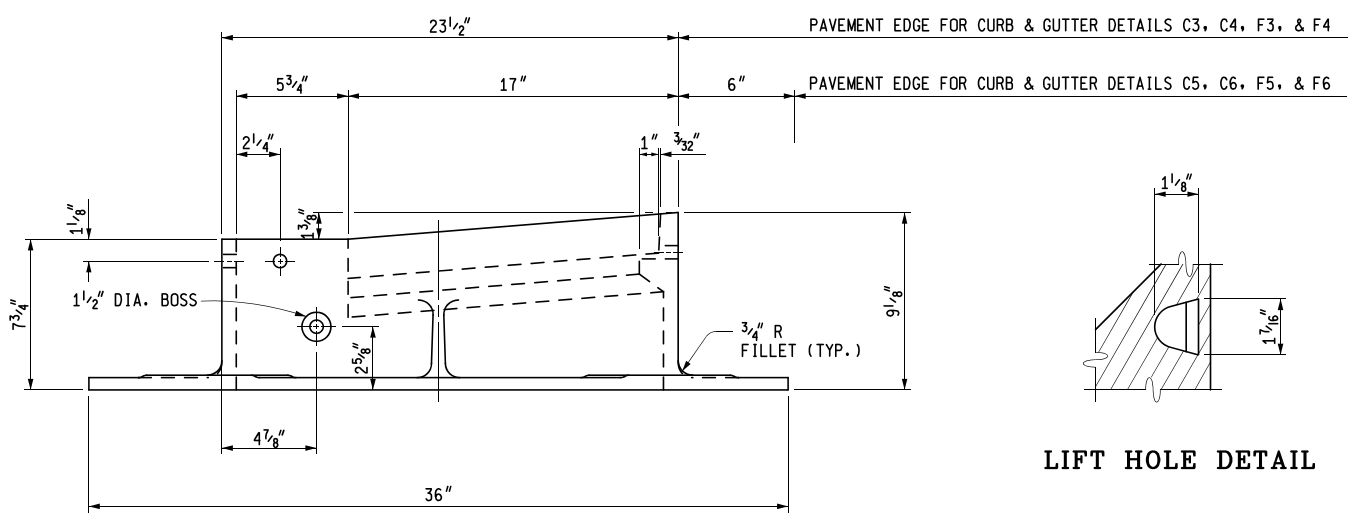


NOTE:
 BOLT CURB BOX TO FRAME WITH THREE
 5/8" x 2 1/2" GALVANIZED MACHINE BOLTS.
 ADJUST FOR HEIGHT AFTER FORMS FOR
 CURB ARE IN PLACE.

PLAN VIEW OF FRAME


SECTION A - A
OF FRAME

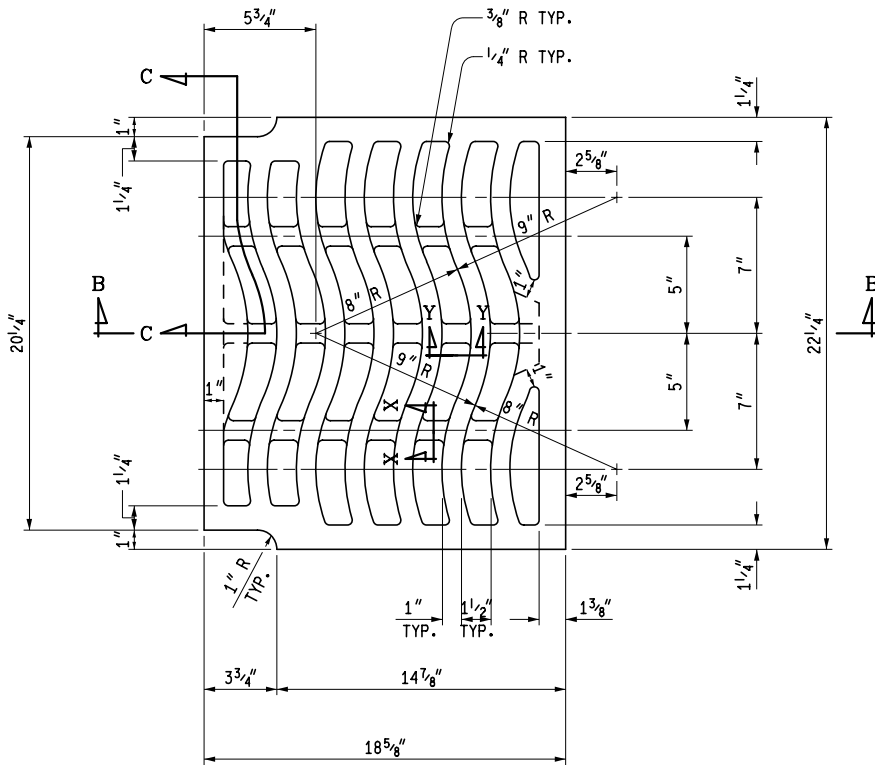
HALF FRONT ELEVATION
OF FRAME



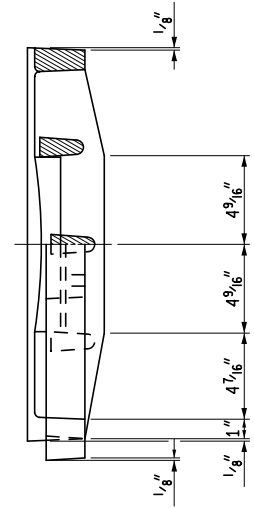
SIDE ELEVATION OF FRAME

LIFT HOLE DETAIL

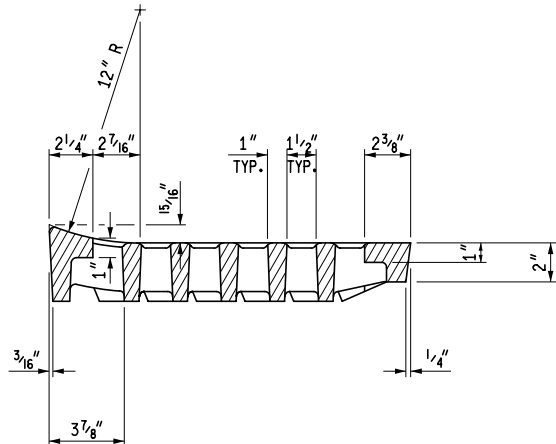
 Michigan Department of Transportation PREPARED BY DESIGN DIVISION DRAWN BY: <u>B.L.T.</u> CHECKED BY: <u>W.K.P.</u>	DEPARTMENT DIRECTOR Paul C. Ajegba APPROVED BY: _____ DIRECTOR, BUREAU OF FIELD SERVICES Gregg Brunner, P.E. Gregg Brunner Oct 14 2021 12:31 PM	MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF DEVELOPMENT STANDARD PLAN FOR COVER K FOR USE WITH CONCRETE CURB & GUTTER DETAILS C, E & F	
	APPROVED BY: _____ DIRECTOR, BUREAU OF DEVELOPMENT Bradley C. Wiefelich Bradley C. Wiefelich Oct 14 2021 11:00 AM	4-7-2022 F.H.W.A. APPROVAL	7-26-2019 PLAN DATE



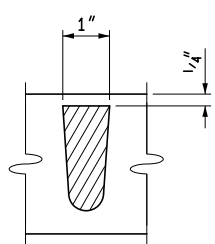
PLAN VIEW OF GRATE



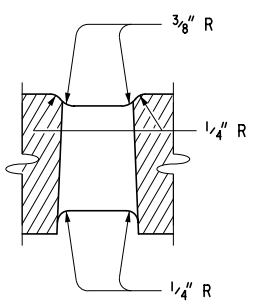
SECTION C - C
HALF FRONT
ELEVATION
OF GRATE



SECTION B - B



SECTION X - X



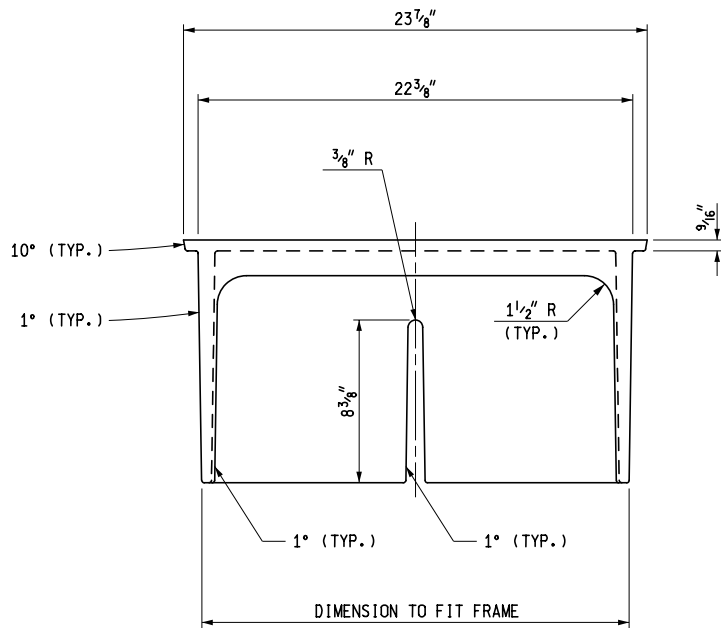
SECTION Y - Y

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

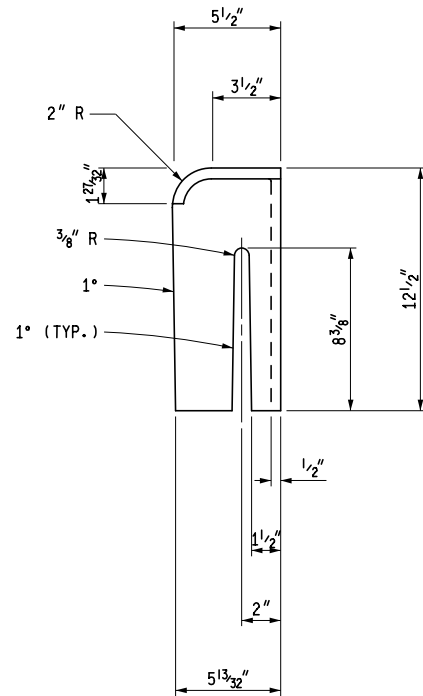
COVER K

FOR USE WITH CONCRETE CURB & GUTTER
DETAILS C, E & F

4-7-2022 F.H.W.A. APPROVAL	7-26-2019 PLAN DATE	R-15-G	SHEET 2 OF 3
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FRONT VIEW OF CURB BOX



SIDE VIEW

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 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.

THE CURB BOX AND FRAME SHALL BE SHIPPED ASSEMBLED.

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 DEVELOPMENT STANDARD PLAN FOR

COVER K

FOR USE WITH CONCRETE CURB & GUTTER
DETAILS C, E & F

4-7-2022
F.H.W.A. APPROVAL

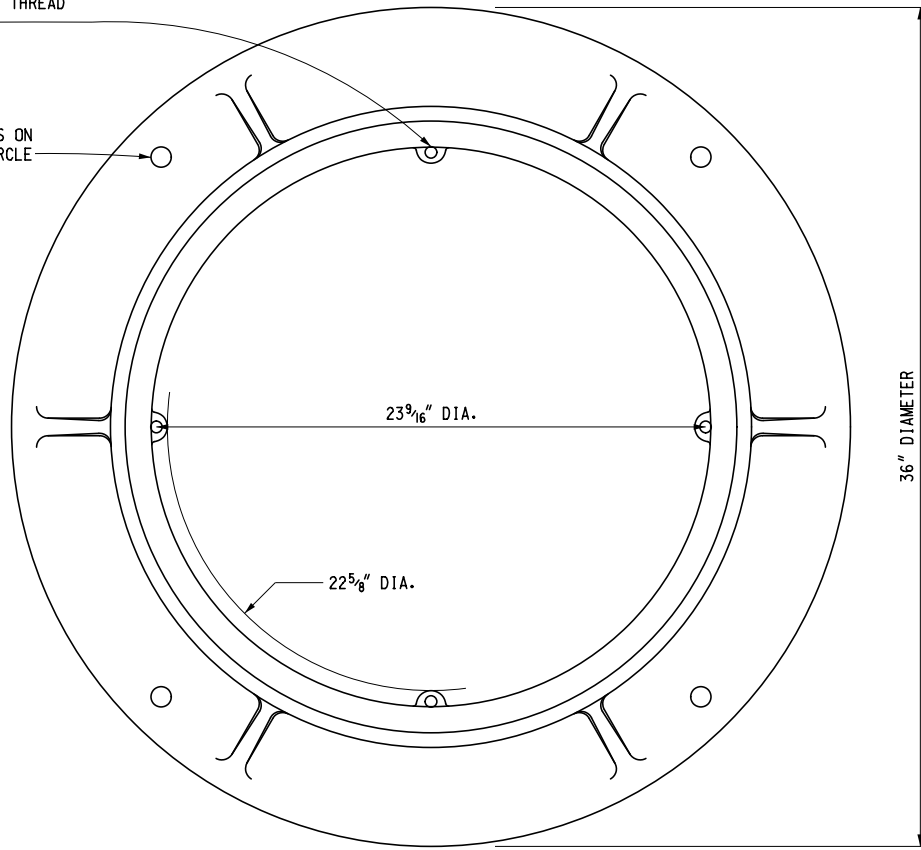
7-26-2019
PLAN DATE

R-15-G

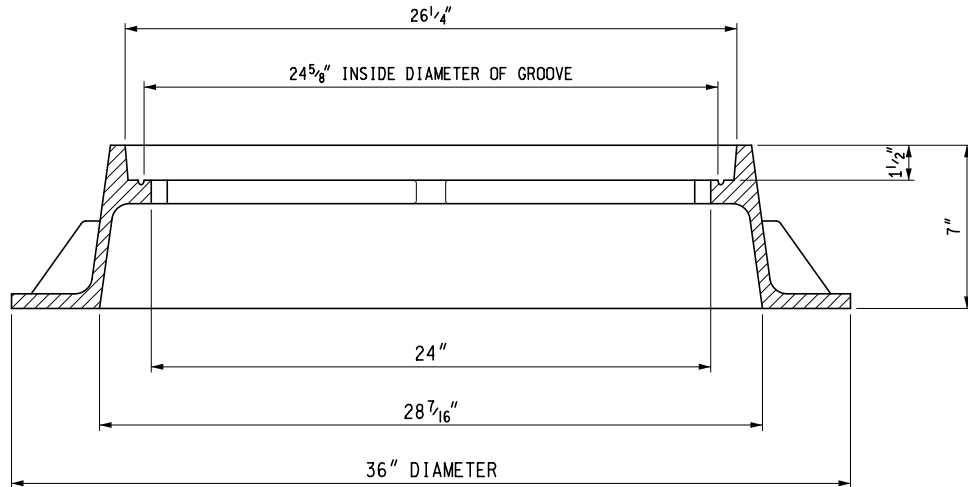
SHEET
3 OF 3

DRILL AND TAP FOR 1/2" - 13 BOLTS
ON DRILL DIMPLES PROVIDED. TYP.
OR PROVIDE REPLACEABLE THREAD
OPTION

FOUR 7/8" DIAMETER HOLES ON
32 3/4" DIAMETER BOLT CIRCLE



TOP VIEW OF FRAME



FRAME SECTION



PREPARED
BY
DESIGN DIVISION

DRAWN BY: B.L.T.

CHECKED BY: W.K.P.

DEPARTMENT DIRECTOR
Kirk T. Steudle

APPROVED BY: Randy V. Puffel
DIRECTOR, BUREAU OF FIELD SERVICES

APPROVED BY: Mark A. Van Pelt
DIRECTOR, BUREAU OF HIGHWAY DEVELOPMENT

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

COVER Q

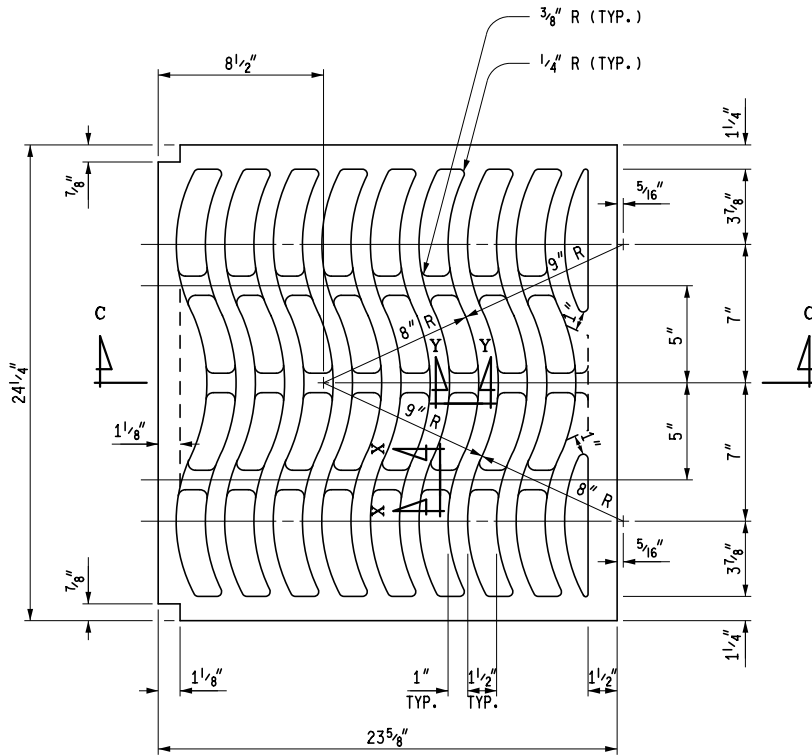
FOR USE ON MANHOLES OR SANITARY SEWERS
WHERE VENT HOLES ARE NOT DESIRED

9-30-2014
F.H.W.A. APPROVAL

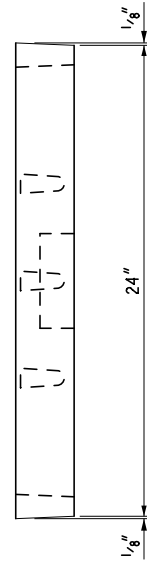
3-12-2014
PLAN DATE

R-18-F

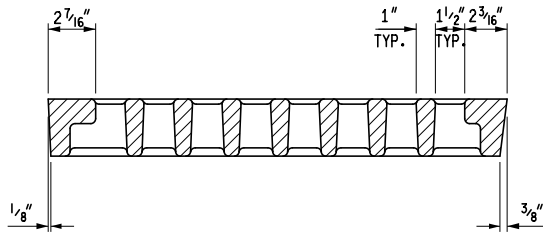
SHEET
1 OF 2



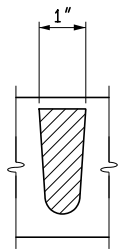
PLAN VIEW OF GRATE



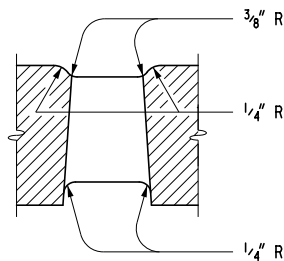
FRONT ELEVATION OF GRATE



SECTION C - C



SECTION X - X



SECTION Y - Y

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

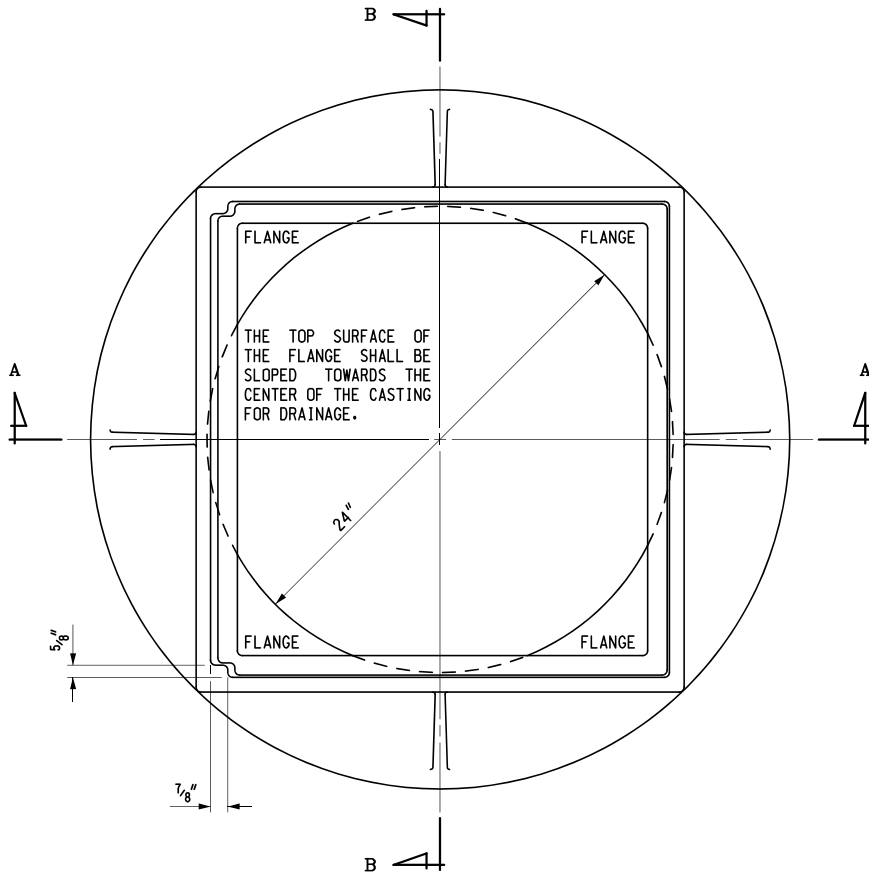
COVER R

9-30-2014
F.H.W.A. APPROVAL

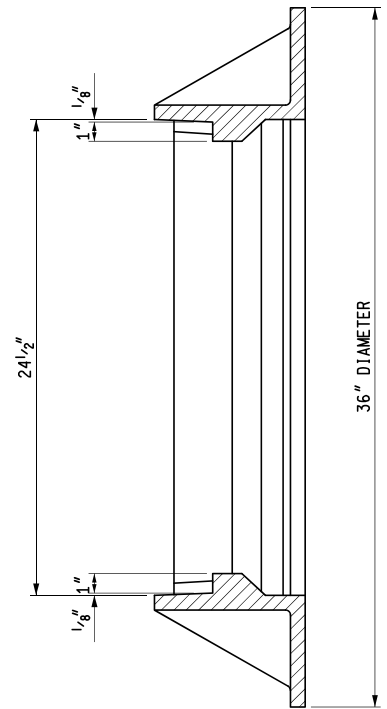
3-12-2014
PLAN DATE

R-20-D

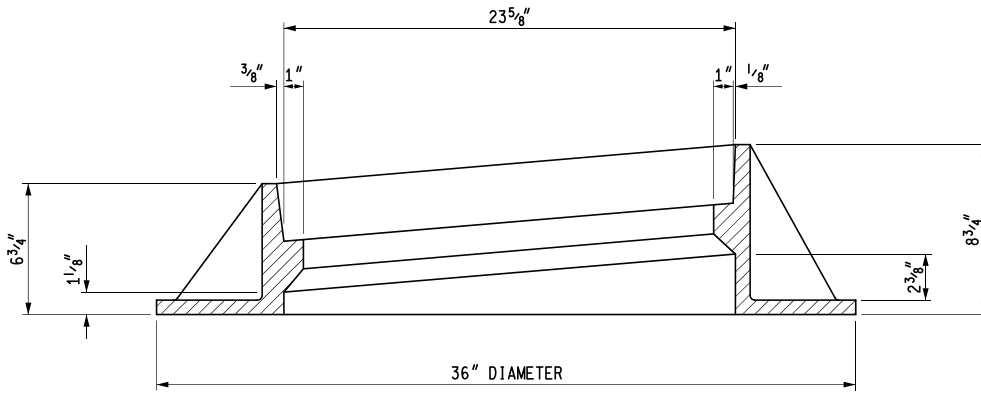
SHEET
2 OF 2



PLAN VIEW OF FRAME



SECTION B - B



SECTION A - A



PREPARED BY
DESIGN DIVISION

DRAWN BY: B.L.T.

CHECKED BY: W.K.P.

DEPARTMENT DIRECTOR
Paul C. Ajegba

APPROVED BY: Gregg Brunner, P.E. Gregg Brunner
Oct 14 2021 12:31 PM
DIRECTOR, BUREAU OF FIELD SERVICES

APPROVED BY: Bradley C. Wiefelich Bradley C. Wiefelich
Oct 14 2021 11:00 AM
DIRECTOR, BUREAU OF DEVELOPMENT

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

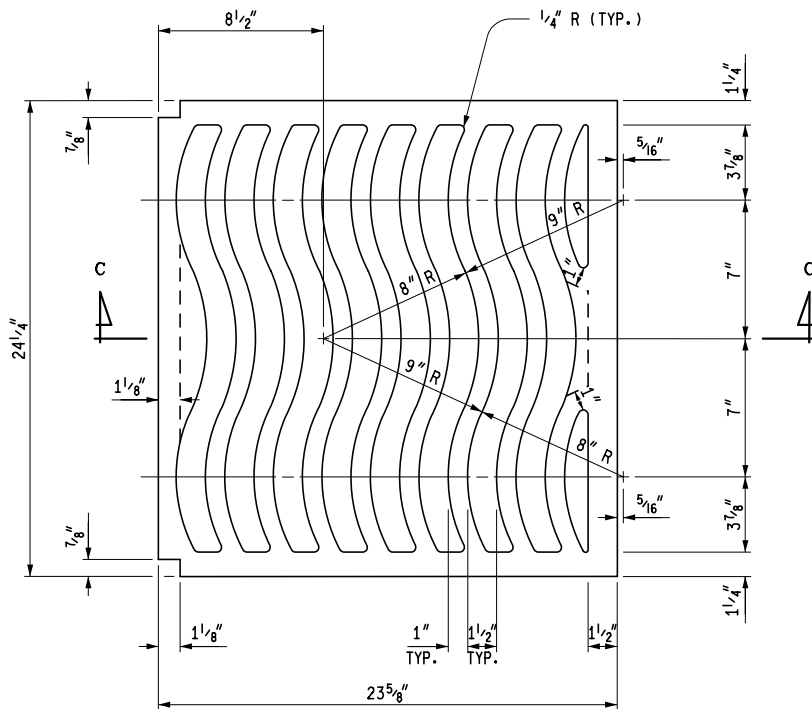
COVER RX
(FREEWAYS ONLY)

4-7-2022
F.H.W.A. APPROVAL

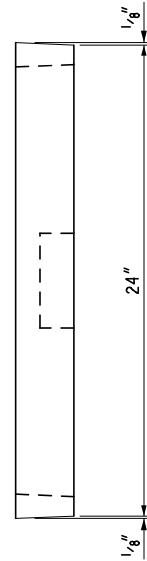
4-1-2021
PLAN DATE

R-20X-E

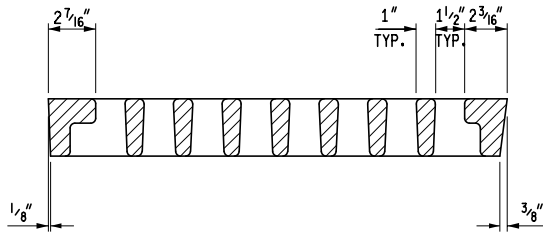
SHEET
1 OF 2



PLAN VIEW OF GRATE



FRONT ELEVATION OF GRATE



SECTION C - C

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.

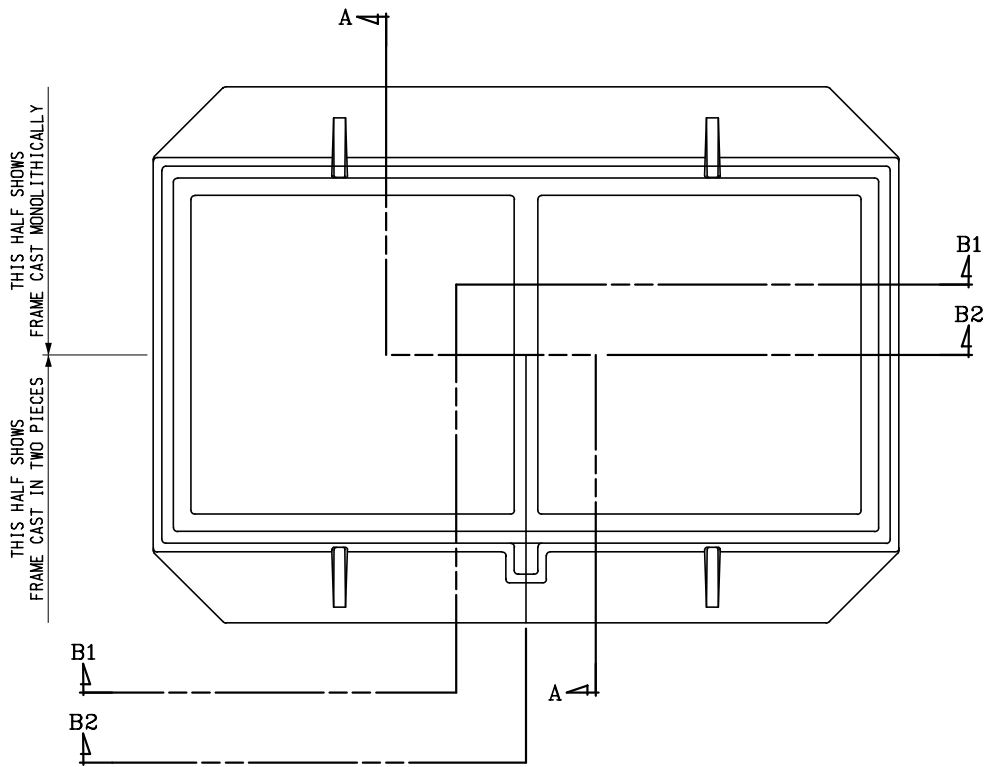
THE CASTINGS SHALL BE FREE OF POURING FAULTS, BLOW HOLES, CRACKS AND OTHER IMPERFECTIONS. THEY SHALL BE SOUND, TRUE TO FORM AND THICKNESS, CLEAN AND NEATLY FINISHED, AND SHALL BE COATED WITH COAL TAR PITCH VARNISH.

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 DEVELOPMENT STANDARD PLAN FOR

COVER RX
(FREEWAYS ONLY)

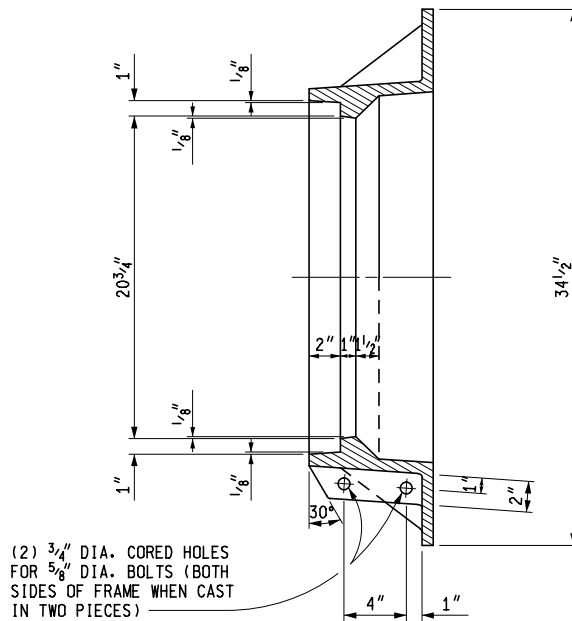
4-7-2022 F.H.W.A. APPROVAL	4-1-2021 PLAN DATE	R-20X-E	SHEET 2 OF 2
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PLAN OF FRAME

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



PREPARED BY
DESIGN DIVISION

DRAWN BY: B.L.T.

CHECKED BY: W.K.P.

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. Wiefelich Bradley C. Wiefelich
Jul 3 2019 8:57 AM
DIRECTOR, BUREAU OF DEVELOPMENT

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

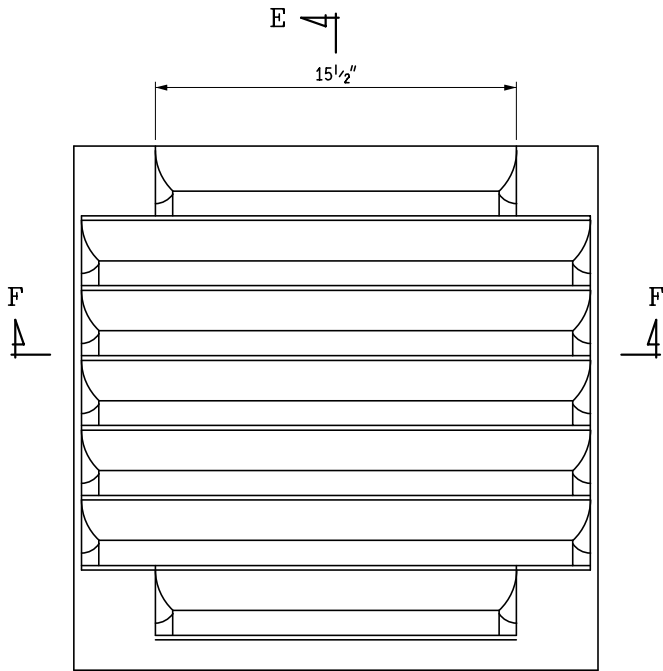
COVER V

5-18-2020
F.H.W.A. APPROVAL

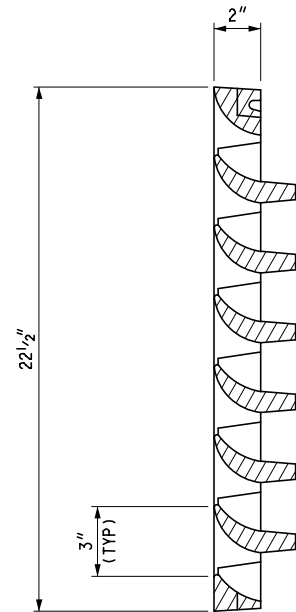
6-25-2019
PLAN DATE

R-22-F

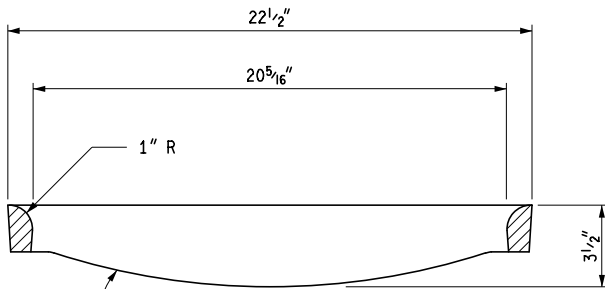
SHEET
1 OF 4



PLAN OF GRATE



SECTION E - E



ALTERNATE PROFILES PERMITTED

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.

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

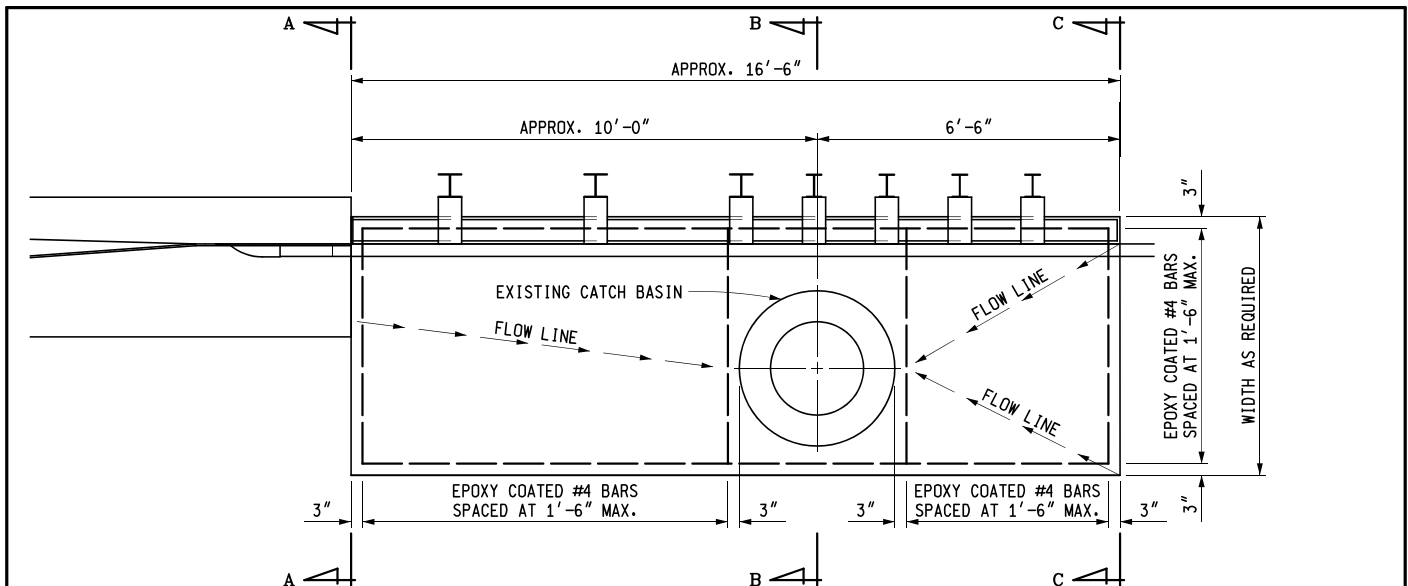
COVER VG
FOR USE WITH
CONCRETE VALLEY GUTTER

5-18-2020
F.H.W.A. APPROVAL

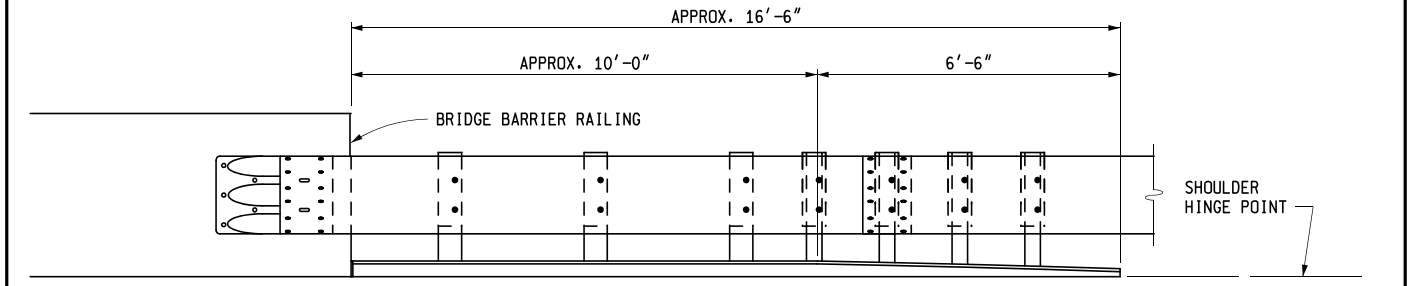
6-25-2019
PLAN DATE

R-24-F

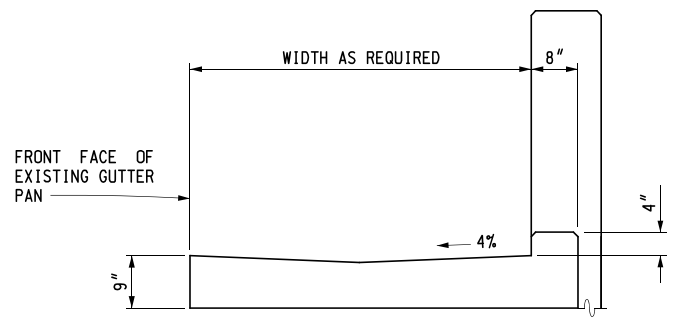
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3 OF 3



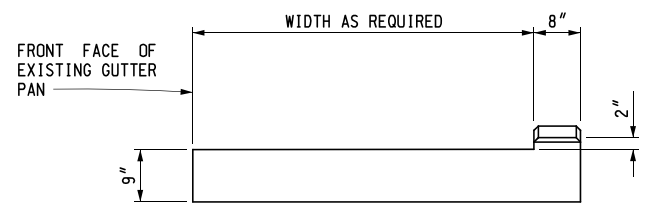
PLAN



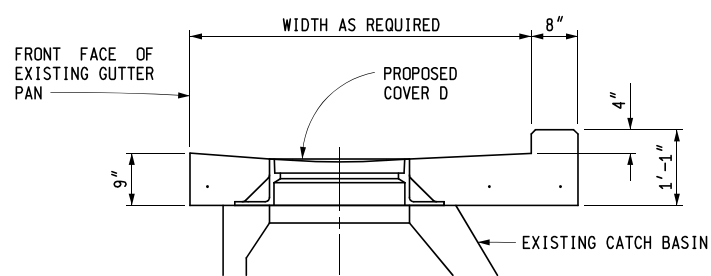
ELEVATION



SECTION A - A



SECTION C - C



SECTION B - B

NOTES:
 FOR INSTALLATION OF BEAM GUARDRAIL, SEE STANDARD PLAN R-60-SERIES.
 FOR INSTALLATION OF GUARDRAIL ANCHORAGE, BRIDGE, SEE STANDARD PLAN R-67-SERIES.
 IF AN INTEGRAL OR SEMI-INTEGRAL ABUTMENT IS NOT USED SEE R-32-SERIES FOR ACCOMMODATING EXPANSION IN THE AREA OF THE PAVEMENT SEAT.

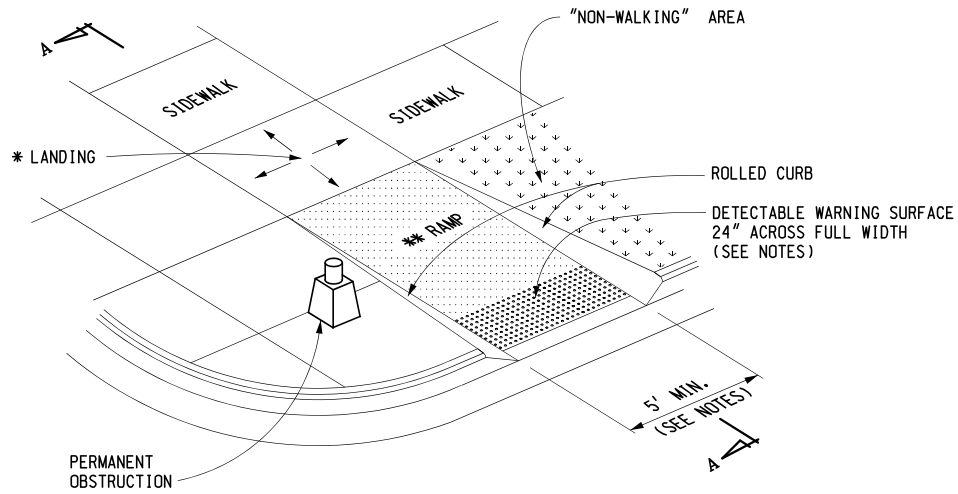
BRIDGE APPROACH CURB & GUTTER, DETAIL 4A
 (USING EXISTING CATCH BASIN)

NOTE: FOR USE WITH GUARDRAIL ANCHORAGE, BRIDGE, DETAIL M - -- AND THE REQUIRED NUMBER OF DRAINAGE STRUCTURES BASED ON A HYDROLOGICAL ANALYSIS OF THE AREA AND THE SIZE OF THE BRIDGE DECK OR WHEN GUARDRAIL IS NOT NEEDED ON DEPARTING ENDS.

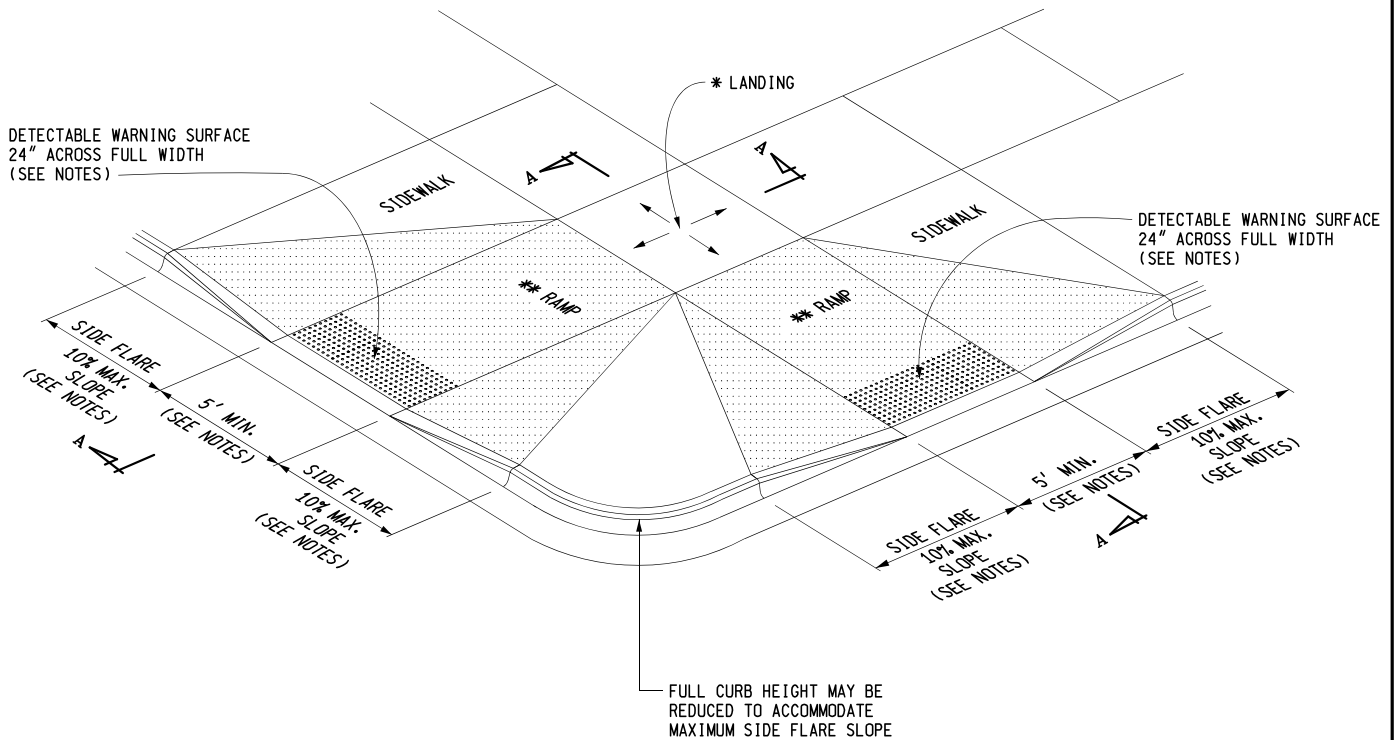
	DEPARTMENT DIRECTOR Paul C. Ajegba	MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF DEVELOPMENT STANDARD PLAN FOR		
	APPROVED BY: <u>Gregg Brunner, P.E.</u> DIRECTOR, BUREAU OF FIELD SERVICES <small>Gregg Brunner Oct 14 2021 12:31 PM</small>	BRIDGE APPROACH CURB & GUTTER (USING EXISTING CATCH BASIN)		SHEET 1 OF 1
PREPARED BY DESIGN DIVISION	APPROVED BY: <u>Bradley C. Wiefersch</u> DIRECTOR, BUREAU OF DEVELOPMENT <small>Bradley C. Wiefersch Oct 14 2021 11:01 AM</small>	4-7-2022 F.H.W.A. APPROVAL	10-14-2019 PLAN DATE	R-27-F
DRAWN BY: <u>B.L.T.</u> CHECKED BY: <u>W.K.P.</u>				

* MAXIMUM LANDING SLOPE IS 2.0% IN EACH DIRECTION OF TRAVEL. LANDING MINIMUM DIMENSIONS 5' x 5'. SEE NOTES.

** MAXIMUM RAMP CROSS SLOPE IS 2.0%, RUNNING SLOPE 5% - 7% (8.3% MAXIMUM). SEE NOTES.



CURB RAMP TYPE R
(ROLLED SIDES)



CURB RAMP TYPE F
(FLARED SIDES, TWO RAMPS SHOWN)



PREPARED BY
DESIGN DIVISION

DRAWN BY: B.L.T.

CHECKED BY: W.K.P.

DEPARTMENT DIRECTOR
Paul C. Ajegba

APPROVED BY: Gregg Brunner, P.E. Gregg Brunner
Oct 14 2021 12:32 PM
DIRECTOR, BUREAU OF FIELD SERVICES

APPROVED BY: Bradley C. Wiefelrich Bradley C. Wiefelrich
Oct 14 2021 11:01 AM
DIRECTOR, BUREAU OF DEVELOPMENT

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

**CURB RAMP AND
DETECTABLE WARNING DETAILS**

4-7-2022
F.H.W.A. APPROVAL

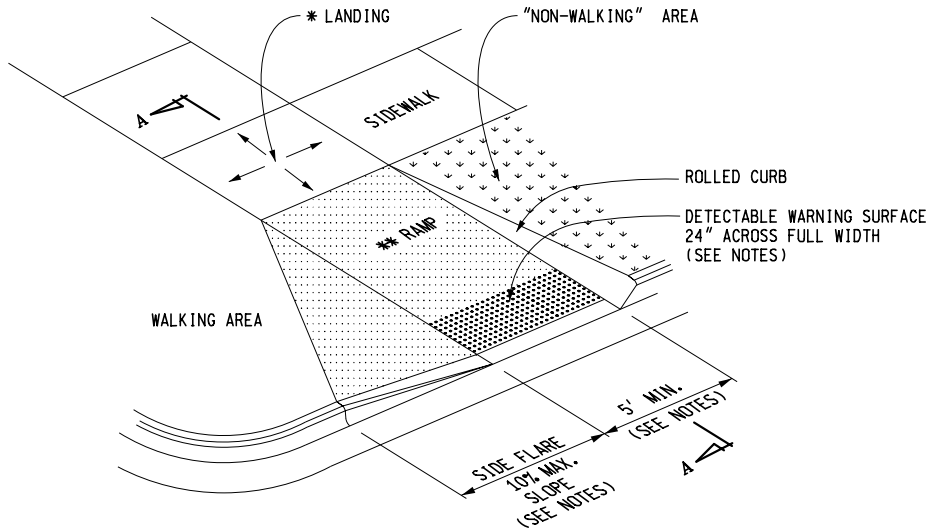
5-8-2020
PLAN DATE

R-28-J

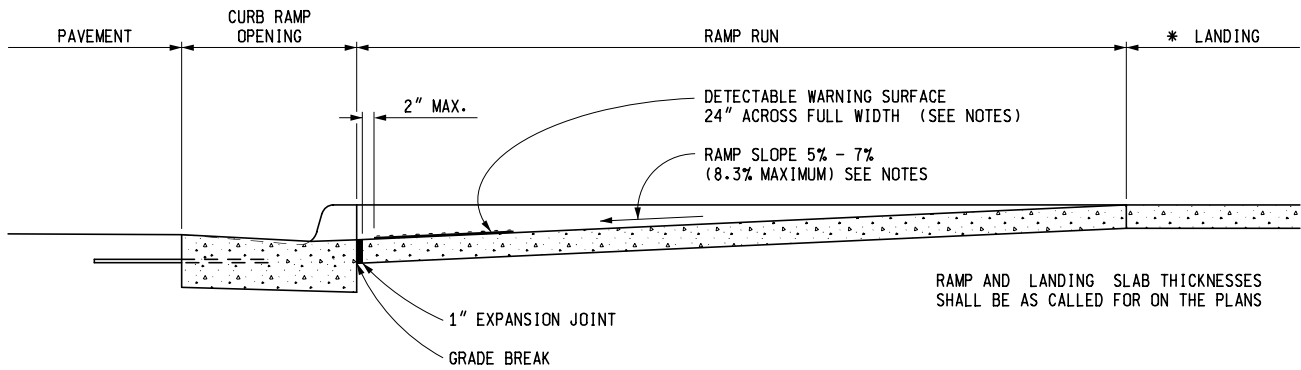
SHEET
1 OF 7

* MAXIMUM LANDING SLOPE IS 2.0% IN EACH DIRECTION OF TRAVEL. LANDING MINIMUM DIMENSIONS 5' x 5'. SEE NOTES.

** MAXIMUM RAMP CROSS SLOPE IS 2.0%, RUNNING SLOPE 5% - 7% (8.3% MAXIMUM). SEE NOTES.



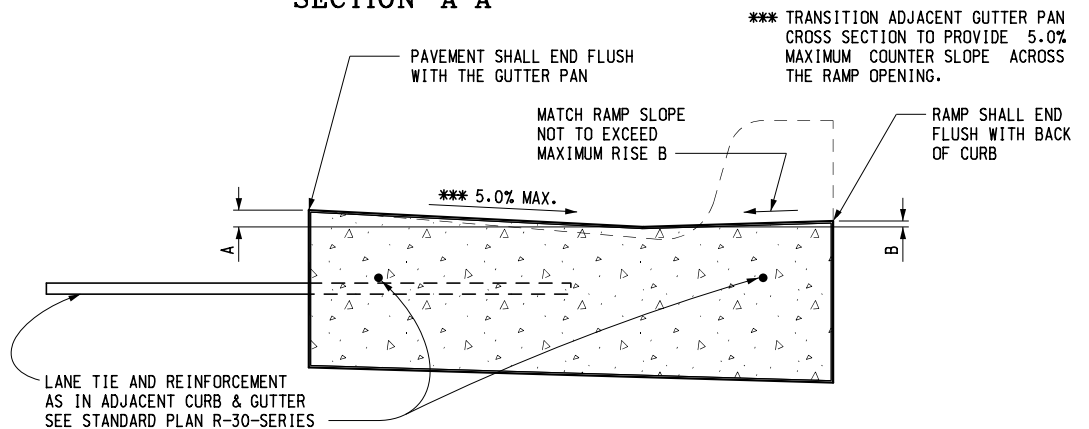
CURB RAMP TYPE RF
(ROLLED / FLARED SIDES)



SECTION A-A

CURB TYPE	MAXIMUM RISE (INCHES)	
	A	B
B1	3/4	1
B2	3/4	1
B3	3/4	1
D1	3/4	1
D2	3/4	1
D3	3/4	1
C1	1/2	1/2
C2	1/2	1/2
C3	3/4	1/2
C4	3/4	1/2
C5	1	1/2
C6	1	1/2
F1	1/2	1/2
F2	1/2	1/2
F3	3/4	1/2
F4	3/4	1/2
F5	1	1/2
F6	1	1/2

FOR CURB TYPES SEE STANDARD PLAN R-30-SERIES

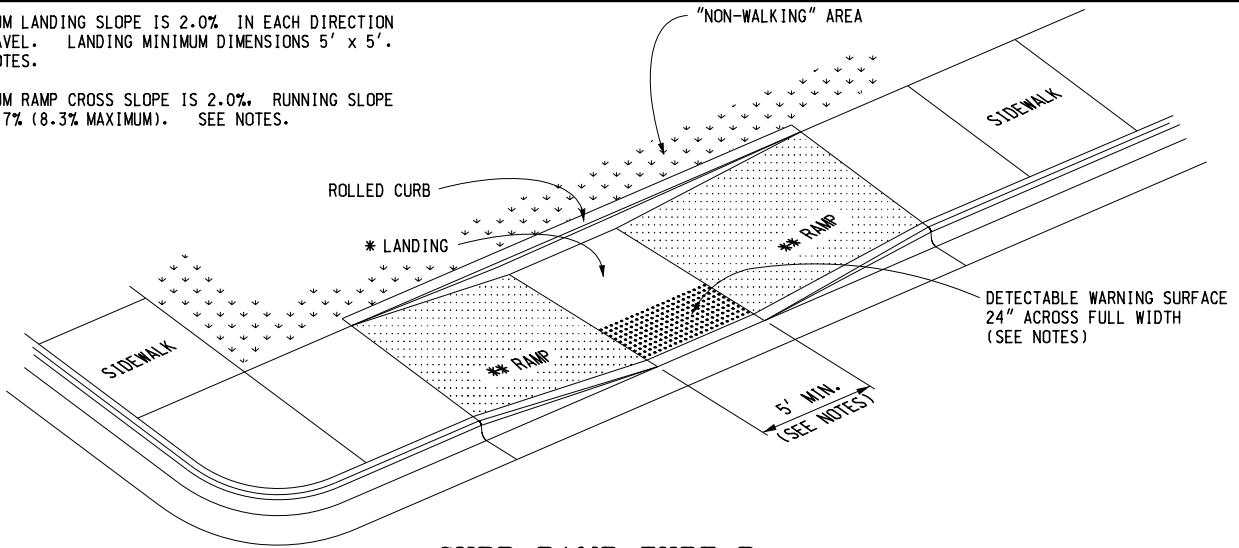


SECTION THROUGH CURB RAMP OPENING
(TYPICAL ALL RAMP TYPES)

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR
**CURB RAMP AND
DETECTABLE WARNING DETAILS**

* MAXIMUM LANDING SLOPE IS 2.0% IN EACH DIRECTION OF TRAVEL. LANDING MINIMUM DIMENSIONS 5' x 5'. SEE NOTES.

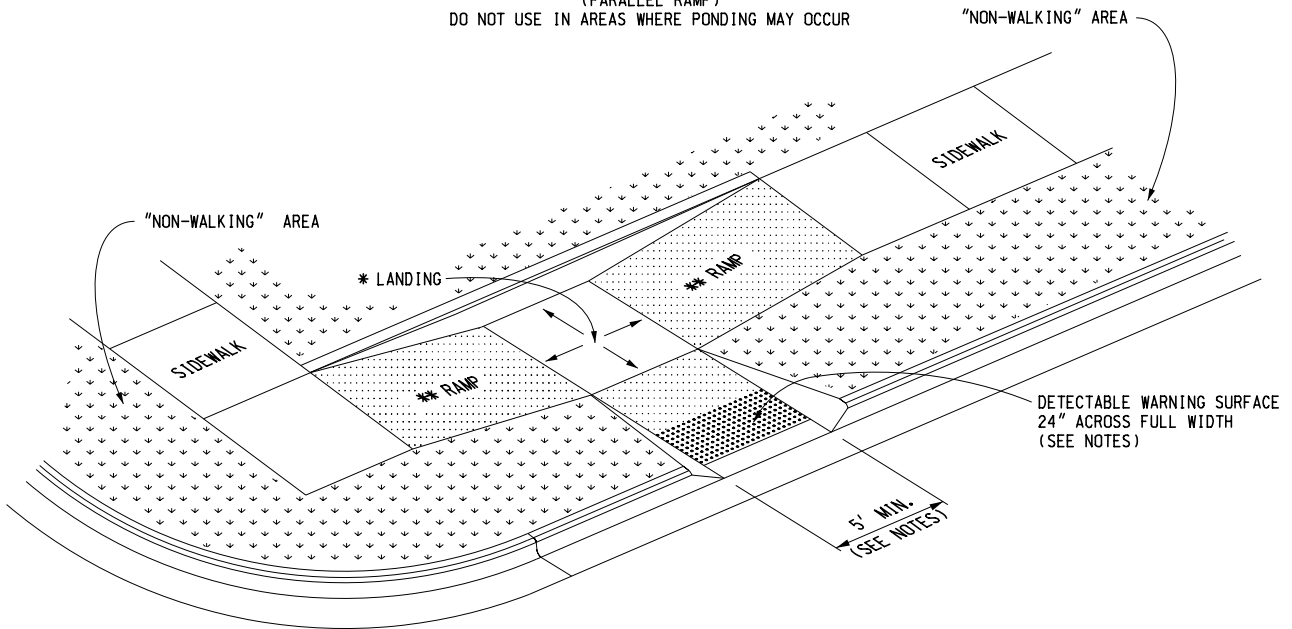
** MAXIMUM RAMP CROSS SLOPE IS 2.0%, RUNNING SLOPE 5% - 7% (8.3% MAXIMUM). SEE NOTES.



CURB RAMP TYPE P

(PARALLEL RAMP)

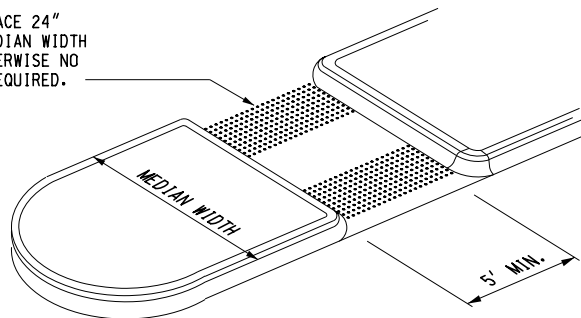
DO NOT USE IN AREAS WHERE PONDING MAY OCCUR



CURB RAMP TYPE C

(COMBINATION RAMP)

DETECTABLE WARNING SURFACE 24" ACROSS FULL WIDTH IF MEDIAN WIDTH IS AT LEAST 6'-0". OTHERWISE NO DETECTABLE WARNING IS REQUIRED.



CURB RAMP TYPE M

(MEDIAN ISLAND)

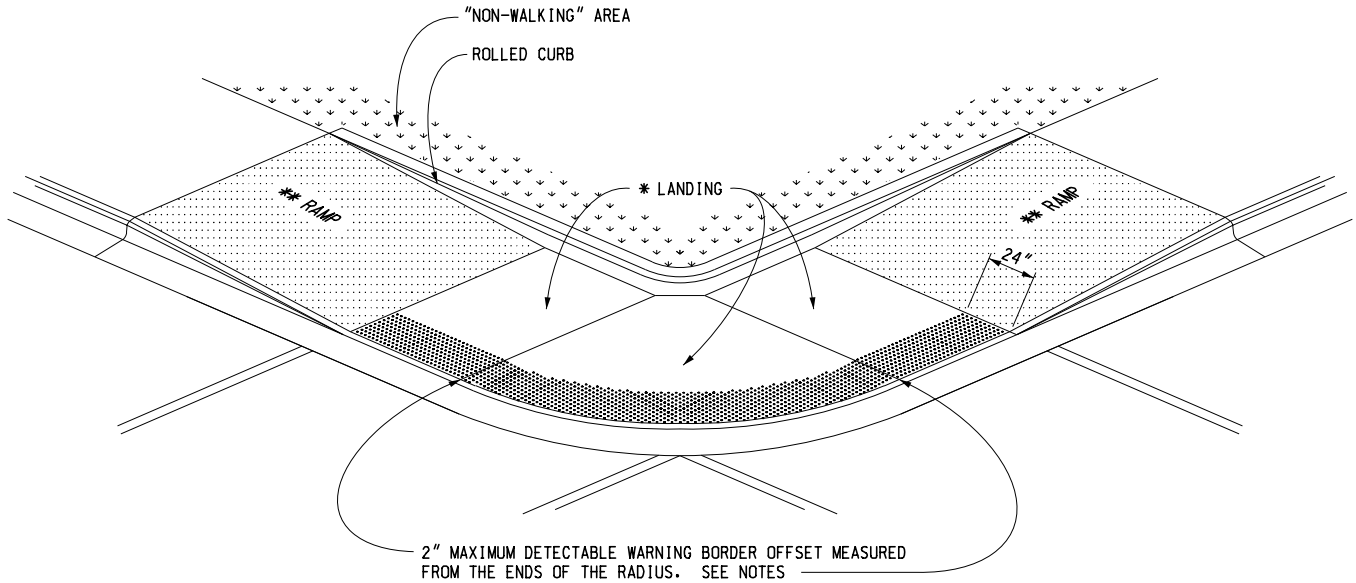
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

**CURB RAMP AND
DETECTABLE WARNING DETAILS**

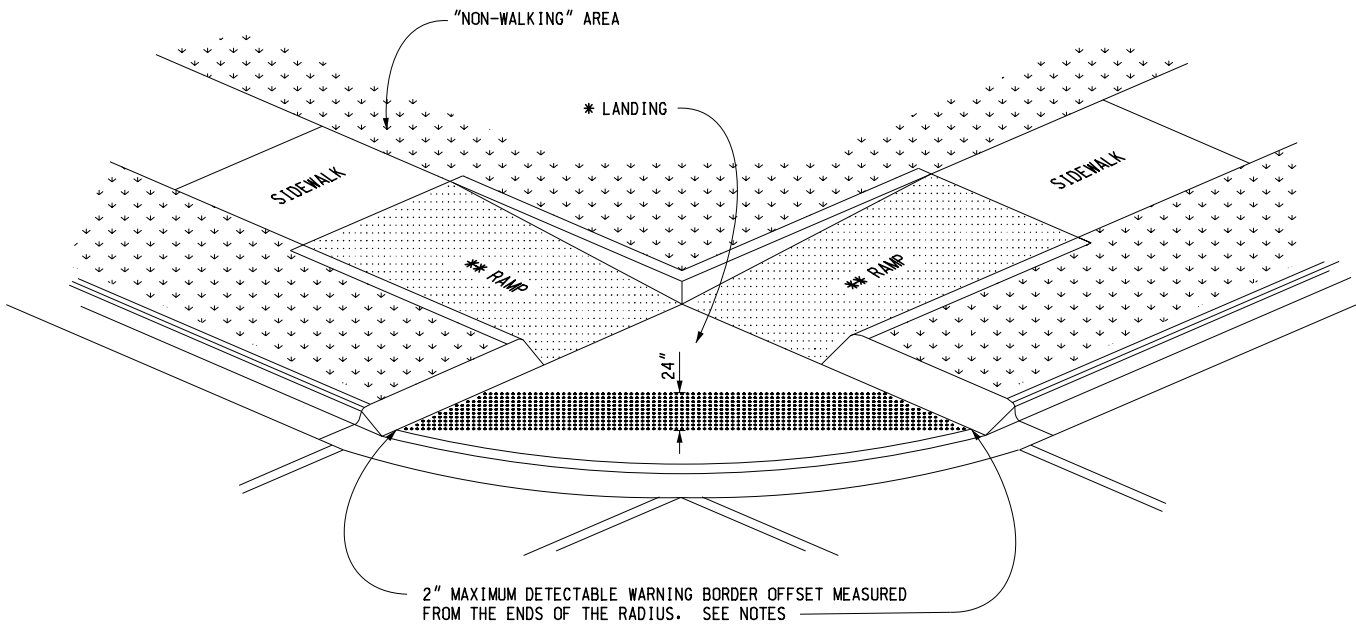
4-7-2022 F.H.W.A. APPROVAL	5-8-2020 PLAN DATE	R-28-J	SHEET 3 OF 7
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* MAXIMUM LANDING SLOPE IS 2.0% IN EACH DIRECTION OF TRAVEL. LANDING MINIMUM DIMENSIONS 5' x 5'. SEE NOTES.

** MAXIMUM RAMP CROSS SLOPE IS 2.0%, RUNNING SLOPE 5% - 7% (8.3% MAXIMUM). SEE NOTES.



(RADIAL DETECTABLE WARNING SHOWN)



(TANGENT DETECTABLE WARNING SHOWN)

CURB RAMP TYPE D

(DEPRESSED CORNER)

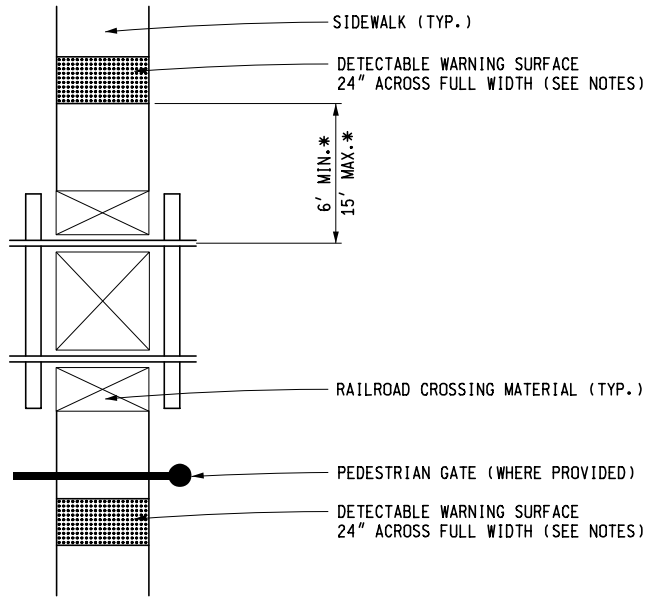
USE ONLY WHEN INDEPENDENT DIRECTIONAL RAMPS CAN NOT BE CONSTRUCTED FOR EACH CROSSING DIRECTION

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

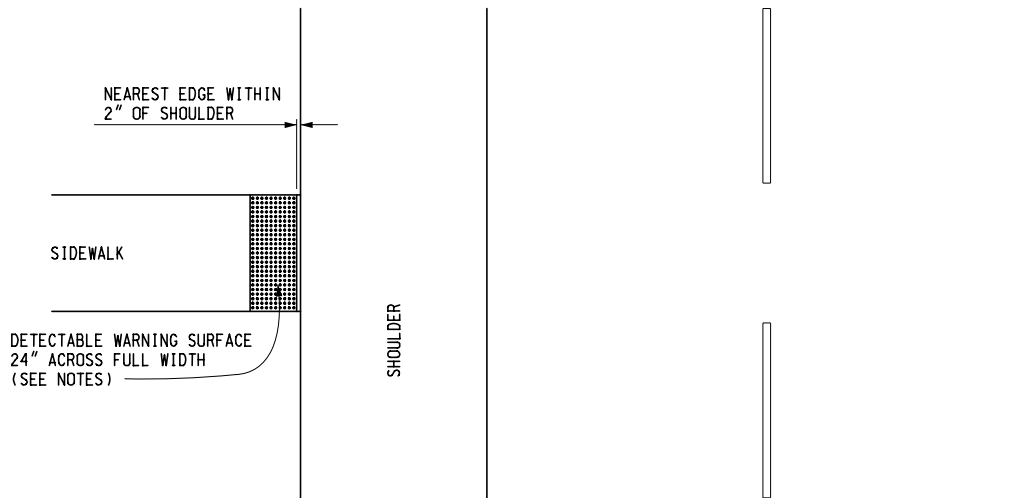
**CURB RAMP AND
DETECTABLE WARNING DETAILS**

4-7-2022 F.H.W.A. APPROVAL	5-8-2020 PLAN DATE	R-28-J	SHEET 4 OF 7
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* THE DETECTABLE WARNING SURFACE SHALL BE LOCATED SO THAT THE EDGE NEAREST THE RAIL CROSSING IS 6' MINIMUM AND 15' MAXIMUM FROM THE CENTERLINE OF THE NEAREST RAIL. DO NOT PLACE DETECTABLE WARNING ON RAILROAD CROSSING MATERIAL.



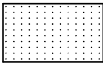
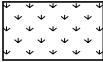


DETECTABLE WARNING AT RAILROAD CROSSING

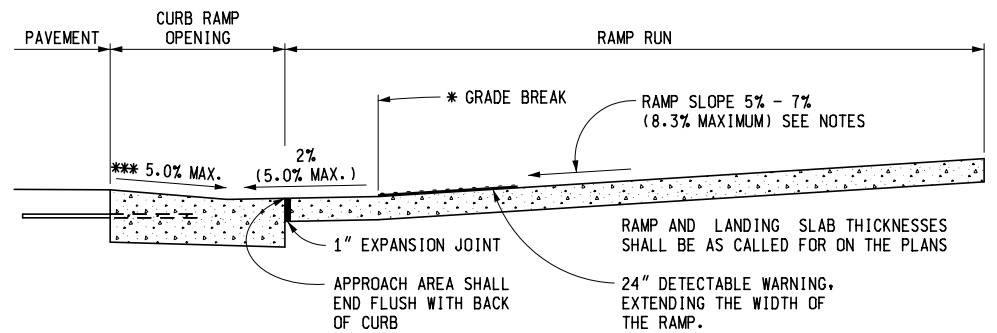
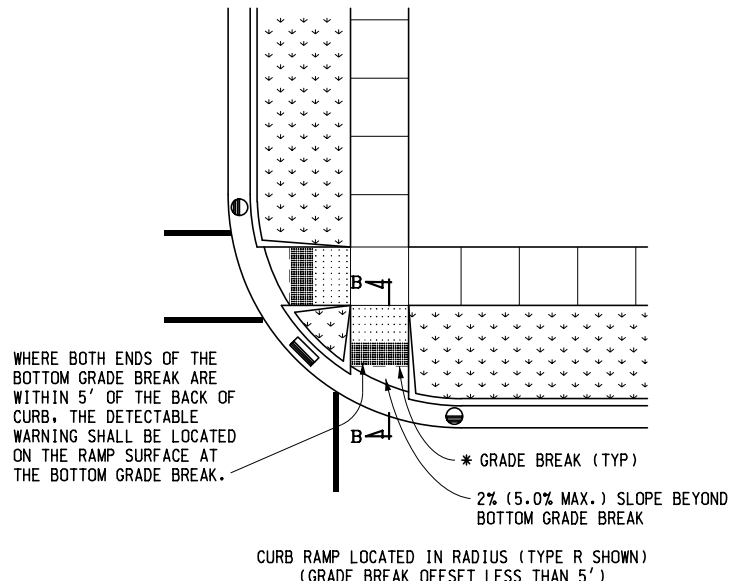
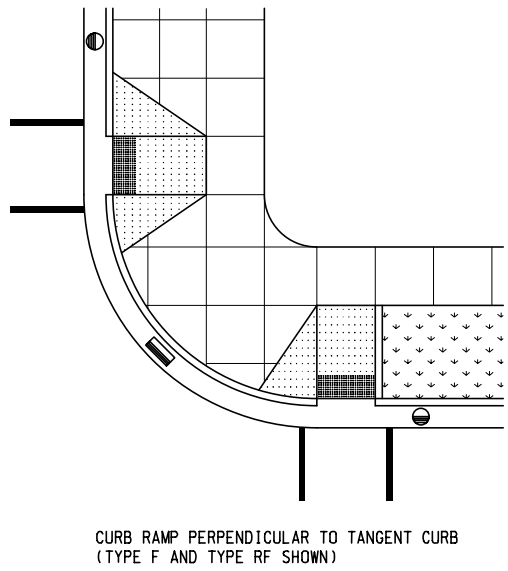
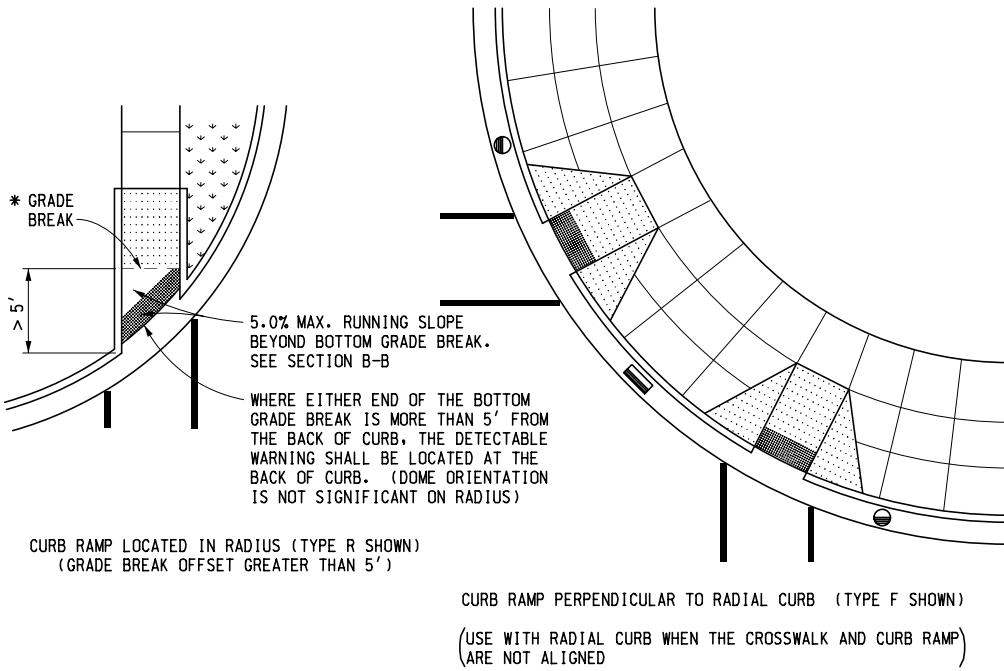


DETECTABLE WARNING AT FLUSH SHOULDER OR ROADWAY

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF DEVELOPMENT STANDARD PLAN FOR		
CURB RAMP AND DETECTABLE WARNING DETAILS		
4-7-2022 F.H.W.A. APPROVAL	5-8-2020 PLAN DATE	R-28-J
		SHEET 5 OF 7

LEGEND

	SLOPED SURFACE
	DETECTABLE WARNING
	"NON-WALKING" AREA
	CROSSWALK MARKING
	PREFERRED LOCATION OF DRAINAGE INLET (TYP.)
	ALTERNATE LOCATION OF DRAINAGE INLET (TYP.)



* GRADE BREAKS AT THE TOP AND BOTTOM OF CURB RAMPS SHALL BE PERPENDICULAR TO THE DIRECTION OF TRAVEL.

*** TRANSITION ADJACENT GUTTER PAN CROSS SECTION TO PROVIDE 5.0% MAXIMUM COUNTER SLOPE ACROSS THE RAMP OPENING.

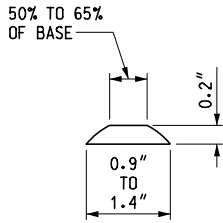
SEE SHEET 2 FOR CURB RAMP OPENING DETAILS.

**SECTION B-B
CURB RAMP ORIENTATION**

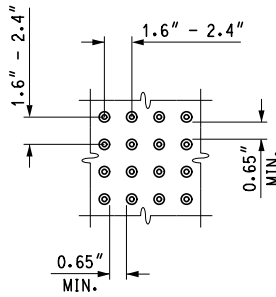
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

**CURB RAMP AND
DETECTABLE WARNING DETAILS**

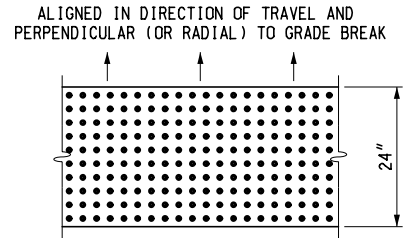
4-7-2022 F.H.W.A. APPROVAL	5-8-2020 PLAN DATE	R-28-J	SHEET 6 OF 7
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DOME SECTION



DOME SPACING



DOME ALIGNMENT

DETECTABLE WARNING DETAILS

NOTES:

DETAILS SPECIFIED ON THIS PLAN APPLY TO ALL CONSTRUCTION, RECONSTRUCTION, OR ALTERATION OF STREETS, CURBS, OR SIDEWALKS IN THE PUBLIC RIGHT OF WAY.

CURB RAMP ARE TO BE LOCATED AS SPECIFIED ON THE PLANS OR AS DIRECTED BY THE ENGINEER.

RAMP SHALL BE PROVIDED AT ALL CORNERS OF AN INTERSECTION WHERE THERE IS EXISTING OR PROPOSED SIDEWALK AND CURB. RAMP SHALL ALSO BE PROVIDED AT MARKED AND/OR SIGNALIZED MID-BLOCK CROSSINGS.

SURFACE TEXTURE OF THE RAMP SHALL BE THAT OBTAINED BY A COARSE BROOMING, TRANSVERSE TO THE RUNNING SLOPE.

SIDEWALK SHALL BE RAMPED WHERE THE DRIVEWAY CURB IS EXTENDED ACROSS THE WALK.

CARE SHALL BE TAKEN TO ASSURE A UNIFORM GRADE ON THE RAMP. WHERE CONDITIONS PERMIT, IT IS DESIRABLE THAT THE SLOPE OF THE RAMP BE IN ONLY ONE DIRECTION, PARALLEL TO THE DIRECTION OF TRAVEL.

RAMP WIDTH SHALL BE INCREASED, IF NECESSARY, TO ACCOMMODATE SIDEWALK SNOW REMOVAL EQUIPMENT NORMALLY USED BY THE MUNICIPALITY.

WHEN 5' MINIMUM WIDTHS ARE NOT PRACTICABLE, RAMP WIDTH MAY BE REDUCED TO NOT LESS THAN 4' AND LANDINGS TO NOT LESS THAN 4' x 4'.

CURB RAMP WITH A RUNNING SLOPE $\leq 5\%$ DO NOT REQUIRE A TOP LANDING. HOWEVER, ANY CONTINUOUS SIDEWALK OR PEDESTRIAN ROUTE CROSSING THROUGH OR INTERSECTING THE CURB RAMP MUST INDEPENDENTLY MAINTAIN A CROSS SLOPE NOT GREATER THAN 2% PERPENDICULAR TO ITS OWN DIRECTION(S) OF TRAVEL.

DETECTABLE WARNING SURFACE COVERAGE IS 24" MINIMUM IN THE DIRECTION OF RAMP/PATH TRAVEL AND THE FULL WIDTH OF THE RAMP/PATH OPENING EXCLUDING CURBED OR FLARED CURB TRANSITION AREAS. A BORDER OFFSET NOT GREATER THAN 2" MEASURED ALONG THE EDGES OF THE DETECTABLE WARNING IS ALLOWABLE. FOR RADIAL CURB THE OFFSET IS MEASURED FROM THE ENDS OF THE RADIUS.

FOR NEW ROADWAY CONSTRUCTION, THE RAMP CROSS SLOPE MAY NOT EXCEED 2.0%. FOR ALTERATIONS TO EXISTING ROADWAYS, THE CROSS SLOPE MAY BE TRANSITIONED TO MEET AN EXISTING ROADWAY GRADE. THE CROSS SLOPE TRANSITION SHALL BE APPLIED UNIFORMLY OVER THE FULL LENGTH OF THE RAMP.

THE MAXIMUM RUNNING SLOPE OF 8.3% IS RELATIVE TO A FLAT (0%) REFERENCE. HOWEVER, IT SHALL NOT REQUIRE ANY RAMP OR SERIES OF RAMP TO EXCEED 15 FEET IN LENGTH NOT INCLUDING LANDINGS OR TRANSITIONS.

DRAINAGE STRUCTURES SHOULD NOT BE PLACED IN LINE WITH RAMP. THE LOCATION OF THE RAMP SHOULD TAKE PRECEDENCE OVER THE LOCATION OF THE DRAINAGE STRUCTURE. WHERE EXISTING DRAINAGE STRUCTURES ARE LOCATED IN THE RAMP PATH OF TRAVEL, USE A MANUFACTURER'S ADA COMPLIANT GRATE. OPENINGS SHALL NOT BE GREATER THAN 1/2". ELONGATED OPENINGS SHALL BE PLACED SO THAT THE LONG DIMENSION IS PERPENDICULAR TO THE DOMINANT DIRECTION OF TRAVEL.

THE TOP OF THE JOINT FILLER FOR ALL RAMP TYPES SHALL BE FLUSH WITH THE ADJACENT CONCRETE.

CROSSWALK AND STOP LINE MARKINGS, IF USED, SHALL BE SO LOCATED AS TO STOP TRAFFIC SHORT OF RAMP CROSSINGS. SPECIFIC DETAILS FOR MARKING APPLICATIONS ARE GIVEN IN THE "MICHIGAN MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES".

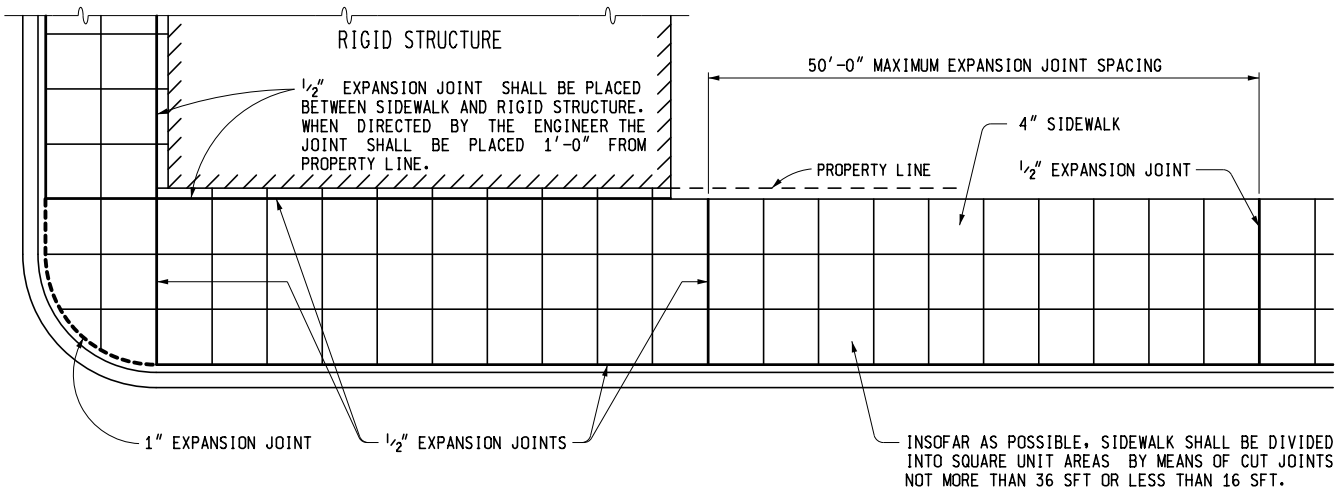
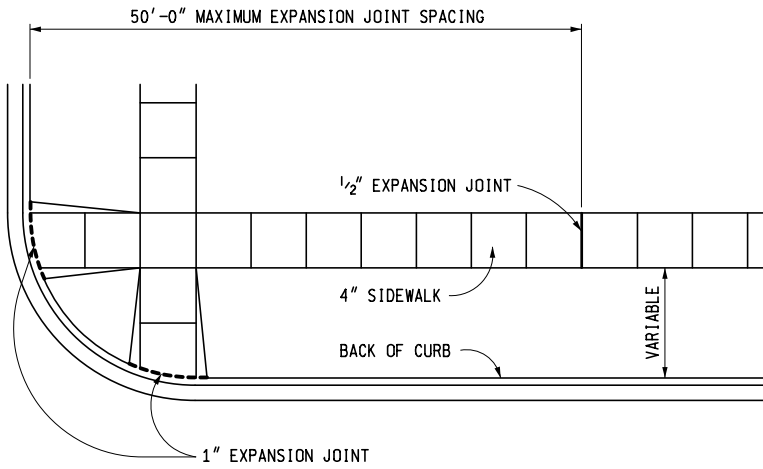
FLARED SIDES WITH A SLOPE OF 10% MAXIMUM, MEASURED ALONG THE ROADSIDE CURB LINE, SHALL BE PROVIDED WHERE AN UNOBSTRUCTED CIRCULATION PATH LATERALLY CROSSES THE CURB RAMP. FLARED SIDES ARE NOT REQUIRED WHERE THE RAMP IS BORDERED BY LANDSCAPING, UNPAVED SURFACE OR PERMANENT FIXED OBJECTS. WHERE THEY ARE NOT REQUIRED, FLARED SIDES CAN BE CONSIDERED IN ORDER TO AVOID SHARP CURB RETURNS AT RAMP OPENINGS.

DETECTABLE WARNING PLATES MUST BE INSTALLED USING FABRICATED OR FIELD CUT UNITS CAST AND/OR ANCHORED IN THE PAVEMENT TO RESIST SHIFTING OR HEAVING.

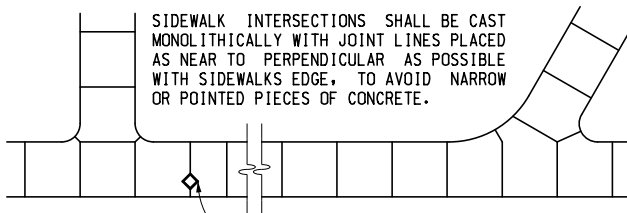
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

**CURB RAMP AND
DETECTABLE WARNING DETAILS**

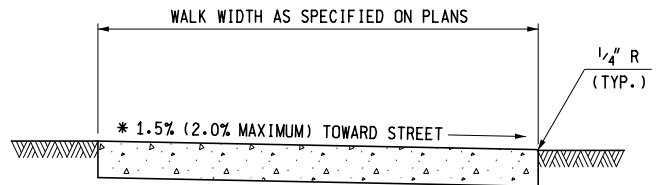
4-7-2022 F.H.W.A. APPROVAL	5-8-2020 PLAN DATE	R-28-J	SHEET 7 OF 7
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LOCATION OF JOINTS IN CONCRETE SIDEWALK



WHERE A PERMANENT STRUCTURE IS LOCATED IN SIDEWALK, PLACE EXPANSION MATERIAL AROUND STRUCTURE AND ADJUST JOINT PATTERN TO INTERSECT STRUCTURE AS ILLUSTRATED.



* SEE NOTES

TYPICAL SIDEWALK JOINT LAYOUTS

4" CONCRETE SIDEWALK



PREPARED BY
DESIGN DIVISION

DRAWN BY: B.L.T.
CHECKED BY: W.K.P.

DEPARTMENT DIRECTOR
Kirk T. Stuedle

APPROVED BY: *Randy Van Pelt*
DIRECTOR, BUREAU OF FIELD SERVICES

APPROVED BY: *Mark A. Van Pelt*
DIRECTOR, BUREAU OF HIGHWAY DEVELOPMENT

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

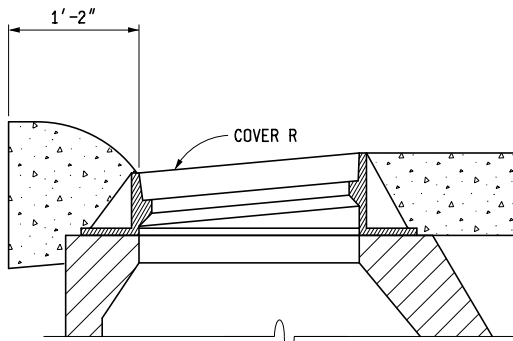
**DRIVEWAY OPENINGS
& APPROACHES,
AND CONCRETE SIDEWALK**

9-30-2014
F.H.W.A. APPROVAL

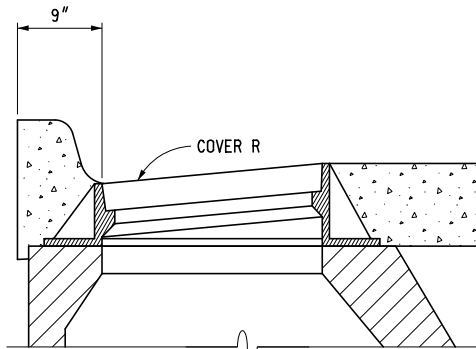
7-1-2014
PLAN DATE

R-29-I

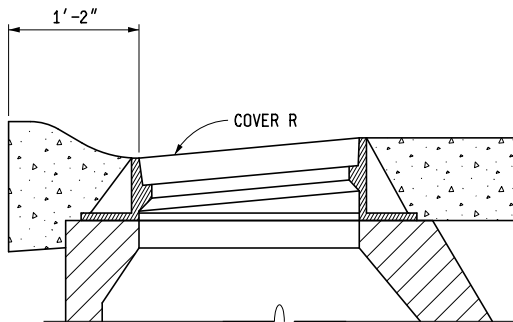
SHEET
1 OF 4



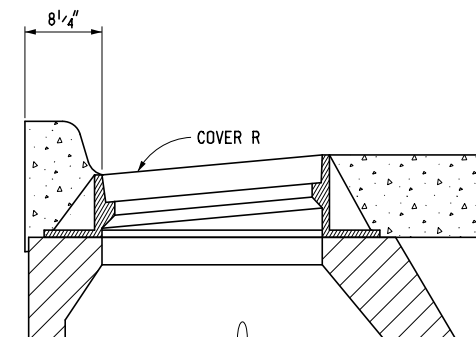
SECTION C - C
INTEGRAL CURB & GUTTER, DETAIL B



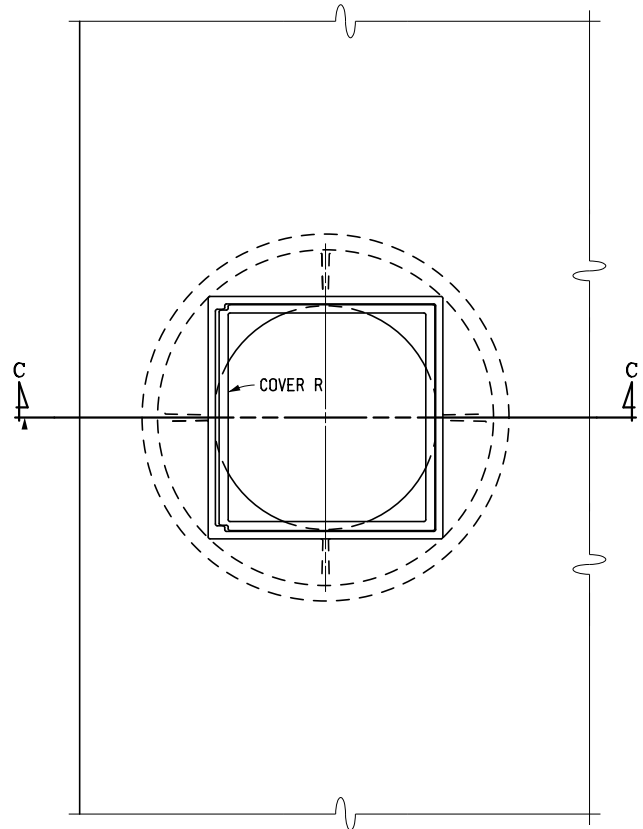
SECTION C - C
INTEGRAL CURB & GUTTER, DETAIL C



SECTION C - C
INTEGRAL CURB & GUTTER, DETAIL D



SECTION C - C
INTEGRAL CURB & GUTTER, DETAIL F



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 WIDENED 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.

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

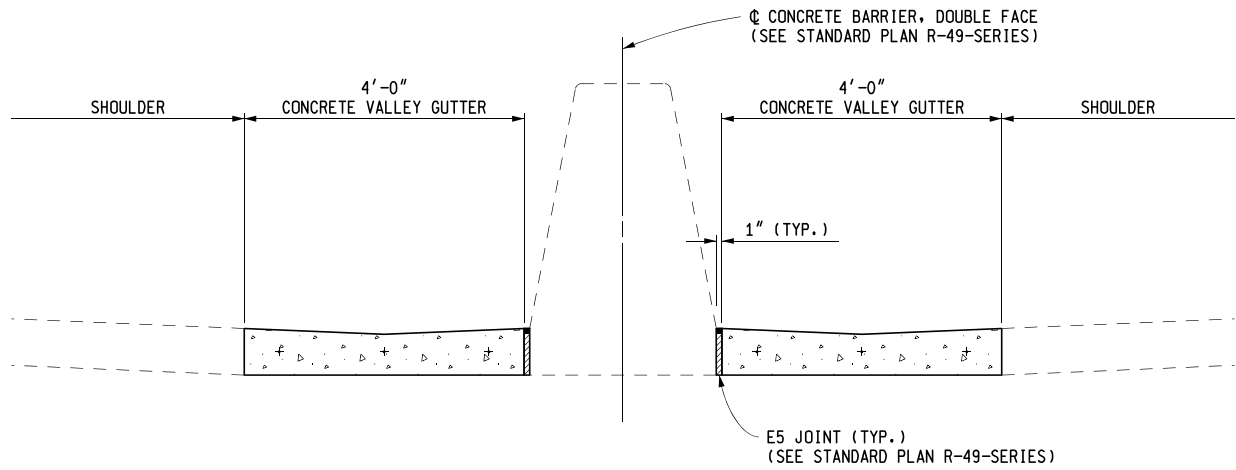
INTEGRAL CURB AND
INTEGRAL CURB & GUTTER

1-25-2013
F.H.W.A. APPROVAL

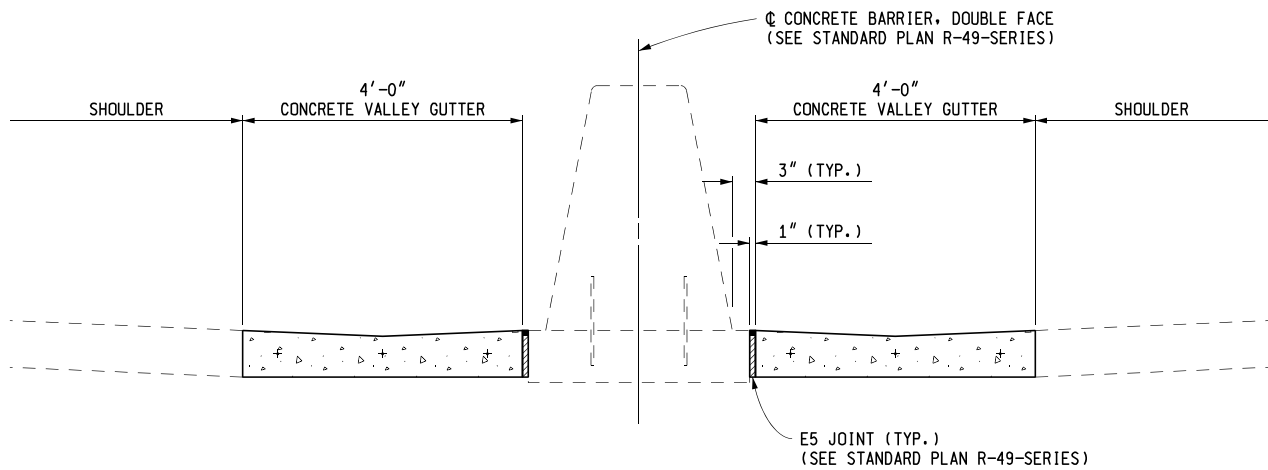
10-22-2012
PLAN DATE

R-31-F

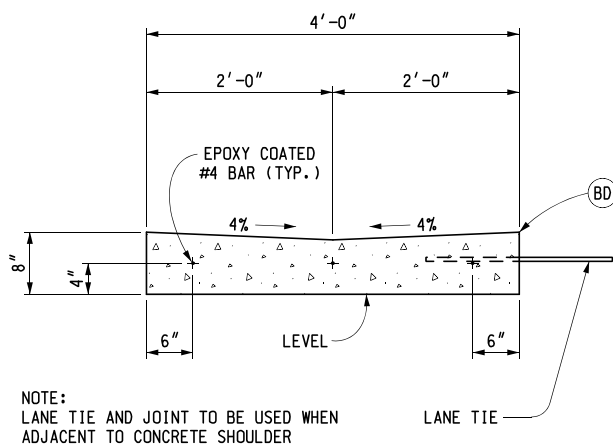
SHEET
2 OF 2



**CONCRETE VALLEY GUTTER
WITH CONCRETE BARRIER, DOUBLE FACE, TYPE A**



**CONCRETE VALLEY GUTTER
WITH CONCRETE BARRIER, DOUBLE FACE, TYPE B**



NOTE:
LANE TIE AND JOINT TO BE USED WHEN
ADJACENT TO CONCRETE SHOULDER

CONCRETE VALLEY GUTTER

NOTES:

THE SHOULDER AND VALLEY GUTTER OR CURB AND GUTTER MAY BE CAST INTEGRALLY WHEN THE SHOULDER AND VALLEY GUTTER OR CURB AND GUTTER ARE THE SAME SLOPE. WHEN THEY ARE CAST INTEGRALLY, THE SLOPE ON THE BOTTOM OF THE SHOULDER MAY BE EXTENDED THROUGH THE VALLEY GUTTER OR CURB AND GUTTER.

TRANSVERSE JOINTS IN CURB AND GUTTER OR VALLEY GUTTER SHALL BE ALIGNED WITH THE SAME SIZE, TYPE, AND SEALANT AS IN THE PAVEMENT AND SHOULDER, EXCEPT THAT NO LOAD TRANSFER ASSEMBLY WILL BE PROVIDED IN THE SHOULDER OR CURB AND GUTTER. NO PLANE OF WEAKNESS JOINTS WILL BE PLACED IN CURB AND GUTTER.

JOINTS, CURB AND GUTTER, AND CONCRETE BARRIER, DOUBLE FACE SHALL BE ACCORDING TO STANDARD PLANS R-30, R-31, R-39, R-40, R-41, AND R-49-SERIES, EXCEPT AS SPECIFIED ON THESE PLANS.

OMIT LONGITUDINAL REINFORCEMENT WHEN CONCRETE VALLEY GUTTER OR URBAN FREEWAY CURB IS TIED TO A NON-REINFORCED PAVEMENT.



PREPARED
BY
DESIGN DIVISION

DRAWN BY: B.L.T.

CHECKED BY: W.K.P.

DEPARTMENT DIRECTOR
Paul C. Ajegba

APPROVED BY: Gregg Brunner, P.E. Gregg Brunner
Oct 14 2021 12:32 PM
DIRECTOR, BUREAU OF FIELD SERVICES

APPROVED BY: Bradley C. Wiefersich Bradley C. Wiefersich
Oct 14 2021 11:02 AM
DIRECTOR, BUREAU OF DEVELOPMENT

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

**CONCRETE VALLEY GUTTER
AND URBAN FREEWAY CURB**

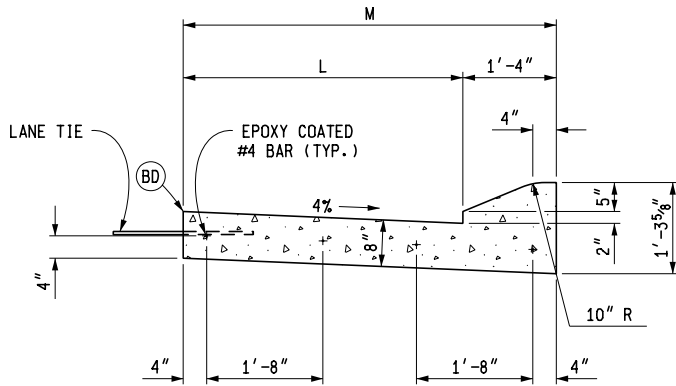
4-7-2022
F.H.W.A. APPROVAL

8-14-2019
PLAN DATE

R-33-G

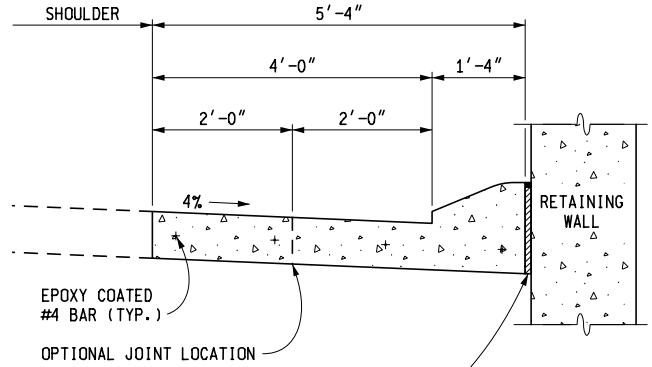
SHEET
1 OF 2

NOTE: LANE TIE AND JOINT TO BE USED WHEN ADJACENT TO CONCRETE SHOULDER



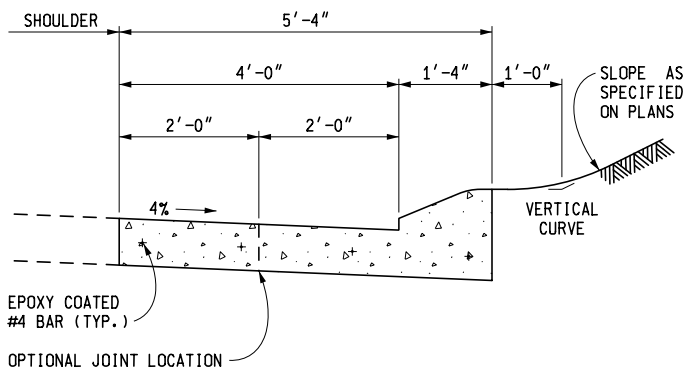
DETAIL	DIMENSION		LANE TIES	CONCRETE CYD / LFT
	L	M		
G1	2'-0"	3'-4"	AS SHOWN	0.1019
G2	4'-0"	5'-4"	AS SHOWN	0.1515

G

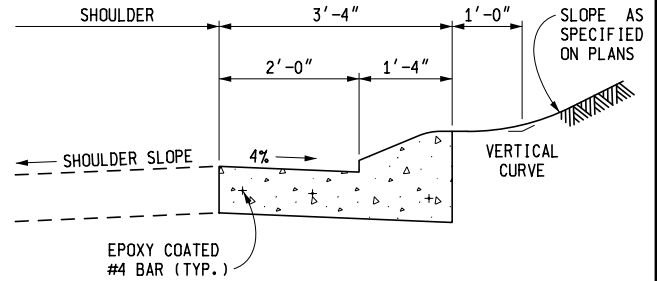


E5 JOINT (SEE STANDARD PLAN R-49-SERIES)

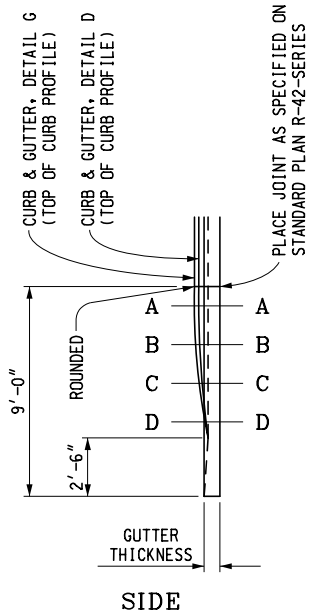
DETAIL G1 OR G2
ABUTTING RETAINING WALL



DETAIL G1 OR G2
IN CUT SECTION

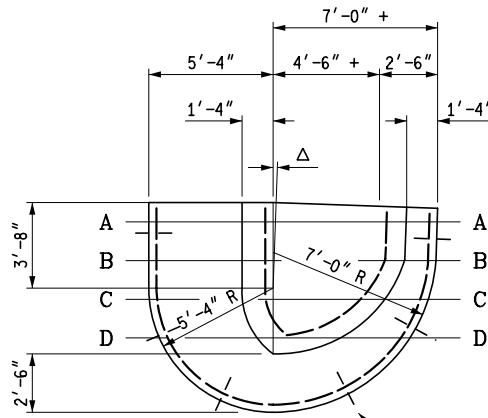


DETAIL G1
IN SUPERELEVATION OR TRANSITION



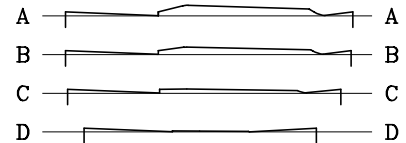
SIDE

CURB & GUTTER, DETAIL G CURB & GUTTER, DETAIL D
SEE STANDARD PLAN R-30-SERIES



PLAN
CURB NOSE DETAIL

Δ = DEFLECTION ANGLE FOR RAMP



SECTIONS THROUGH NOSE

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

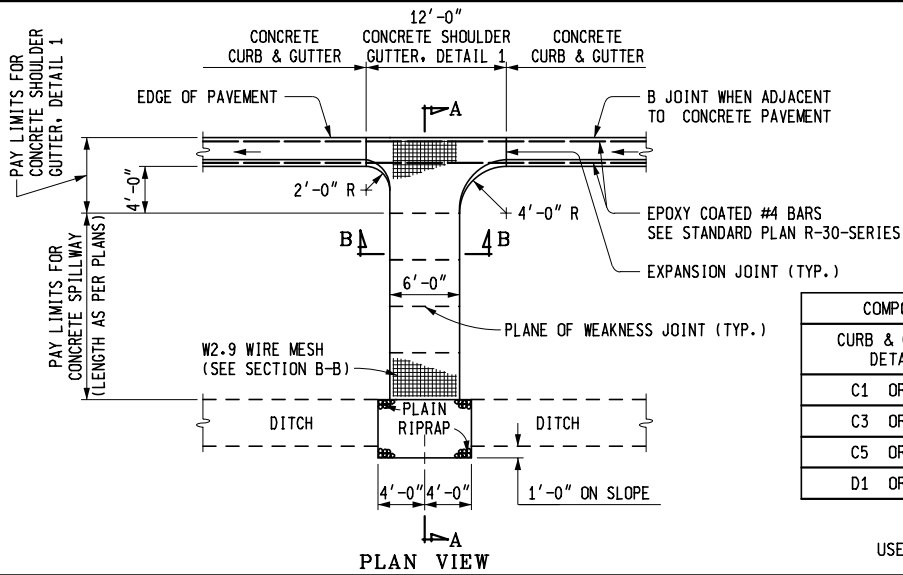
CONCRETE VALLEY GUTTER
AND URBAN FREEWAY CURB

4-7-2022
F.H.W.A. APPROVAL

8-14-2019
PLAN DATE

R-33-G

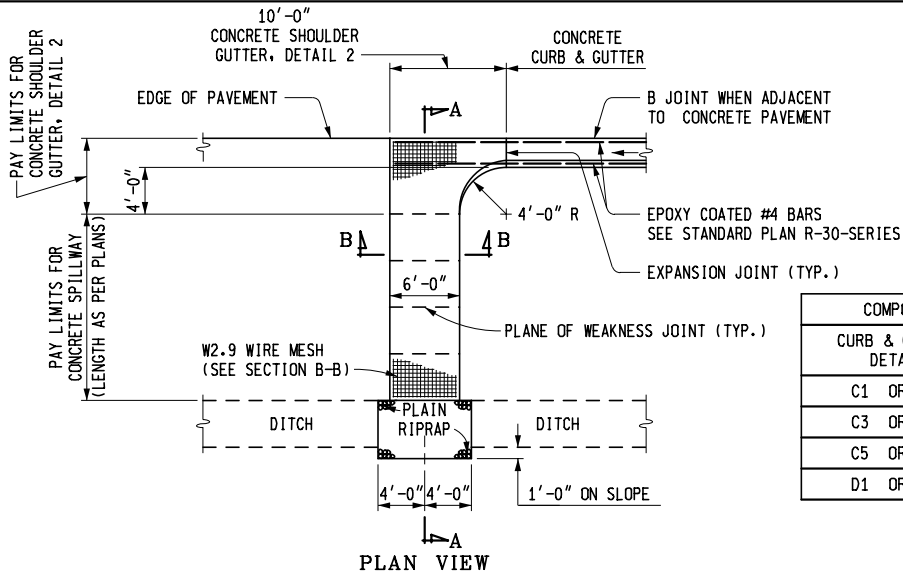
SHEET
2 OF 2



COMPONENTS OF CONCRETE SHOULDER GUTTER, DETAIL 1		
CURB & GUTTER DETAIL	STEEL REINFORCEMENT LBS	CONCRETE CYD
C1 OR C2	39	1.5
C3 OR C4	39	1.7
C5 OR C6	39	1.8
D1 OR D2	39	1.8

DETAIL 1

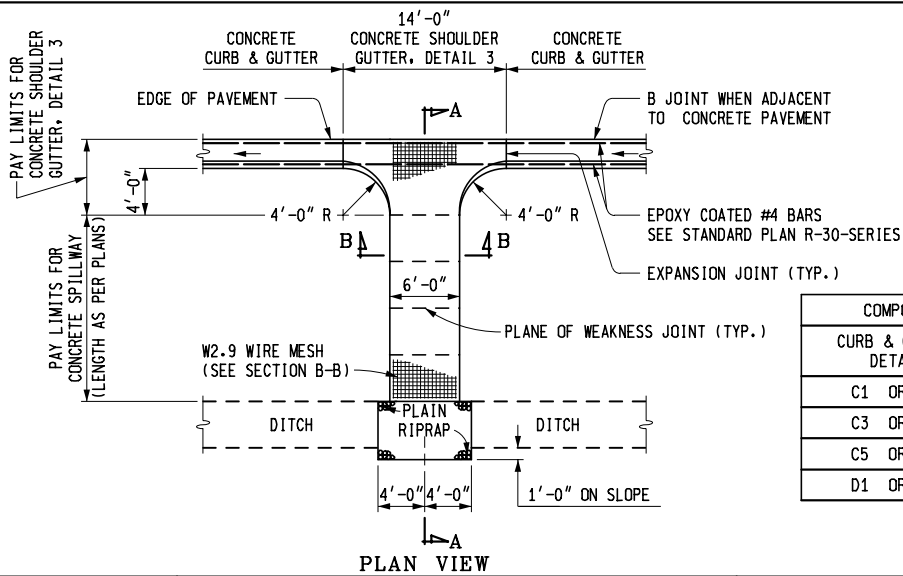
USED AS INTERMEDIATE OPENING IN CURB & GUTTER



COMPONENTS OF CONCRETE SHOULDER GUTTER, DETAIL 2		
CURB & GUTTER DETAIL	STEEL REINFORCEMENT LBS	CONCRETE CYD
C1 OR C2	36	1.4
C3 OR C4	36	1.5
C5 OR C6	36	1.7
D1 OR D2	36	1.6

DETAIL 2

USED AT END OF CURB



COMPONENTS OF CONCRETE SHOULDER GUTTER, DETAIL 3		
CURB & GUTTER DETAIL	STEEL REINFORCEMENT LBS	CONCRETE CYD
C1 OR C2	41	1.7
C3 OR C4	41	1.9
C5 OR C6	41	2.1
D1 OR D2	41	2.1

DETAIL 3

USED AT LOW POINT IN GUTTER LINE

PREPARED BY
DESIGN DIVISION

DRAWN BY: B.L.T.

CHECKED BY: W.K.P.

DEPARTMENT DIRECTOR
Paul C. Ajegba

APPROVED BY: Gregg Brunner, P.E. Gregg Brunner
Jul 24 2019 11:23 AM
DIRECTOR, BUREAU OF FIELD SERVICES

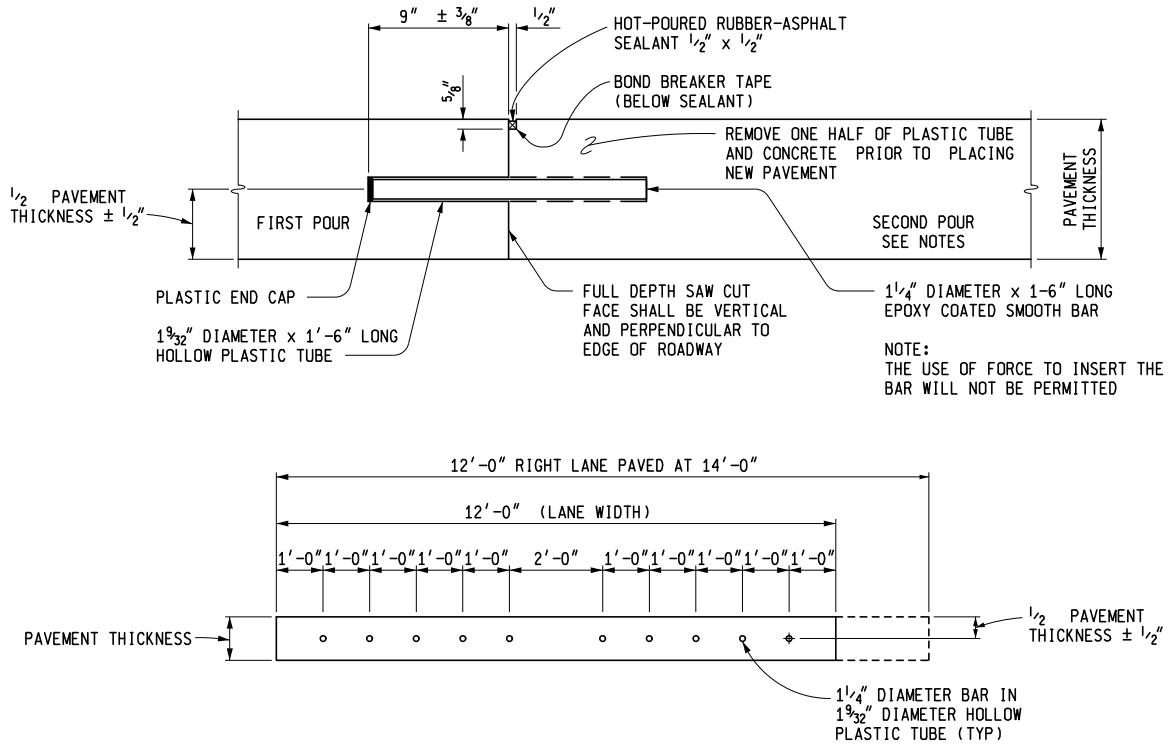
APPROVED BY: Bradley C. Wiefelrich Bradley C. Wiefelrich
Jul 3 2019 9:01 AM
DIRECTOR, BUREAU OF DEVELOPMENT

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

CONCRETE SHOULDER GUTTER AND SPILLWAY

5-18-2020 F.H.W.A. APPROVAL	7-30-2018 PLAN DATE	R-35-E
		SHEET 1 OF 2

SYMBOL (H)



DEFORMED BAR SPACING

TRANSVERSE END OF POUR JOINT (PLASTIC TUBE METHOD)

NOTES:

LOAD TRANSFER ASSEMBLIES ARE DETAILED ON THE CURRENT STANDARD PLAN R-40-SERIES.

TRANSVERSE JOINTS SHALL BE SPACED ACCORDING TO THE CURRENT STANDARD PLAN R-43-SERIES.

A TRANSVERSE END OF POUR JOINT (DRILLED IN METHOD) SYMBOL (H), SHALL BE CONSTRUCTED WHEN IT IS ANTICIPATED THAT THE SECOND POUR WILL BE DELAYED 7 DAYS OR LONGER.

A TRANSVERSE END OF POUR JOINT (SPLIT HEADER METHOD) OR (PLASTIC TUBE METHOD) SHALL BE USED AT THE END OF THE DAY'S POUR OR WHEN THERE IS AN UNAVOIDABLE INTERRUPTION OF THE WORK FOR MORE THAN ONE-HALF HOUR AND LESS THAN 7 DAYS. THE JOINT SHALL BE CONSTRUCTED ACCORDING TO TRANSVERSE END OF POUR JOINT (SPLIT HEADER METHOD) OR (PLASTIC TUBE METHOD), SYMBOL (H).

THE EXPANSION JOINT MATERIAL IN THE SHOULDERS SHALL BE SUPPORTED BY ONE OF THE FOLLOWING METHODS:

1. A CONTINUOUS SUPPORT WIRE, AS SPECIFIED FOR EXPANSION LOAD TRANSFERS ASSEMBLIES, AS DETAILED ON STANDARD PLAN R-40-SERIES, SHALL BE USED ON EACH SIDE OF EXPANSION MATERIAL. THIS WIRE SHALL BE EQUIPPED WITH STAKES AND STAKE POCKETS TO RIGIDLY HOLD THE EXPANSION MATERIAL IN PLACE DURING CONCRETE PLACEMENT. STAKES SHALL BE AS SPECIFIED ON STANDARD PLAN R-40-SERIES, SPACED NOT MORE THAN 2'-0\" APART.
2. "U" OR "J" SHAPE STAPLES OF W8 WIRE (0.319\" NOMINAL DIAMETER) SHALL BE SPACED ON 2'-0\" CENTERS EACH SIDE OF THE EXPANSION MATERIAL. EACH VERTICAL LEG OF THE STAPLE SHALL BE AT LEAST 1'-3\" LONG.
3. OTHER EQUIVALENT METHODS MAY BE USED WHEN APPROVED BY THE ENGINEER.

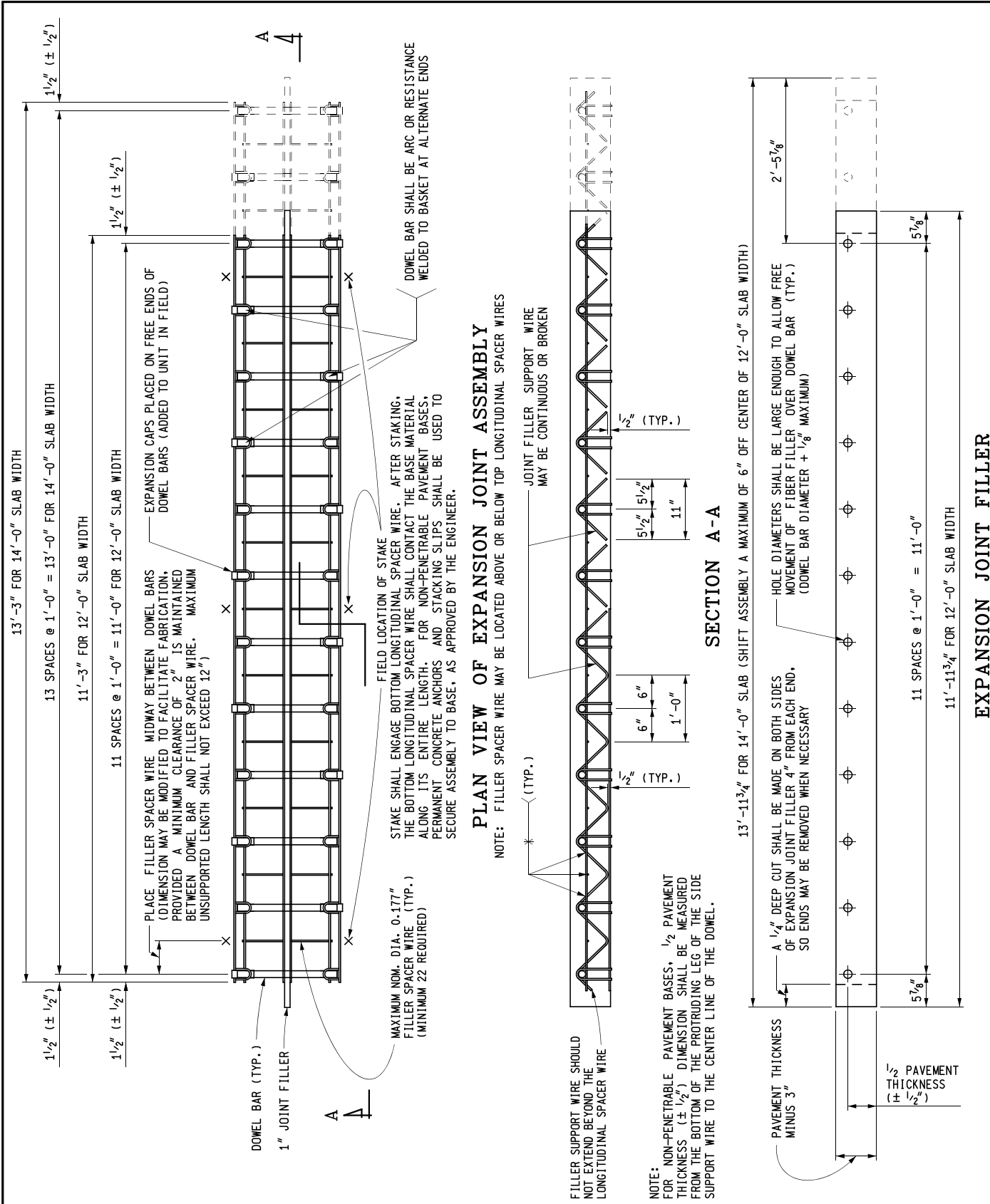
JOINTS SHALL NOT BE SEALED IN CONCRETE BASE COURSE.

WHEN CONCRETE SHOULDERS ARE CAST SEPARATELY FROM MAINLINE CONCRETE PAVEMENT, A KEYWAY MAY BE USED TO FACILITATE THE PLACING OF LANE TIES. WHEN A KEYWAY GROOVE IS USED, IT SHALL BE CONTINUOUS AND UNIFORM.

THE LOCATION OF TRANSVERSE JOINTS IN CONCRETE SHOULDERS SHALL MATCH THE LOCATION OF ADJACENT TRANSVERSE PAVEMENT JOINTS. CORRESPONDING TRANSVERSE CONCRETE SHOULDER AND PAVEMENT JOINTS SHALL BE (C3p) SHOULDER WITH (Cp) PAVEMENT, (E4) SHOULDER WITH (E2) PAVEMENT, AND (E3) BEING THE SAME IN BOTH SHOULDER AND PAVEMENT.

DEFORMED BARS FOR TRANSVERSE END OF POUR JOINTS (DRILLED IN METHOD) 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 PAVEMENT REPAIRS.

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF DEVELOPMENT STANDARD PLAN FOR			
TRANSVERSE PAVEMENT JOINTS (PLAIN CONCRETE PAVEMENT)			
2-21-2018 F.H.W.A. APPROVAL	9-25-2017 PLAN DATE	R-39-K	SHEET 5 OF 5



MDOT
Michigan Department of Transportation

PREPARED BY
DESIGN DIVISION

DRAWN BY: B.L.T.

CHECKED BY: W.K.P.

DEPARTMENT DIRECTOR
Paul C. Ajegba

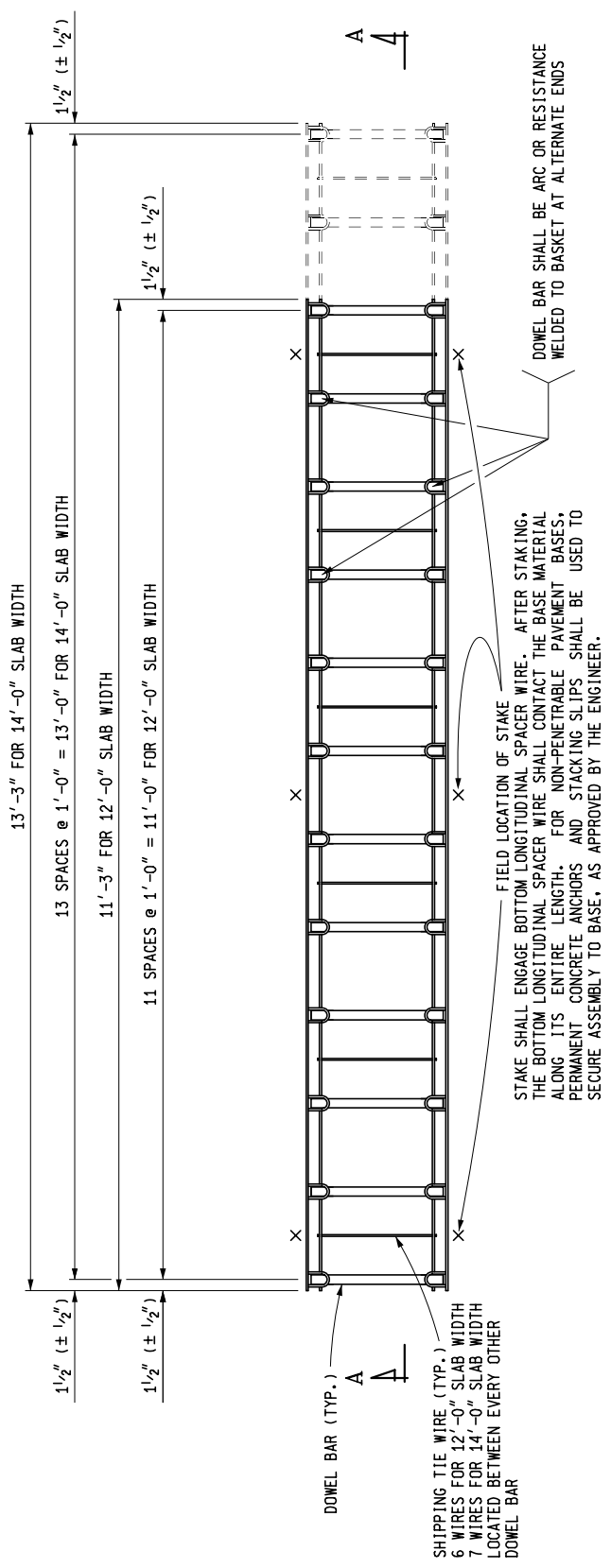
APPROVED BY: Gregg Brunner, P.E. Gregg Brunner
Oct 14 2021 12:33 PM
DIRECTOR, BUREAU OF FIELD SERVICES

APPROVED BY: Bradley C. Wiefersich Bradley C. Wiefersich
Oct 14 2021 11:02 AM
DIRECTOR, BUREAU OF DEVELOPMENT

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

**LOAD TRANSFER ASSEMBLIES
FOR TRANSVERSE JOINTS**

4-7-2022 F.H.W.A. APPROVAL	10-1-2021 PLAN DATE	R-40-I	SHEET 1 OF 4
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PLAN VIEW OF CONTRACTION JOINT ASSEMBLY

NOTE: SHIPPING TIE WIRES MAY BE LOCATED ABOVE OR BELOW TOP LONGITUDINAL SPACING WIRES.

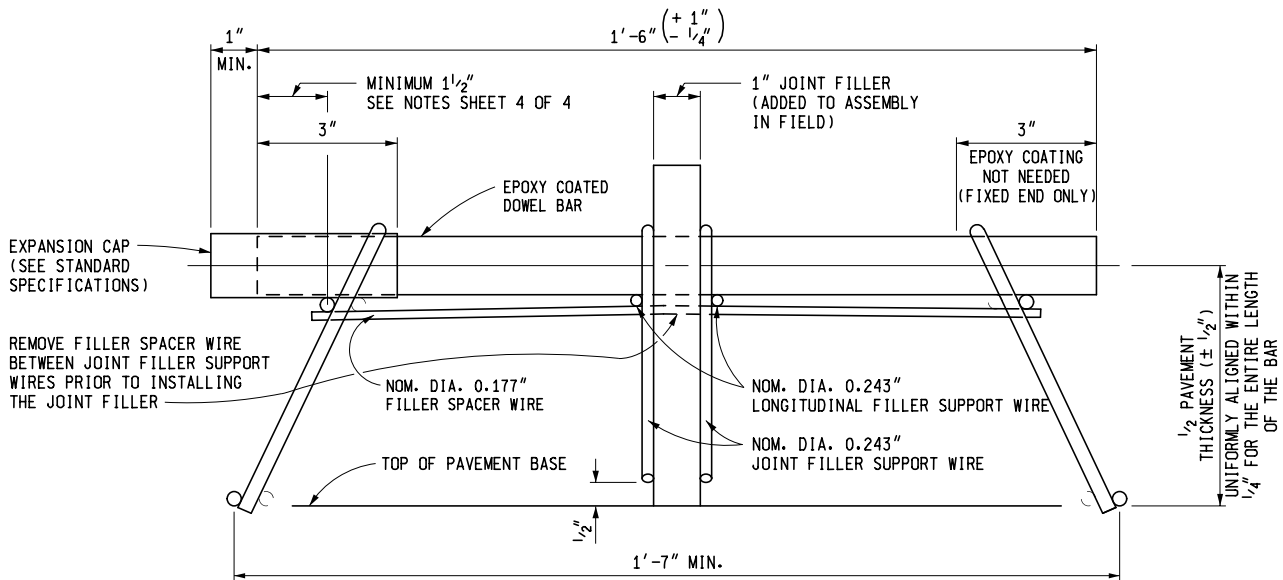


SECTION A-A

MICHIGAN DEPARTMENT OF TRANSPORTATION
 BUREAU OF DEVELOPMENT STANDARD PLAN FOR

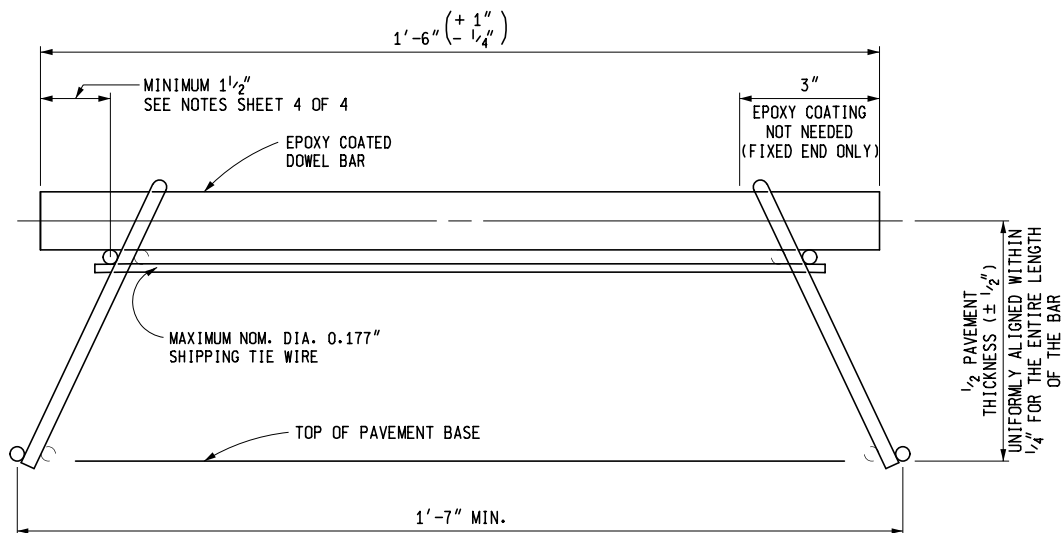
**LOAD TRANSFER ASSEMBLIES
 FOR TRANSVERSE JOINTS**

4-7-2022 F.H.W.A. APPROVAL	10-1-2021 PLAN DATE	R-40-I	SHEET 2 OF 4
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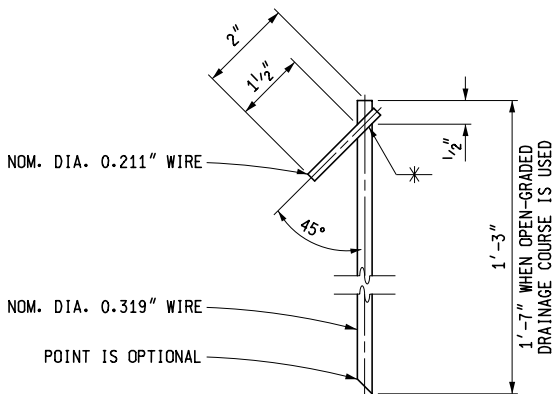
END VIEW OF EXPANSION JOINT ASSEMBLY

NOTE: FILLER SPACER WIRE MAY BE LOCATED ABOVE OR BELOW TOP LONGITUDINAL SPACER WIRES



END VIEW OF CONTRACTION JOINT ASSEMBLY

NOTE: SHIPPING TIE WIRE MAY BE LOCATED ABOVE OR BELOW TOP LONGITUDINAL SPACER WIRES



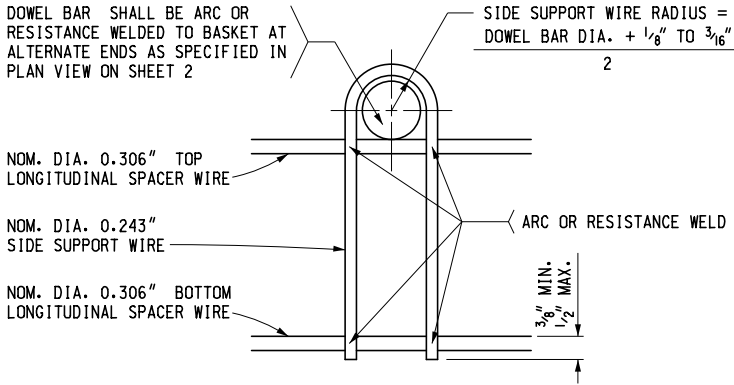
STAKE DETAIL

A SINGLE WIRE MAY BE USED IN LIEU OF STAKE DETAIL SPECIFIED PROVIDED A NOM. DIA. 0.319" WIRE IS USED AND BENT INTO A HOOK AT TOP END TO CONFORM TO DETAIL

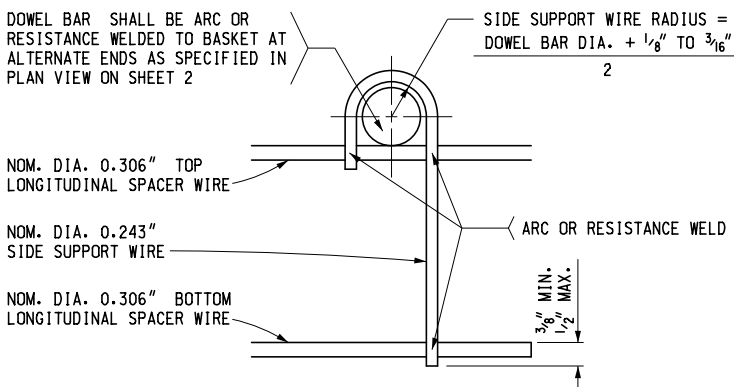
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

**LOAD TRANSFER ASSEMBLIES
FOR TRANSVERSE JOINTS**

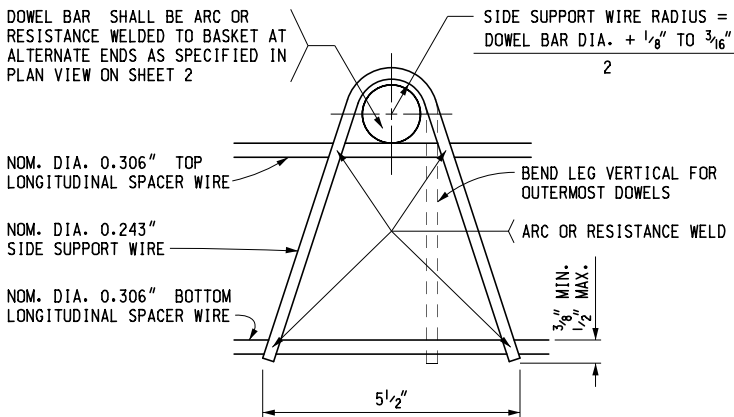
4-7-2022 F.H.W.A. APPROVAL	10-1-2021 PLAN DATE	R-40-I	SHEET 3 OF 4
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**SIDE SUPPORT WIRE DETAIL
U - LEG OPTION**



**SIDE SUPPORT WIRE DETAIL
J - LEG OPTION**



**SIDE SUPPORT WIRE DETAIL
V - LEG OPTION**

NOTES:

LOAD TRANSFER ASSEMBLIES SHALL BE PLACED AT RIGHT ANGLES TO THE PAVEMENT CENTERLINE.

THE SIDE SUPPORT WIRE (U-LEG, J-LEG OR V-LEG) MAY BE INSTALLED ON EITHER THE INSIDE OR THE OUTSIDE OF THE LONGITUDINAL SPACER WIRES. THE DIMENSION FROM THE END OF THE DOWEL BAR TO THE CENTER OF THE TOP LONGITUDINAL SPACER WIRE SHALL BE A MINIMUM OF 1 1/2\".

WIRES:

ALL WIRES SPECIFIED (EXCEPT SHIPPING TIE WIRES) ARE MINIMUM NOMINAL SIZES ALLOWED. (DO NOT EXCEED THE MAXIMUM NOMINAL DIAMETER OF 0.177\" FOR SHIPPING TIE WIRES.)

ALL WIRES SHALL CONFORM TO THE CURRENT SPECIFICATIONS FOR CARBON STEEL WIRE FOR GENERAL USE, A.S.T.M. DESIGNATION A-853, GRADE 1008 OR GREATER. UNLESS OTHERWISE SPECIFIED, MINIMUM TENSILE STRENGTH REQUIREMENTS SHALL BE 60 ksi.

ALL WIRE INTERSECTIONS ARE TO BE ARC OR RESISTANCE WELDED.

STAKES TYPICALLY APPLIED AT WORKING ENDS OF DOWELS WITH SUFFICIENT INSTALLATIONS TO PREVENT UNIT FROM OVERTURNING UNDER LOAD.

DO NOT CUT FILLER SPACER WIRES AFTER THE LOAD TRANSFER ASSEMBLY IS SET IN PLACE.

DOWEL BARS:

DOWEL BARS ARE TO BE ACCORDING TO THE STANDARD SPECIFICATIONS FOR CONSTRUCTION.

EPOXY COATED DOWEL BARS ARE TO BE FACTORY COATED WITH A VISIBLE COATING OF AN APPROVED BOND RELEASE AGENT, UNIFORMLY APPLIED BY DIPPING AND WITHOUT EXCESSIVE DRIPS OR THICKNESS IN SUCH A THICKNESS THAT ITS PRESENCE CAN BE READILY IDENTIFIED.

METAL EXPANSION CAPS MUST BE ENTIRELY CLOSED AT ENDS BY CRIMPING. PLASTIC CAPS MUST HAVE A POSITIVE STOP. DO NOT DRIVE CAPS BEYOND THEIR STOP. EXPANSION CAPS MUST HAVE A SUITABLE STOP TO ENSURE THAT THE END OF THE CAP MAINTAINS A DISTANCE OF 1\" (EXPANSION) FROM THE END OF THE DOWEL DURING CONCRETE PLACEMENT.

DOWEL BARS SHALL BE COATED WITH EPOXY COATING ACCORDING TO THE STANDARD SPECIFICATIONS FOR CONSTRUCTION. CUT ENDS ARE NOT REQUIRED TO BE COATED.

DOWEL BAR DIAMETER	PAVEMENT THICKNESS
1"	6" - LESS THAN 8"
1 1/4"	8" - 10"
1 1/2"	GREATER THAN 10"

DOWEL BARS SHALL BE ALIGNED PARALLEL TO EACH OTHER IN THE ASSEMBLY ON 1'-0" ($\pm 1/2$ ") CENTERS.

AFTER THE LOAD TRANSFER ASSEMBLY IS SET IN PLACE, DOWEL BARS SHALL REMAIN ALIGNED (PARALLEL) WITH EACH OTHER IN THE VERTICAL AND HORIZONTAL PLANES OF THE PAVEMENT TO WITHIN 1/4\" FOR THE ENTIRE LENGTH OF THE BAR.

DOWEL BARS SHALL BE PLACED AT MID DEPTH OF THE SLAB UNIFORMLY ALIGNED WITHIN 1/4\" FOR THE ENTIRE LENGTH OF THE BAR.

FOR PAVEMENTS WITH VARIABLE THICKNESS TRANSVERSLY ACROSS THE SLAB, THE TOP AND BOTTOM SURFACES OF THE DOWEL BAR SHALL BE WITHIN THE MIDDLE 1/3 OF THE PAVEMENT THICKNESS, AS APPROVED BY THE ENGINEER.

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

**LOAD TRANSFER ASSEMBLIES
FOR TRANSVERSE JOINTS**

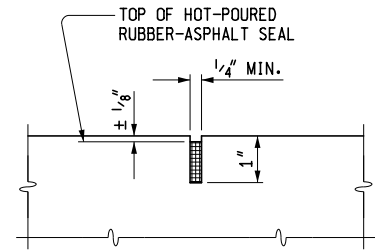
4-7-2022
F.H.W.A. APPROVAL

10-1-2021
PLAN DATE

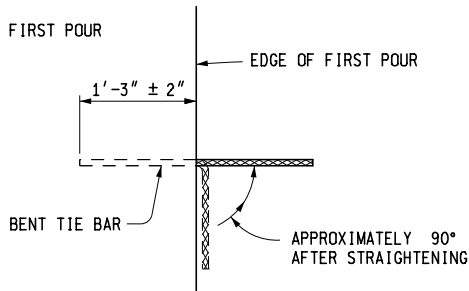
R-40-I

SHEET
4 OF 4

SYMBOL (B)



SAWED JOINT SEALED WITH HOT - POURED RUBBER - ASPHALT



SURFACE OF FINISHED PAVEMENT

1/2 PAVEMENT THICKNESS ± 3/4"

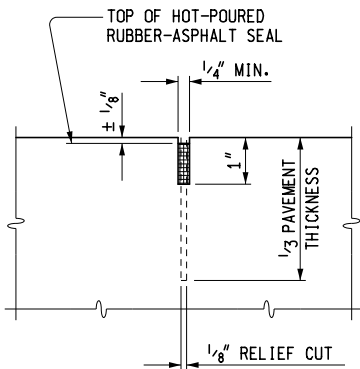
BENT TIE BAR EPOXY COATED #5 DEFORMED BAR 2'-6" LONG (TYP.)

MAXIMUM ALLOWABLE LANE TIE SPACING (SPECIFIED BELOW)

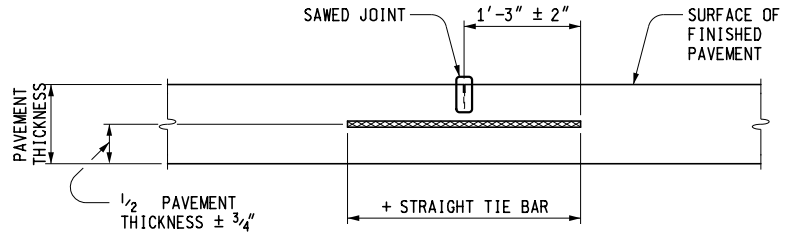
LONGITUDINAL BULKHEAD JOINT - SYMBOL (B)

ALL SYMBOL (B) JOINTS SHALL BE SAWED AND SEALED EXCEPT JOINTS WITHOUT LANE TIES AND JOINTS ADJACENT TO VERTICAL FACES WHICH WOULD PROHIBIT SAWING.

SYMBOL (D) AND (S)



SAWED JOINT SEALED WITH HOT - POURED RUBBER - ASPHALT



+ EPOXY COATED #5 DEFORMED BAR 2'-6" LONG FOR SYMBOL (D)
EPOXY COATED #5 SMOOTH BAR 2'-6" LONG FOR SYMBOL (S)
(MAXIMUM ALLOWABLE LANE TIE SPACING SPECIFIED BELOW)

LONGITUDINAL LANE TIE JOINT - SYMBOL (D)
LONGITUDINAL SMOOTH LANE TIE JOINT - SYMBOL (S)

SYMBOL (D) AND SYMBOL (S) TIE BARS SHALL BE PLACED AT THE PROPER SPACING LONGITUDINALLY, AND TRANSVERSELY AT 90° WITH THE JOINT.

MAXIMUM ALLOWABLE LANE TIE SPACING SYMBOLS (B), (D), (L2), AND (S)		* TOTAL DISTANCE OF TIED JOINT FROM NEAREST FREE EDGE
(B) GRADE 40	(D), (L2), AND (S) GRADE 60	
2'-10"	3'-7"	12' OR LESS
1'-11"	2'-7"	OVER 12' THROUGH 17'
1'-5"	1'-11"	OVER 17' THROUGH 24'
1'-2"	1'-9"	OVER 24' THROUGH 28'
1'-2"	1'-4"	OVER 28' THROUGH 36'
1'-1"	1'-1"	36' OR GREATER **

* INCLUDES ANY TIED COMBINATION OF LANE WIDTH, VALLEY GUTTER, CURB & GUTTER, OR SHOULDER

** FOR WIDTHS GREATER THAN 48' USE #6 DEFORMED BARS AT 1'-2" SPACING.

MAXIMUM ALLOWABLE LANE TIE SPACING



PREPARED BY DESIGN DIVISION

DRAWN BY: B.L.T.

CHECKED BY: W.K.P.

DEPARTMENT DIRECTOR
Kirk T. Stuedle

APPROVED BY: *Randy U. ...*
DIRECTOR, BUREAU OF FIELD SERVICES

APPROVED BY: *Mark A. Van ...*
DIRECTOR, BUREAU OF HIGHWAY DEVELOPMENT

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

LONGITUDINAL PAVEMENT JOINTS

9-30-2014
F.H.W.A. APPROVAL

4-22-2013
PLAN DATE

R-41-H

SHEET 1 OF 2

NOTES:

TRANSVERSE JOINT SPACING IN CONCRETE PAVEMENT AND CONCRETE SHOULDERS SHALL BE AS SPECIFIED IN THE PROPOSAL OR ON THE PLANS AND CONSTRUCTED ACCORDING TO STANDARD PLAN R-43-SERIES AND THIS PLAN, OR AS DIRECTED BY THE ENGINEER. THE PLACEMENT OF JOINTS IN CURB, CURB AND GUTTER OR VALLEY GUTTER SHALL BE PLACED AS SPECIFIED ON STANDARD PLAN R-30-SERIES AND R-33-SERIES. PAVEMENTS NOT CAST INTEGRALLY WITH CURB, CURB AND GUTTER, VALLEY GUTTER OR CONCRETE SHOULDER SHALL BE CONNECTED WITH A LONGITUDINAL SYMBOL (B) JOINT.

JOINTS SHALL BE CONSTRUCTED ACCORDING TO CURRENT STANDARD PLANS R-39-SERIES AND R-41-SERIES.

RAMP JOINTS SHALL BE ORIENTED 90 DEGREES TO THE ALIGNMENT EDGE OF THE RAMP UNTIL THE 2' POINT OF THE GORE. THEN, AS THE RAMP MERGES WITH THE MAINLINE, THE JOINTS SHALL BE ALIGNED 90 DEGREES TO THE MAINLINE.

BASE COURSES SHALL BE NONREINFORCED UNLESS OTHERWISE SPECIFIED ON THE PLANS.

THE LOCATION OF SYMBOLS (E2), (E3) OR (Cp) JOINTS SHALL BE ADJUSTED TO AVOID CONFLICTS WITH MANHOLES, CATCH BASINS, MONUMENT BOXES, WATER SHUT-OFFS, OR OTHER RIGID STRUCTURES. EITHER THE JOINT SHALL BE LOCATED TO INTERSECT AT THE MID POINT OF THE STRUCTURE OR THE STRUCTURE SHALL BE LOCATED IN THE CENTER OF THE PAVEMENT SLAB. SEE R-37-SERIES FOR ISOLATION JOINT DETAILS.

THE CONCRETE PAVEMENT IN THE TRUCK AND PASSENGER CAR PARKING AREAS OF REST AREAS SHALL BE TEXTURED ACCORDING TO THE CURRENT STANDARD SPECIFICATIONS FOR CONSTRUCTION.

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

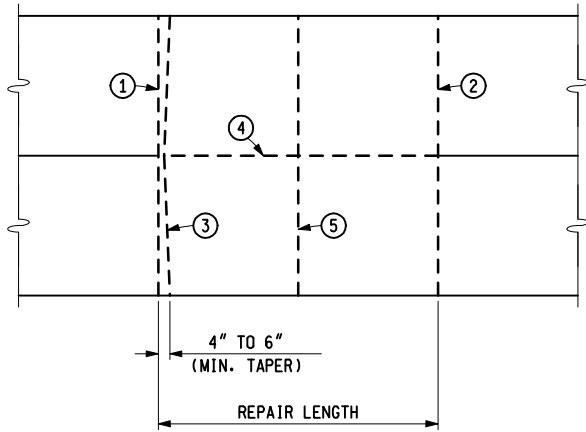
**TYPICAL JOINT LAYOUTS
FOR CONCRETE PAVEMENT**

1-25-2013
F.H.W.A. APPROVAL

12-6-2010
PLAN DATE

R-42-F

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6 OF 6

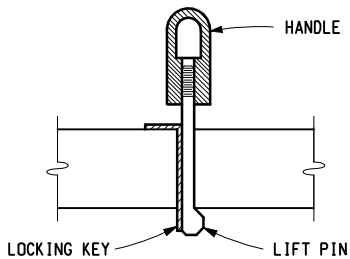


PLAN OF SAWING DIAGRAM

THIS METHOD OF REMOVING DISTRESSED CONCRETE SHALL BE USED IN CONJUNCTION WITH FULL DEPTH CAST-IN-PLACE REPAIRS LESS THAN 50'-0" LONG AND IS OPTIONAL FOR REPAIRS OVER 50'-0" IN LENGTH.

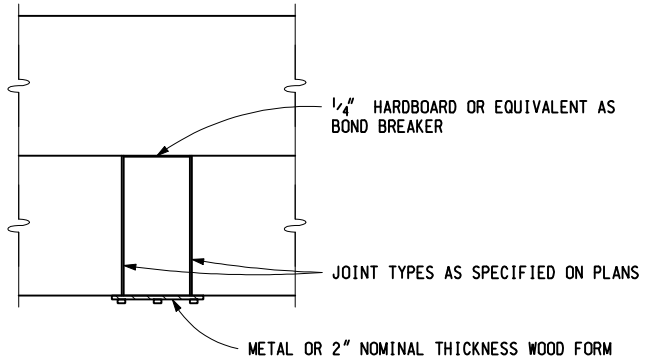
- ① & ② THESE SAW CUTS SHALL BE FULL DEPTH AND PERPENDICULAR TO THE EDGE OF THE ROADWAY, WITHIN A TOLERANCE OF 1". NO OVERCUTTING INTO ADJACENT LANES SHALL BE MADE UNLESS THE OVERCUT IS WITHIN THE LIMITS OF A SUBSEQUENT REPAIR TO THE ADJACENT LANE. SHOULDER OVERCUTS WILL BE ALLOWED.
- ③ THIS FULL DEPTH SAW CUT IS MADE TO FACILITATE OPENING A TRENCH ACROSS THE SLAB TO RELIEVE COMPRESSION IN THE PAVEMENT PRIOR TO LIFTING OUT THE FAILED AREA. THIS SAW CUT MAY BE OMITTED PROVIDED NO SPALLING OF THE REMAINING CONCRETE OCCURS. IF SPALLING DOES OCCUR, THE CONTRACTOR WILL BE REQUIRED TO MAKE THIS SAW CUT ON SUBSEQUENT REPAIRS. WHEN THIS SAW CUT IS USED AND THE ADJACENT LANE IS NOT REPAIRED, NO OVERCUTTING INTO THAT LANE SHALL BE MADE.
- ④ THIS LONGITUDINAL FULL DEPTH SAW CUT IS MADE BETWEEN LANES OR BETWEEN ANY COMBINATION OF THE FOLLOWING: LANE, RAMP, CURB, CONCRETE SHOULDER, OR PARTIAL LANE WIDTH REPAIR.
- ⑤ IF REQUIRED, INTERMEDIATE SAW CUTS MAY BE MADE TO REMOVE A SECTION OF PAVEMENT LANE WHICH IS OVER 6'-0" IN LENGTH, TO PERMIT LOADING INTO THE HAULING UNITS.

ADDITIONAL SAW CUTS, AT CONTRACTOR'S EXPENSE, MAY BE MADE INSIDE THE REPAIR LIMITS TO REDUCE 6'-0" BY 12'-0" OR LESS SLABS INTO SMALLER PIECES TO FACILITATE REMOVAL.

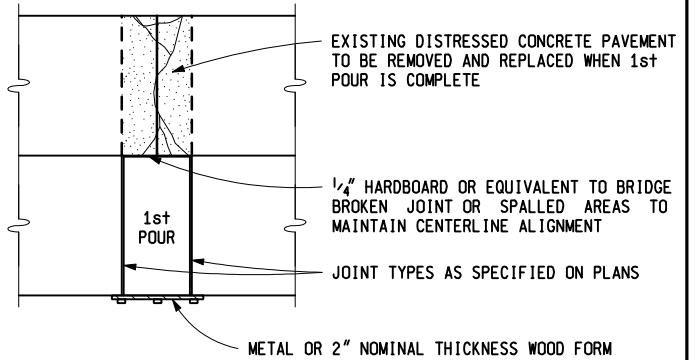


SCHEMATIC OF TYPICAL LIFT PIN ASSEMBLY

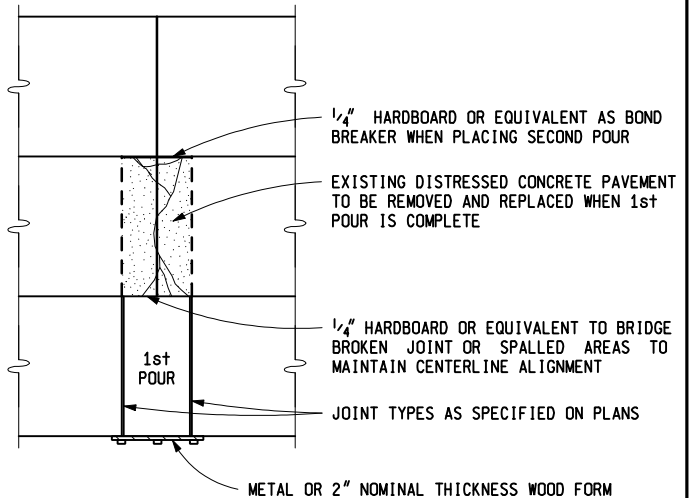
SAWING DIAGRAM & LIFT PIN FOR REMOVING OLD SLAB



**ONE LANE REPAIRS
(2 - LANE ROADWAY SHOWN)**



**ALL LANES REPAIRED
(2 - LANE ROADWAY SHOWN)**



**MORE THAN ONE LANE REPAIRED
BUT REPAIR LESS THAN FULL WIDTH
(3 - LANE ROADWAY SHOWN)**

FORMING NOTES:

STAKES USED TO HOLD HMA FILLER OR HARDBOARD IN PLACE DURING CONCRETE PLACEMENT SHALL BE REMOVED BEFORE SCREEDING THE CONCRETE.

ADJACENT LANE REPAIRS MAY BE CAST INTEGRALLY, WHEN APPROVED BY THE ENGINEER.

**FORMING REQUIREMENTS FOR
CAST-IN-PLACE REPAIRS 12'-0" OR LESS**



PREPARED BY
DESIGN DIVISION

DRAWN BY: B.L.T.

CHECKED BY: W.K.P.

DEPARTMENT DIRECTOR
Kirk T. Steudle

APPROVED BY: John C. Friend
ENGINEER OF DELIVERY

APPROVED BY: Paul A. Van Pelt
ENGINEER OF DEVELOPMENT

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

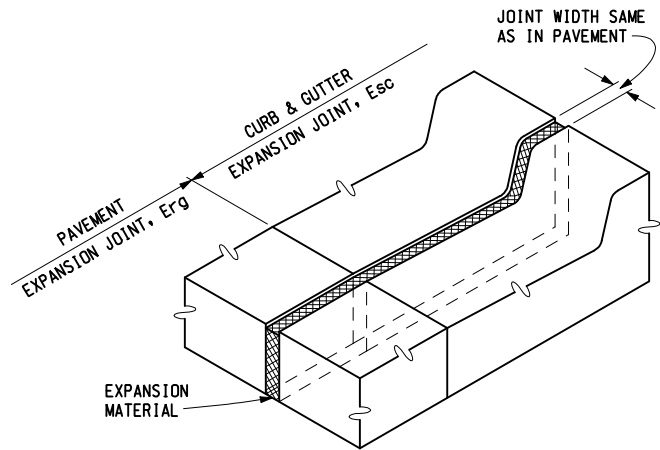
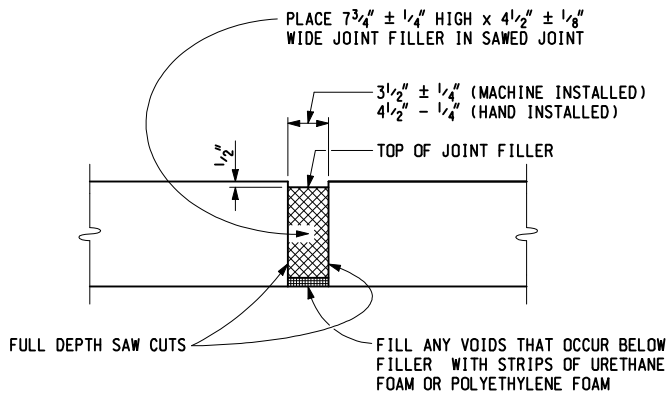
CONCRETE PAVEMENT REPAIR

9-10-2010
F.H.W.A. APPROVAL

8-9-2010
PLAN DATE

R-44-F

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1 OF 6



NOTES:
 WHEN PRESSURE RELIEF JOINT IS TO BE CONSTRUCTED THROUGH CONCRETE SHOULDER, TRENCHING BELOW CONCRETE MAY BE NECESSARY TO ALLOW ROOM FOR $7\frac{1}{4}''$ FILLER.

PRESSURE RELIEF JOINT

THIS DETAIL ALSO APPLIES TO HMA SURFACED CONCRETE PAVEMENT REQUIRING PRESSURE RELIEF JOINTS

CURB, GUTTER, AND CURB FACE SHALL BE SAWED AS DEEP AS THE EXISTING PAVEMENT THICKNESS. THE REMAINING CONCRETE SHALL BE CHIPPED OUT AND EXPANSION MATERIAL OF SUFFICIENT THICKNESS SHALL BE PLACED IN SAWED JOINT TO FILL THE GAP AS DIRECTED BY THE ENGINEER.

EXPANSION JOINT, Esc

NOTES:

CONCRETE PAVEMENT REPAIRS (INCLUDING JOINT TYPES) OR PRESSURE RELIEF DETAILS SHALL BE AS SPECIFIED ON THE PLANS OR IN THE LOG OF PROJECT.

IF THE EXISTING PAVEMENT HAS A HMA SURFACE, THE SAW CUTS SHALL EXTEND THROUGH THE UNDERLYING PORTLAND CEMENT CONCRETE.

SAW OVERCUTS IN ADJACENT LANE, SHOULDER, RAMP, AND GUTTERS THAT WILL REMAIN IN PLACE, SHALL BE CLEANED AND THEN SEALED WITH HOT-POURED RUBBER-ASPHALT.

WHEN THE CONCRETE PAVEMENT REPAIR IS CONSTRUCTED IN PREPARATION FOR AN OVERLAY, Crg JOINT RESERVOIRS AND SEALANTS SHALL BE OMITTED AND EXPANSION JOINTS (Erg) SHALL HAVE THE FIBER JOINT FILLER KEPT FLUSH TO THE PAVEMENT SURFACE.

EXPANSION CAPS SHALL BE ACCORDING TO STANDARD PLAN R-40-SERIES.

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.

AFTER GROUTING IN-PLACE, RC-250 OR AN APPROVED BOND BREAKER SHALL BE APPLIED TO THAT PORTION OF Crg AND Erg DOWEL BARS THAT EXTEND INTO THE CAST CONCRETE.

REPAIRED CONCRETE PAVEMENTS REQUIRE THAT 1" OF Erg EXPANSION JOINTS BE DISTRIBUTED THROUGHOUT A GIVEN 1000' SECTION.

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 $1\frac{1}{2}''$ DEEP TO PERMIT THE PLACEMENT OF THE HOT-POURED RUBBER ASPHALT SEALANT. HOLES IN EXPANSION JOINT FILLER SHALL BE $1\frac{1}{2}''$ 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 Erg 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.

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 1'-8" 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 STENCILED ON EACH CONCRETE REPAIR.

ALL REPAIRS WILL BE JOINTED PLAIN CONCRETE PAVEMENT.

MICHIGAN DEPARTMENT OF TRANSPORTATION
 BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

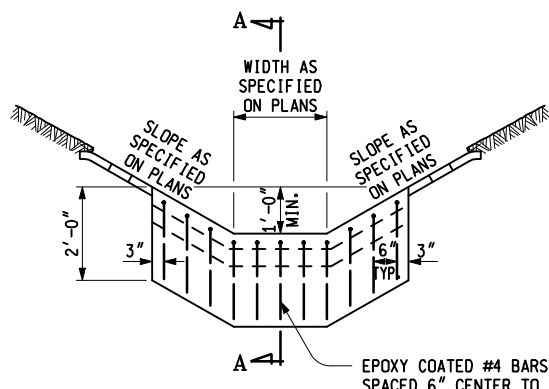
CONCRETE PAVEMENT REPAIR

9-10-2010
 F.H.W.A. APPROVAL

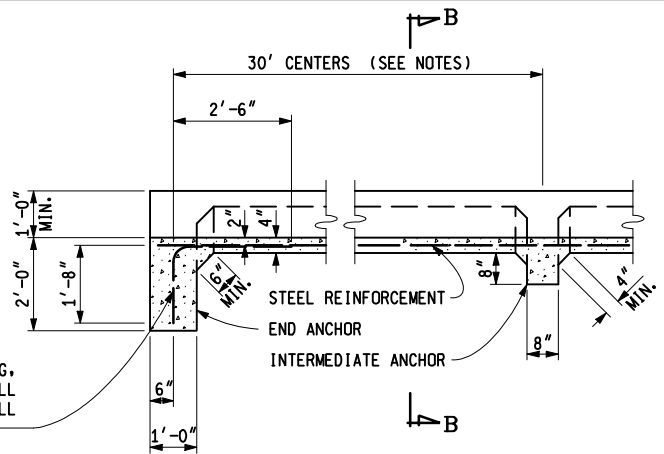
8-9-2010
 PLAN DATE

R-44-F

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 6 OF 6

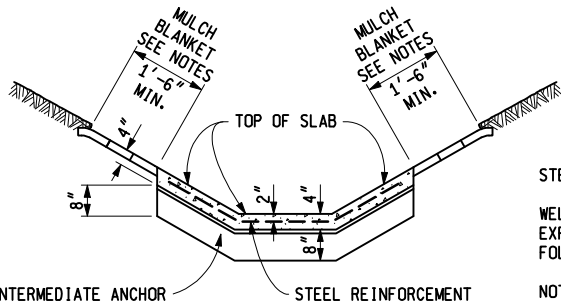


EPOXY COATED #4 BARS, 4'-2" LONG, SPACED 6" CENTER TO CENTER, SHALL BE BENT AS ILLUSTRATED AND SHALL BE USED AT END ANCHORS ONLY



SECTION A - A

TWO PLANE OF WEAKNESS JOINTS EQUALLY SPACED SHALL BE PLACED BETWEEN ANCHORS AND SHALL BE CONSTRUCTED ACCORDING TO THE CURRENT STANDARD SPECIFICATIONS

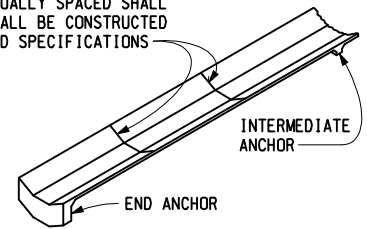


SECTION B - B

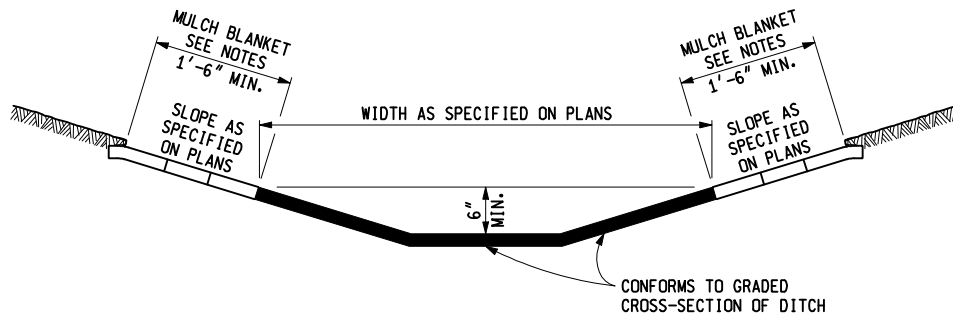
STEEL REINFORCEMENT

WELDED STEEL WIRE FABRIC OR AN EQUIVALENT EXPANDED METAL MESH CONFORMING TO THE FOLLOWING MINIMUM REQUIREMENTS:

NOT LESS THAN 3.69 LBS PER SYD UNIFORM WIRE FABRIC COMPOSED OF W6 (NOMINAL DIA. 0.276") 6" ON CENTER LONGITUDINALLY AND TRANSVERSELY.

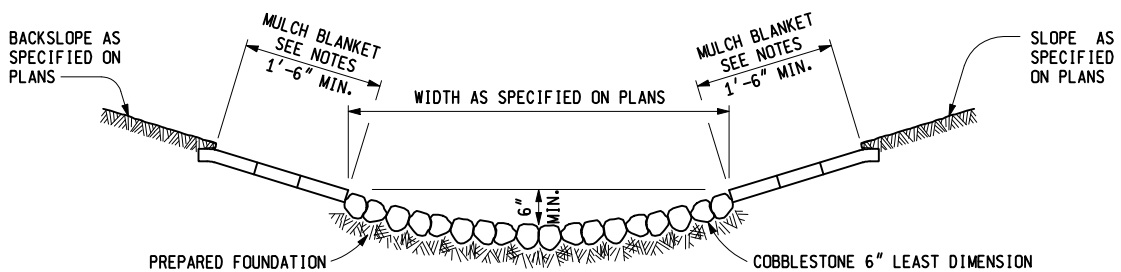


CONCRETE PAVED DITCH



THE RATE OF APPLICATION FOR THE HMA MATERIAL SHALL BE ACCORDING TO THE CURRENT STANDARD SPECIFICATIONS

HMA PAVED DITCH



PLAIN COBBLE DITCH
GROUTED COBBLE DITCH

GROUTED COBBLE DITCHES 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.



PREPARED BY
DESIGN DIVISION

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MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

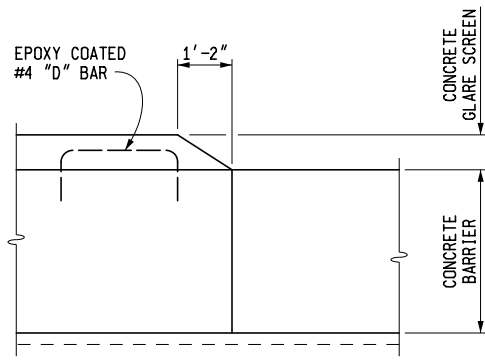
PAVED AND COBBLE DITCHES,
& DRAINAGE TREATMENT DETAILS

9-10-2010
F.H.W.A. APPROVAL

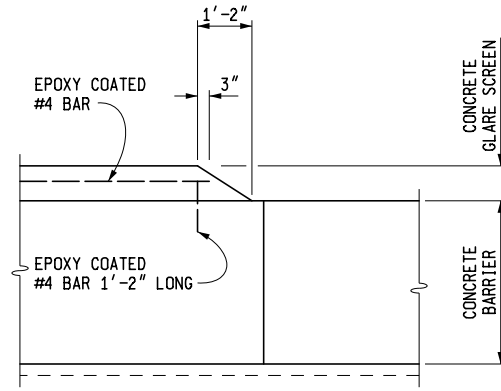
4-6-2010
PLAN DATE

R-46-D

SHEET
1 OF 2



ELEVATION WHEN "D" BARS ARE USED



ELEVATION WHEN LONGITUDINAL BAR AND DOWEL BARS ARE USED

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.

WHERE A CRACK IN THE EXISTING CONCRETE BARRIER APPEARS TO BE WORKING AS A JOINT, A CONTRACTION JOINT SHALL BE PLACED IN THE CONCRETE GLARE SCREEN DIRECTLY OVER THE CRACK, AND IF STEEL REINFORCEMENT GOES THROUGH THE JOINT, THE STEEL BAR SHALL BE CUT AT THE JOINT (NO GAP IN THE STEEL IS REQUIRED). IF THE JOINT OVER THE CRACK IS WITHIN 4'-0" OF WHERE THE NORMAL JOINT WOULD BE LOCATED, THE NORMAL JOINT SHALL BE OMITTED.

EXPANSION JOINTS SHALL BE CONSTRUCTED BY INSERTING A 1" FIBER JOINT FILLER IN LINE WITH EXPANSION JOINTS IN THE CONCRETE BARRIER. 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 SAWED, 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.

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

CONCRETE GLARE SCREEN

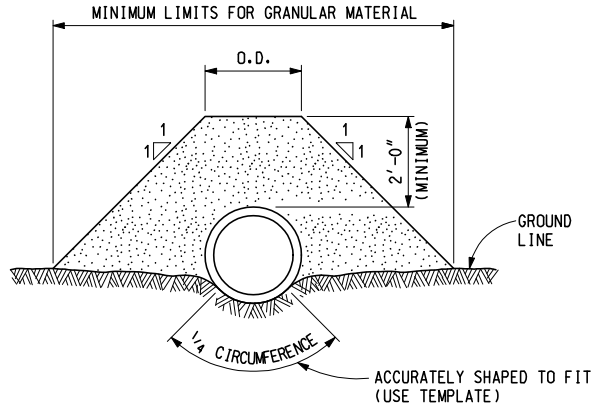
3-29-2018
F.H.W.A. APPROVAL

3-22-2017
PLAN DATE

R-76-E

SHEET
3 OF 3

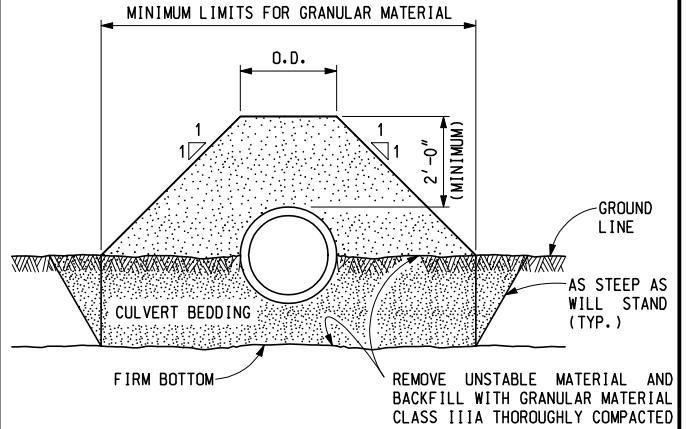
EMBANKMENT BETWEEN GROUND LINE AND 2'-0" MINIMUM ABOVE TOP OF PIPE CULVERT SHALL CONSIST OF GRANULAR MATERIAL CLASS IIIA COMPACTED TO 95% OF ITS MAXIMUM UNIT WEIGHT. THE MATERIAL SHALL BE DEPOSITED AND COMPACTED IN LAYERS NOT MORE THAN 10" IN THICKNESS.



NOTE:
TRENCH MAY BE UNDERCUT BELOW CULVERT AND THE UNDERCUT MATERIAL REPLACED WITH GRANULAR MATERIAL.

CROSS-SECTION SHOWING CULVERT INSTALLATION IN STABLE SOIL

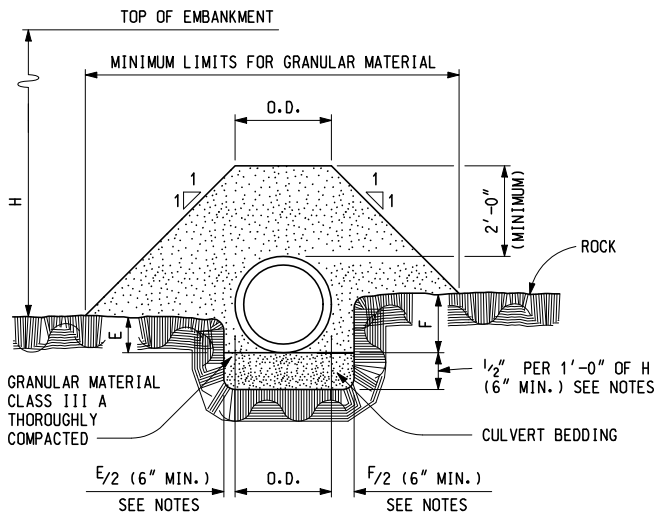
EMBANKMENT BETWEEN GROUND LINE AND 2'-0" MINIMUM ABOVE TOP OF PIPE CULVERT SHALL CONSIST OF GRANULAR MATERIAL CLASS IIIA COMPACTED TO 95% OF ITS MAXIMUM UNIT WEIGHT. THE MATERIAL SHALL BE DEPOSITED AND COMPACTED IN LAYERS NOT MORE THAN 10" IN THICKNESS.



NOTE:
PLACE AND COMPACT CULVERT BEDDING TO THE LEVEL OF 1/4 THE DIAMETER OF THE PIPE CULVERT AND THEN EXCAVATE AND SHAPE A TRENCH TO FIT THE PIPE. AFTER PLACING CULVERT, CONTINUE FILLING WITH CULVERT BEDDING TO GROUND LINE.

CROSS-SECTION SHOWING CULVERT INSTALLATION IN UNSTABLE SOIL

EMBANKMENT BETWEEN GROUND LINE AND 2'-0" MINIMUM ABOVE TOP OF PIPE CULVERT SHALL CONSIST OF GRANULAR MATERIAL CLASS IIIA COMPACTED TO 95% OF ITS MAXIMUM UNIT WEIGHT. THE MATERIAL SHALL BE DEPOSITED AND COMPACTED IN LAYERS NOT MORE THAN 10" IN THICKNESS.



NOTE:
PLACE AND COMPACT GRANULAR MATERIAL CLASS IIIA TO THE LEVEL OF 1/4 THE DIAMETER OF THE PIPE CULVERT AND THEN EXCAVATE AND SHAPE A TRENCH TO FIT THE PIPE.

CROSS-SECTION SHOWING CULVERT INSTALLATION IN ROCK

NOTES:

CORRUGATED STEEL PIPE, CORRUGATED POLYETHYLENE, AND ALUMINUM ALLOY PIPE SHALL HAVE A MINIMUM OF 12" OF GRANULAR MATERIAL CLASS IIIA PLACED COMPLETELY AROUND THE PIPE FOR ITS FULL LENGTH EXCEPT FOR BEDDING.

THE ENGINEER SHALL DESIGNATE THE REQUIRED DETAIL BASED ON SOIL CONDITIONS ENCOUNTERED.

UNSTABLE SOIL IS SOIL TOO SOFT OR SPONGY TO PROVIDE A FIRM BED FOR THE PIPE CULVERT.

NO REDUCTION SHALL BE MADE IN THE REGULAR EMBANKMENT QUANTITY FOR THE SPACE OCCUPIED BY THE CULVERT.

PIPE CULVERTS IN CUT SECTIONS SHALL BE PLACED ACCORDING TO THE DETAILS SPECIFIED ON STANDARD PLAN R-83-SERIES.

WHEN AN END SECTION IS USED IN LIEU OF A HEADWALL, A STABLE FOUNDATION SHALL BE PROVIDED FOR THE END SECTION COMPARABLE TO THAT PROVIDED BY THE CULVERT.

WHEN BELL AND SPIGOT PIPE IS USED IN A ROCK TRENCH, A MINIMUM OF 4" OF CULVERT BEDDING WILL BE REQUIRED UNDER THE BELL.



David D. Chin
ENGINEER OF CONSTRUCTION & TECHNOLOGY

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Mark A. H. ...
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MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

BEDDING AND FILLING AROUND PIPE CULVERTS

PREPARED BY
DESIGN
SUPPORT AREA

DRAWN BY: *B.L.T.*

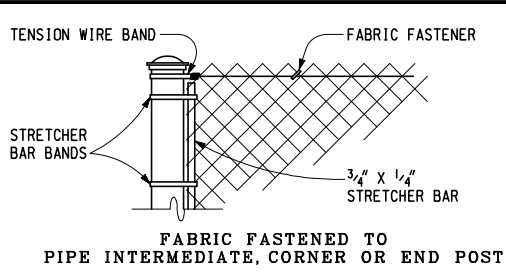
CHECKED BY: *W.K.P.*

11-14-2003
F.H.W.A. APPROVAL

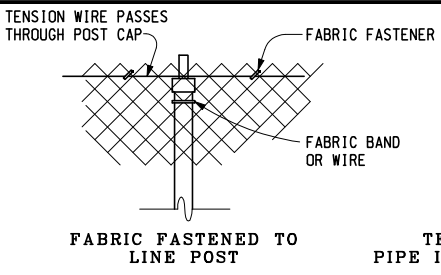
6-25-2002
PLAN DATE

R-82-D

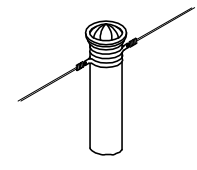
SHEET
1 OF 2



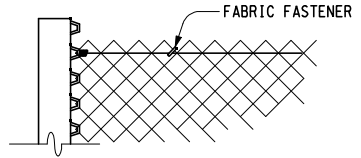
FABRIC FASTENED TO PIPE INTERMEDIATE, CORNER OR END POST



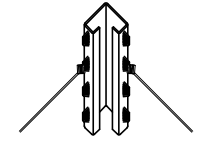
FABRIC FASTENED TO LINE POST



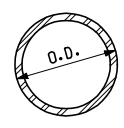
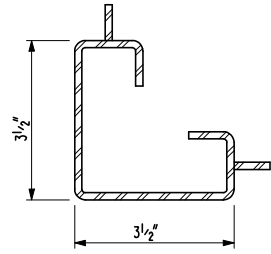
TENSION WIRE FASTENED TO PIPE INTERMEDIATE OR CORNER POST



FABRIC FASTENED TO ROLLED-FORMED CORNER OR END POST

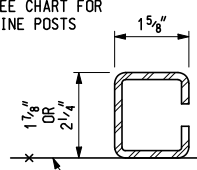


TENSION WIRE FASTENED TO ROLLED-FORMED INTERMEDIATE OR CORNER POST

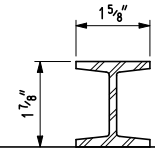


"ROLLED-FORMED CORNER" SECTION "PIPE" SECTION

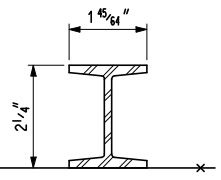
* SEE CHART FOR LINE POSTS



"C" SECTION



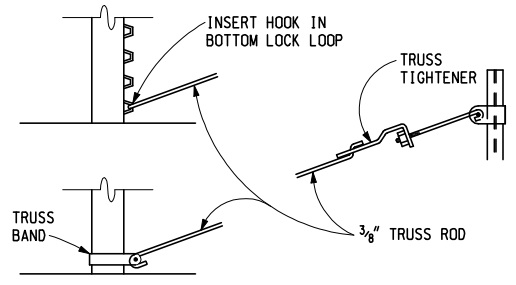
"H" SECTION



"H" SECTION

PIPE SIZE REQUIREMENTS FOR CHAIN LINK FENCE GATE POSTS AND FRAMES			
USE FOR	GATE WIDTH (FEET)	SHAPE	* SIZE, INCHES NOMINAL (ACTUAL O.D.)
GATE POSTS	6 OR LESS	PIPE	2 1/2 (2.875)
	7 TO 13	PIPE	3 1/2 (4.000)
	14 TO 18	PIPE	6 (6.625)
GATE FRAMES	6 OR LESS	PIPE	1 1/4 (1.660)
	7 TO 18	PIPE	1 1/2 (1.900)

* POSTS AND GATE FRAMES SHALL MEET THE SPECIFIED NOMINAL WEIGHTS PER LFT AND CORRESPONDING A.S.T.M. SPECIFICATIONS SHOWN IN THE CURRENT STANDARD SPECIFICATIONS.



3/8" TRUSS ROD ASSEMBLY

NOTES:

ALL CHAIN LINK FENCING MATERIALS SHALL BE: OF AN APPROVED DESIGN, MANUFACTURED OF STEEL, AND CONFORM TO THE REQUIREMENTS OF THE CURRENT STANDARD SPECIFICATIONS.

INTERMEDIATE BRACED POSTS SHALL BE PLACED AT 660' INTERVALS OR MIDWAY BETWEEN END OR CORNER POSTS WHEN DISTANCE IS LESS THAN 1320' AND MORE THAN 660'.

FENCE FABRIC SHALL BE SECURELY FASTENED TO TOP TENSION WIRE WITH FASTENERS SPACED NOT MORE THAN 1'-3" APART. IF HOG RINGS ARE USED FOR FABRIC FASTENERS, THEY SHALL BE 12-GAGE TIGHTLY CRIMPED ABOUT BOTH THE TENSION WIRE AND THE FABRIC WIRE OR 11-GAGE IF UNCRIMPED. FENCE FABRIC SHALL BE FASTENED TO THE POSTS USING METAL BANDS OR WIRES SPACED NOT MORE THAN 1'-0" APART. THE WIRE SHALL NOT BE LESS THAN 12-GAGE.

TENSION WIRE SHALL BE STRETCHED TAUT.

TOP AND BOTTOM SALVAGES OF FENCE FABRIC SHALL HAVE A KNUCKLED FINISH.

ALTERNATE POST SECTIONS MAY BE SUBMITTED FOR APPROVAL BY THE ENGINEER.

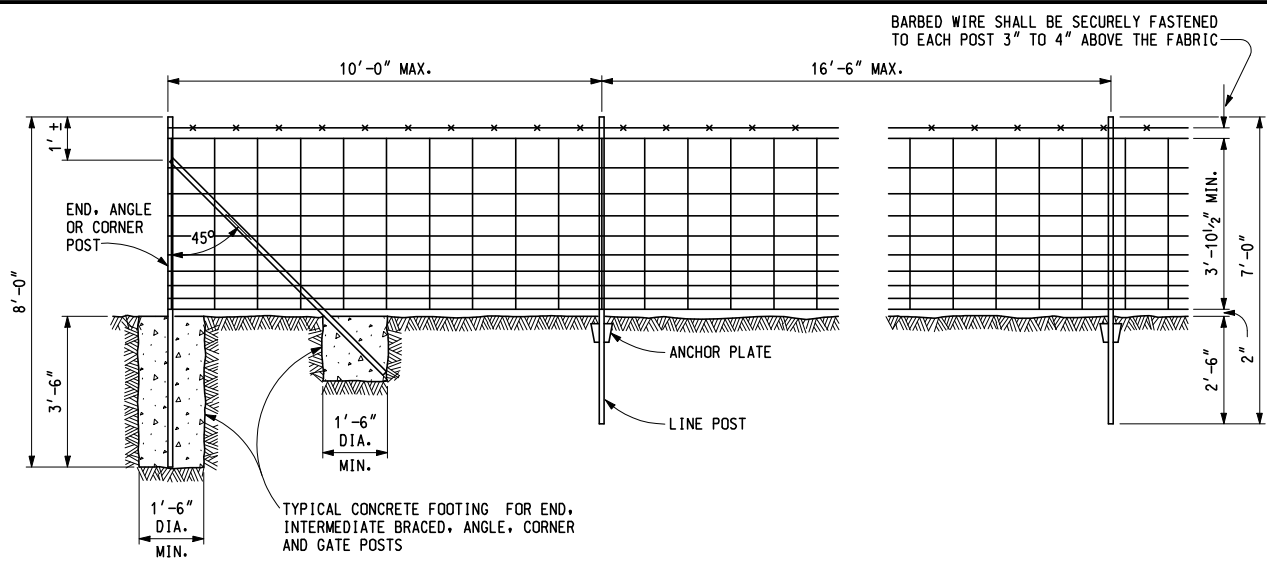
INTERMEDIATE LENGTHS OF FENCING LESS THAN (660') WITH VARIABLE HEIGHTS SHOULD BE AVOIDED IF POSSIBLE.

SIZE AND SHAPE REQUIREMENTS FOR CHAIN LINK FENCE POSTS			
USE FOR	FABRIC HEIGHT INCHES	SHAPE	* SIZE, INCHES NOMINAL (ACTUAL O.D.)
END, CORNER, ANGLE, INTERSECTION, AND INTERMEDIATE BRACED POSTS	120 OR LESS	PIPE	2 1/2 (2.875)
		ROLL-FORMED CORNER	3 1/2" X 3 1/2"
LINE POSTS	120 OR LESS	PIPE	2 (2.375)
		H-SECTION	1 7/8 X 1 5/8
		H-SECTION	2 1/4 X 1 45/64
		C-SECTION ROLLED-FORMED	2 1/4 X 1 5/8
	72 OR LESS	C-SECTION ROLLED-FORMED	1 7/8 X 1 5/8
	60 OR LESS	PIPE	1 1/2 (1.900)

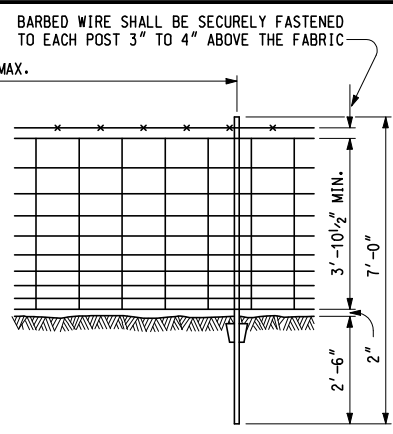
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY TECHNICAL SERVICES STANDARD PLAN FOR

CHAIN LINK FENCE
(USING TENSION WIRE)

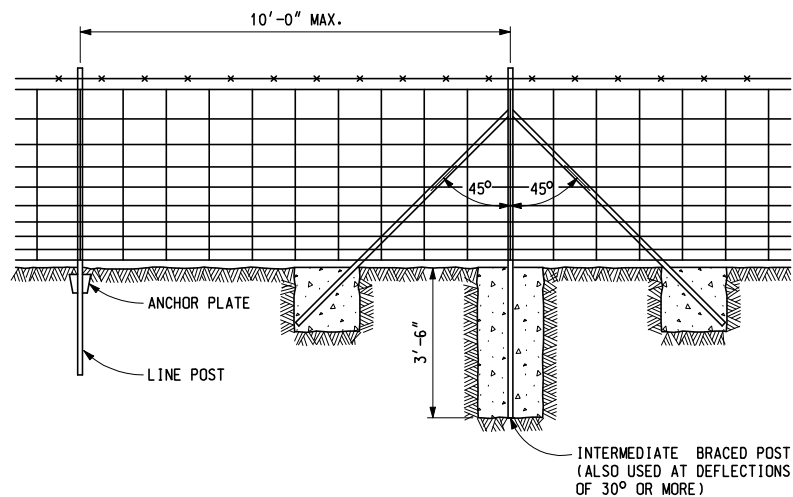
9-14-2001 F.H.W.A. APPROVAL	3-20-2001 PLAN DATE	R-98-B	SHEET 2 OF 2
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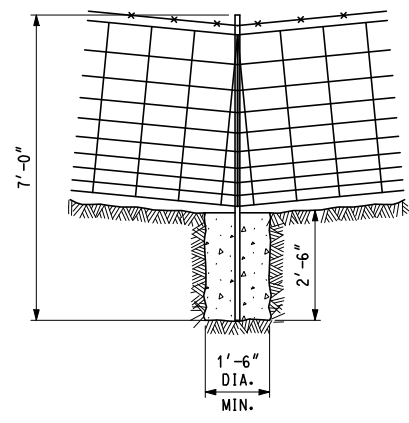
ANCHORING AND BRACING DETAILS FOR END, ANGLE AND CORNER POSTS



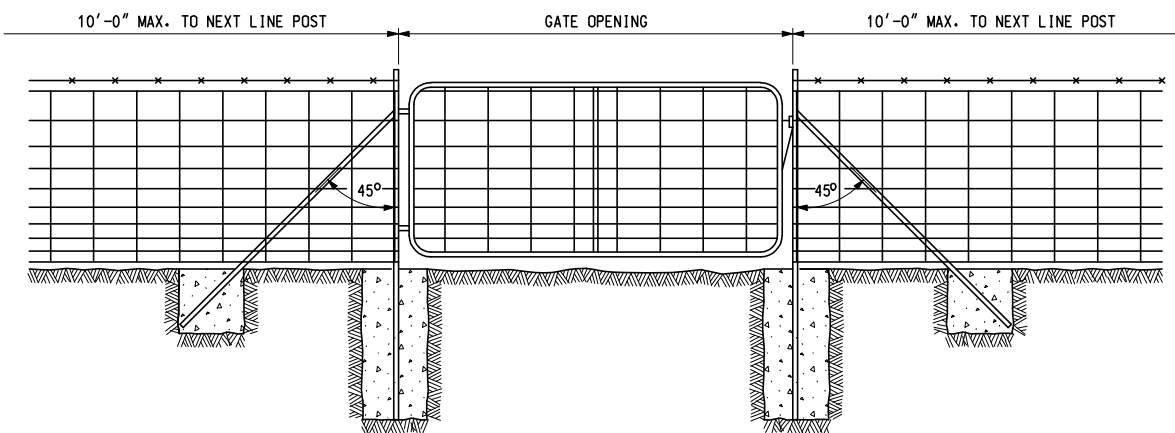
LINE POST



ANCHORING AND BRACING DETAILS FOR INTERMEDIATE BRACED, INTERSECTION AND ANGLE POSTS



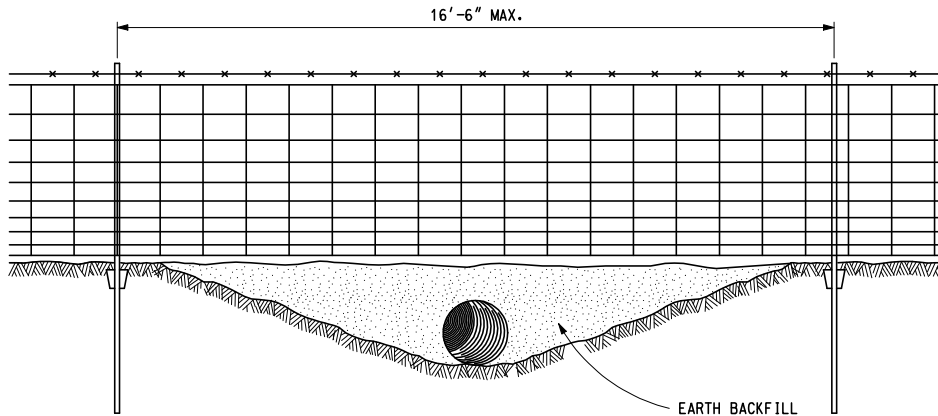
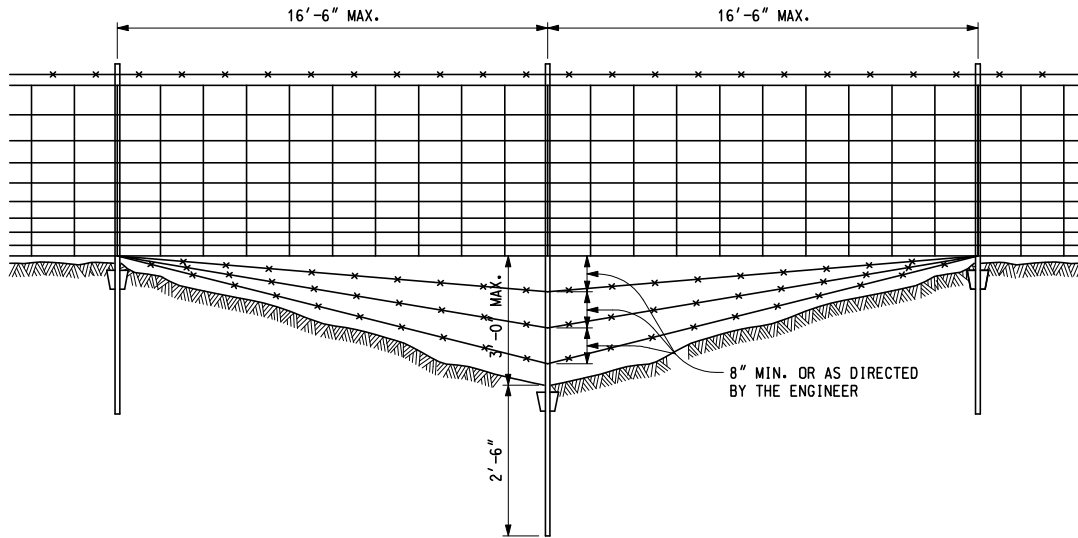
LINE POST IN DEPRESSION



ANCHORING AND BRACING DETAILS FOR GATE POSTS

WOVEN WIRE FENCE - STEEL POSTS

	 ENGINEER OF CONSTRUCTION & TECHNOLOGY	ENGINEER - ROAD DESIGN	MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAY TECHNICAL SERVICES STANDARD PLAN FOR		
	 ENGINEER OF MAINTENANCE	 ENGINEER OF DESIGN	WOVEN WIRE FENCE		
 ENGINEER OF TRAFFIC AND SAFETY	 DEPARTMENT DIRECTOR	9-14-2001 F.H.W.A. APPROVAL			
PREPARED BY DESIGN DIVISION	DRAWN BY: <u>B.L.T.</u> CHECKED BY: <u>W.K.P.</u>	BY: CHIEF ENGINEER/DEPUTY DIRECTOR BUREAU OF HIGHWAY TECHNICAL SERVICES	SHEET 1 OF 3		



DIAMETER AND LENGTH OF CULVERT TO BE AS SPECIFIED ON PLANS OR AS DIRECTED BY THE ENGINEER

SPANNING DEPRESSIONS

NOTES:

FENCING MATERIALS AND POST SIZES SHALL BE ACCORDING TO THE CURRENT STANDARD SPECIFICATIONS.

FABRIC SHALL BE ATTACHED TO EACH WOOD POST BY AT LEAST ONE STAPLE AT EACH HORIZONTAL STRAND. ATTACHMENT TO STEEL POSTS SHALL BE WITH A MINIMUM OF 6 WIRE CLAMPS.

INTERMEDIATE BRACED POSTS SHALL BE SPACED AT 660' INTERVALS OR MIDWAY BETWEEN END, CORNER OR ANGLE POSTS WHEN THIS DISTANCE IS LESS THAN 1320' AND MORE THAN 660'.

DRIVE GATES AND GATE POSTS OF COMMERCIAL GRADE MAY BE FURNISHED IN LIEU OF DRIVE GATE AND POST SPECIFIED WHEN APPROVED BY THE ENGINEER.

GATE POSTS SHALL HAVE AT LEAST ONE BRACE. THE CORNER AND INTERMEDIATE BRACED POSTS SHALL HAVE AT LEAST TWO BRACES. INTERSECTION POSTS SHALL HAVE THREE BRACES.

THE SINGLE STRAND OF BARBED WIRE ILLUSTRATED SHALL BE INSTALLED ONLY AS SPECIFIED ON THE PLANS OR AS DIRECTED BY THE ENGINEER.

TEMPORARY FENCE SHALL BE ERECTED AS SPECIFIED ON THIS STANDARD PLAN WITH THE FOLLOWING EXCEPTIONS:

1. CONCRETE WILL NOT BE REQUIRED TO ANCHOR POSTS.
2. LINE POSTS MAY BE SET A MINIMUM OF 2'-0", AND END POSTS A MINIMUM 3'-0" INTO GROUND.
3. TOPS OF WOOD POST NEED NOT BE TRIMMED AND INTERMEDIATE BRACED POSTS MAY BE OMITTED.
4. BARBED WIRE WILL NOT BE REQUIRED.
5. FABRIC SHALL BE ATTACHED TO WOOD POSTS BY AT LEAST ONE STAPLE AT EVERY THIRD STRAND, OR TO METAL POSTS WITH A MINIMUM OF FOUR WIRE CLAMPS.

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY TECHNICAL SERVICES STANDARD PLAN FOR

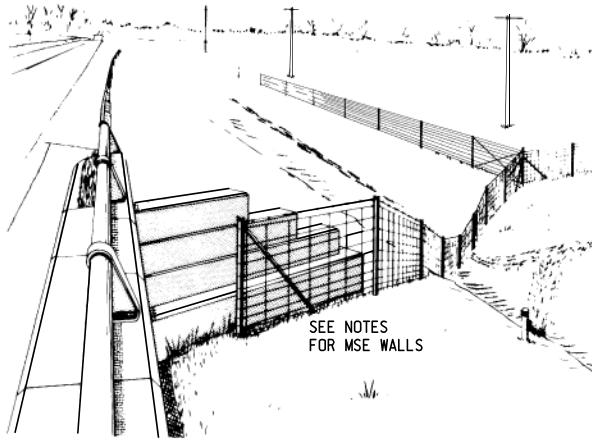
WOVEN WIRE FENCE

9-14-2001
F.H.W.A. APPROVAL

3-20-2001
PLAN DATE

R-101-B

SHEET
3 OF 3

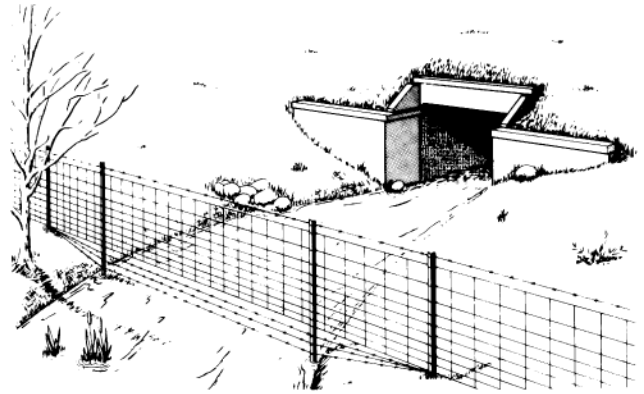


SEE NOTES FOR MSE WALLS

NOTE: FENCES TERMINATING AT STRUCTURES WILL HAVE A CLEARANCE OF NO MORE THAN 6". (TYPICAL)

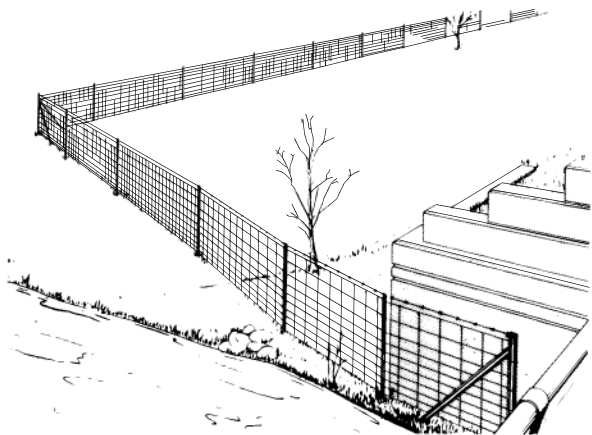
BRIDGES WITH SLOPE - WALLS

1



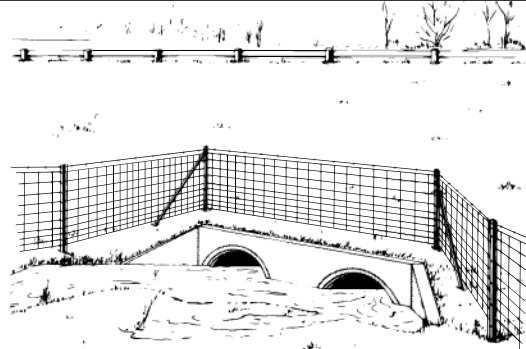
INSTALLATION AT DITCHES AND DRAINS WITH INTERMITTENT FLOW

4



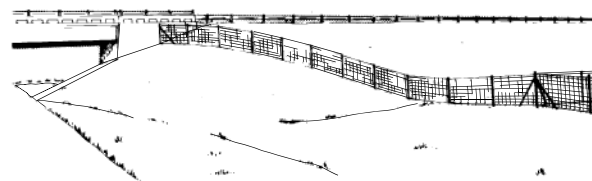
STREAM CROSSING

2



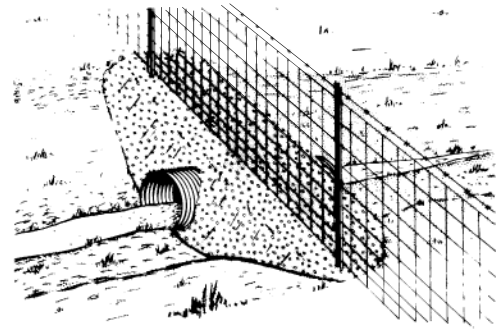
ALTERNATE TO DETAIL 4

5



BRIDGES WITH TURN BACK WINGWALLS

3



ALTERNATE TO DETAIL 4

6

NOTE: THIS TREATMENT REQUIRES R.O.W. AND PLAN QUANTITIES FOR ADDITIONAL ITEMS OF WORK INVOLVED.

NOTES:

THE INSTALLATION DETAIL APPLICABLE WILL BE PAID FOR AT THE CONTRACT UNIT PRICE FOR WOVEN WIRE FENCE EXCEPT AS NOTED.

WHEN TWIN BRIDGES DO NOT HAVE A COMMON ABUTMENT WALL ACROSS A MEDIAN AND THERE IS A POSSIBILITY OF LIVESTOCK GAINING ACCESS TO THE FREEWAY THROUGH THE WATERWAY OPENINGS, A FENCE SHOULD BE INSTALLED BETWEEN STRUCTURES ON BOTH SIDES OF THE CHANNEL.

ON LIMITED ACCESS HIGHWAYS WITH SPREAD ROADWAYS OVER CROSS-ROADS, FENCING SHOULD BE PROVIDED BETWEEN THE STRUCTURES ALONG THE CROSS-ROAD, TO CONTROL THE ACCESS BETWEEN THE STRUCTURES.

FOR MECHANICALLY STABILIZED EARTH (MSE) WALLS, TERMINATE THE FENCE AGAINST THE SIDE OF THE WALL OPPOSITE THE STABILIZED EARTH. DO NOT DRIVE POSTS IN MECHANICALLY STABILIZED EARTH.



PREPARED BY
DESIGN DIVISION

DRAWN BY: SCAN

CHECKED BY: W.K.P.

DEPARTMENT DIRECTOR
Paul C. Ajegba

APPROVED BY: Gregg Brunner, P.E. Gregg Brunner
Oct 14 2021 12:33 PM
DIRECTOR, BUREAU OF FIELD SERVICES

APPROVED BY: Bradley C. Wiefelrich Bradley C. Wiefelrich
Oct 14 2021 11:03 AM
DIRECTOR, BUREAU OF DEVELOPMENT

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

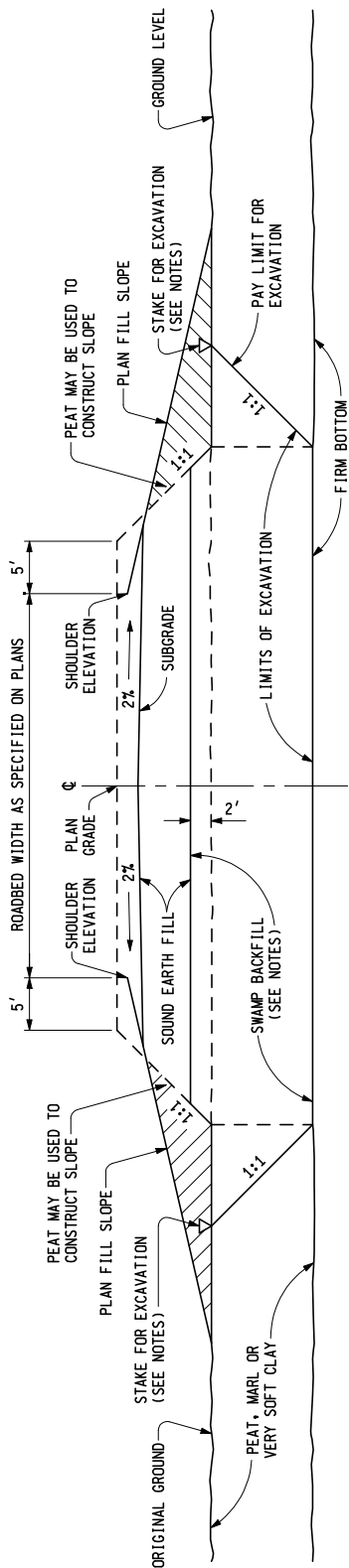
**INSTALLATION OF
WOVEN WIRE FENCE
(AT STRUCTURES)**

4-7-2022
F.H.W.A. APPROVAL

3-22-2021
PLAN DATE

R-102-C

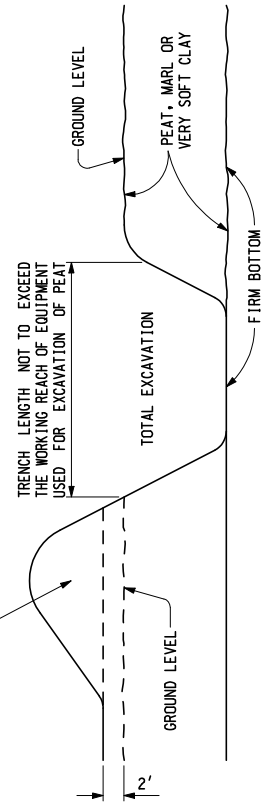
SHEET
1 OF 1



CROSS SECTION

EXCAVATION PAY LIMIT FOR BOTTOM TO BE DETERMINED BY MEASUREMENTS TAKEN AT TIME OF EXCAVATION.

WHERE THE MATERIAL TO BE EXCAVATED EXCEEDS 10' IN DEPTH, A 10' TEMPORARY SURCHARGE WILL BE REQUIRED. (TO BE MOVED FORWARD AS THE FILL PROGRESSES.) NOT REQUIRED WHERE EXCAVATION RESULTS IN A DRY TRENCH.



LONGITUDINAL SECTION

FILL TO BE CONSTRUCTED FULL WIDTH TO 2' ABOVE THE GROUND LEVEL, OR AS SPECIFIED ON PLANS, BY END DUMP METHOD AS EXCAVATION PROGRESSES. (EXCEPT AS INDICATED UNDER NOTES.)

THE BALANCE OF EMBANKMENT SHALL BE CONSTRUCTED ACCORDING TO THE "CONTROLLED DENSITY METHOD" FOR EMBANKMENT CONSTRUCTION.

METHOD A - 1
TOTAL EXCAVATION AND BACKFILL
(FOR SINGLE ROADWAYS)



PREPARED BY DESIGN DIVISION

DRAWN BY: B.L.T.

CHECKED BY: W.K.P.

DEPARTMENT DIRECTOR
Kirk T. Stuedle

APPROVED BY: *John C. Friend*
ENGINEER OF DELIVERY

APPROVED BY: *J.P. Roden*
ENGINEER OF DEVELOPMENT

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

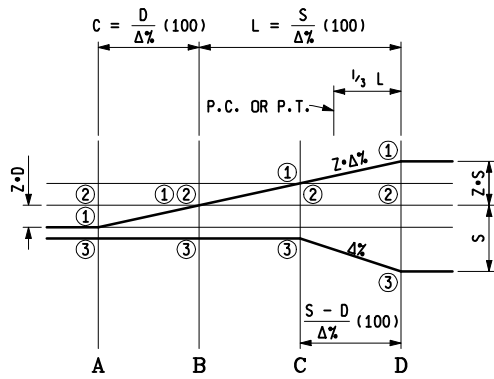
TREATMENT OF PEAT MARSHES

10-21-2008
F.H.W.A. APPROVAL

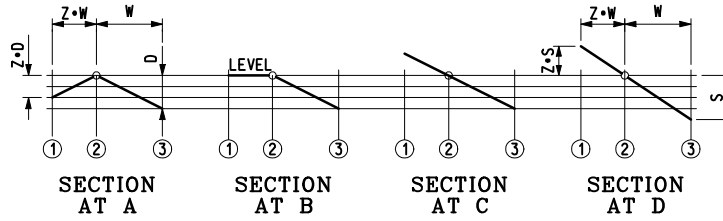
5-14-2008
PLAN DATE

R-103-C

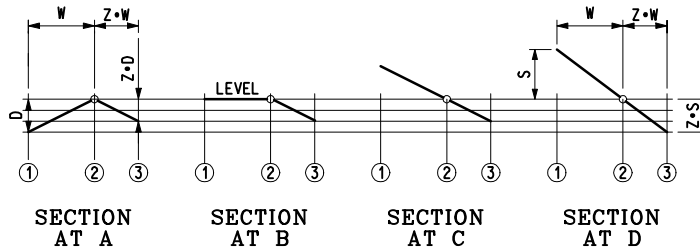
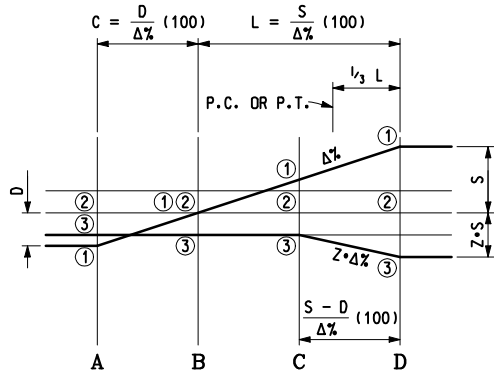
SHEET 1 OF 7



Z VALUES FOR UNSPIRALED TWO WAY ROADWAYS WITH AN ODD NUMBER OF LANES	
NUMBER OF LANES	Z
3	$\frac{1}{2}$
5	$\frac{2}{3}$
7	$\frac{3}{4}$



UNSPIRALED TWO WAY ROADWAY WITH ODD NUMBER OF LANES
(FARTHEST EDGE ON LOW SIDE)



UNSPIRALED TWO WAY ROADWAY WITH ODD NUMBER OF LANES
(FARTHEST EDGE ON HIGH SIDE)

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

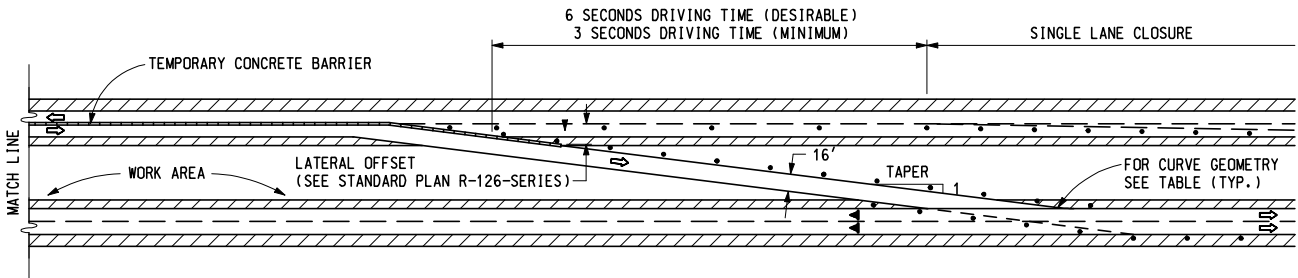
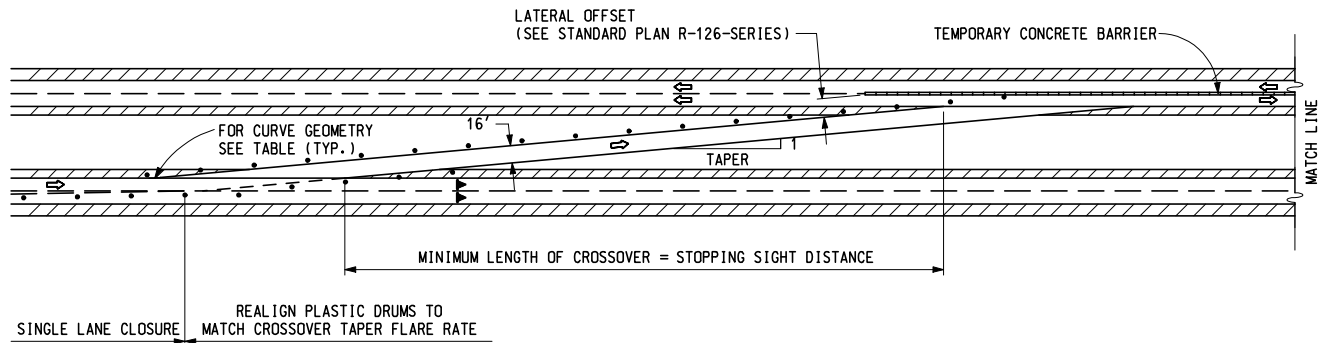
**SUPERELEVATION AND
PAVEMENT CROWNS**

9-10-2010
F.H.W.A. APPROVAL

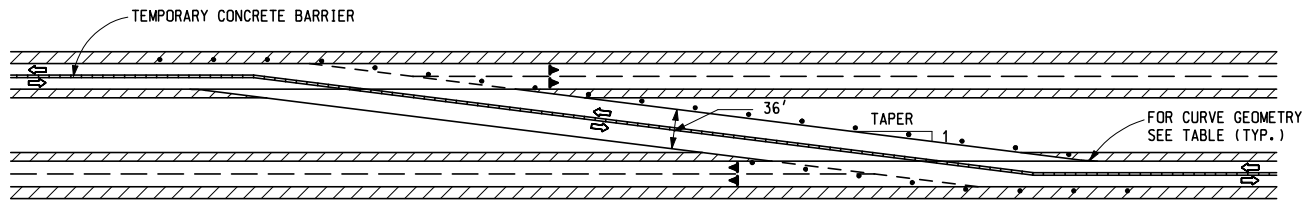
10-19-2009
PLAN DATE

R-107-H

SHEET
7 OF 7



ONE LANE CROSSOVER



TWO LANE, TWO - WAY CROSSOVER

LEGEND

- PLASTIC DRUM
- ▶ TYPE III BARRICADE

CROSSOVER TAPER GEOMETRY		
DESIGN SPEED (MPH)	MAXIMUM DEFLECTION (TAPER)	MINIMUM RADIUS (FEET)
30	8 : 1	955
40	11 : 1	1910
50	14 : 1	2865
60	17 : 1	3370
70	20 : 1	3820

NOTES:

CROSSOVERS SHALL BE LOCATED TO PROVIDE THE MAXIMUM ADVANCE WARNING TO THE DRIVER BASED ON THE VERTICAL AND HORIZONTAL ALIGNMENTS AT THE SITE.

VEHICLES MUST BE PROTECTED FROM THE BLUNT END OF BARRIERS. PREFERABLY, CONNECT THE TEMPORARY CONCRETE BARRIER TO THE EXISTING MEDIAN BARRIER OR PLACE AS SPECIFIED ON STANDARD PLAN R-126-SERIES.

ON A TWO-WAY CROSSOVER, A TAPER FLATTER THAN SPECIFIED IN THE TABLE IS TO BE USED IF PRACTICAL.

THE MAXIMUM DEFLECTION (TAPER) SHALL BE DETERMINED FROM THE TABLE AS A FUNCTION OF SPEED.

SUPERELEVATION IS NOT REQUIRED FOR THE SPEEDS AND RADII OF THE CURVES GIVEN.

IN WIDE MEDIANS, ALIGNMENT MAY BE DESIGNED INTO THE CROSSOVER TO SHORTEN ITS LENGTH SUBJECT TO THE MINIMUM RADIUS SPECIFIED, WITH THE APPROVAL OF THE ENGINEER. ANY PROPOSED RADIUS WHICH IS LESS THAN THAT SPECIFIED IN THE TABLE SHALL BE REVIEWED BY THE TRAFFIC AND SAFETY SUPPORT AREA FOR DESIGN FEATURES SUCH AS SUPERELEVATION, DEFLECTION, AND REVERSE ALIGNMENT.

PLASTIC DRUMS SHALL BE OFFSET FROM THE LINE OF TRAVEL 2'-0" MINIMUM. THEY MAY BE ALIGNED BY EYE.

TRAFFIC CONTROL DEVICES AND PAVEMENT MARKINGS SHALL BE ACCORDING TO THE "MICHIGAN MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES".

FOR STOPPING SIGHT DISTANCE, REFER TO THE CURRENT EDITION OF THE AASHTO PUBLICATION "A POLICY ON GEOMETRIC DESIGN OF HIGHWAY AND STREETS."

FOR SPECIFIC CHANNELIZATION TREATMENTS, SEE THE TRAFFIC AND SAFETY SUPPORT AREA.

THE MINIMUM DESIGN SPEED FOR CROSSOVERS SHOULD BE 10 MPH BELOW THE POSTED SPEED PRIOR TO CONSTRUCTION, UNLESS UNUSUAL SITE CONDITIONS REQUIRE THAT A LOWER DESIGN SPEED BE USED.



David W. Brui
ENGINEER OF CONSTRUCTION & TECHNOLOGY

Carol A. Roberts
ENGINEER OF DESIGN SUPPORT AREA

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

PREPARED BY
DESIGN
SUPPORT AREA

Calvin Roberts
ENGINEER OF MAINTENANCE

DEPARTMENT DIRECTOR
Gloria J. Jeff

**TEMPORARY CROSSOVERS
FOR DIVIDED ROADWAYS**

DRAWN BY: B.L.T.

James D. Culp
ENGINEER OF TRAFFIC AND SAFETY

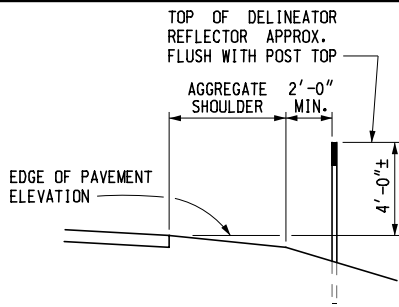
J.P. Platt
ENGINEER OF DEVELOPMENT

10-27-2004
F.H.W.A. APPROVAL

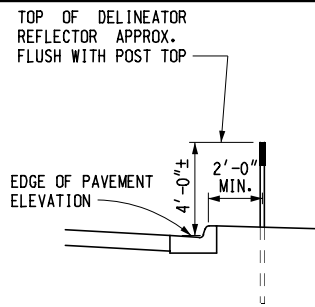
4-16-2004
PLAN DATE

R-113-C

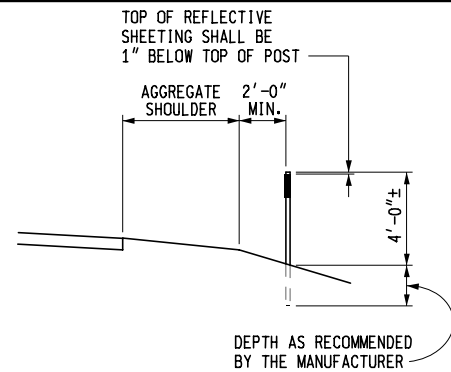
SHEET
1 OF 2



SHOULDER

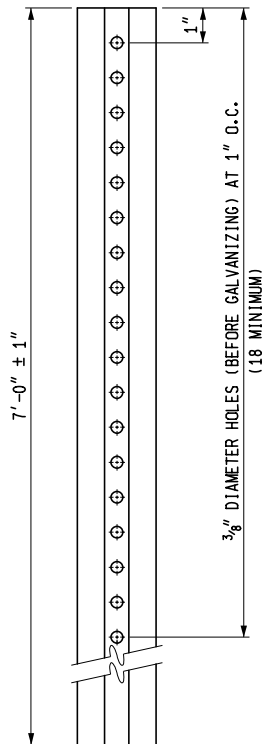


CURB



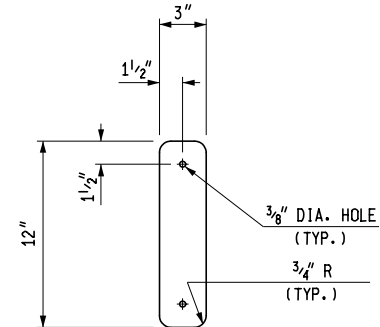
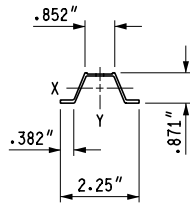
INSTALLATION OF REFLECTIVE SHEETING ON FLEXIBLE POST

INSTALLATION OF DELINEATOR REFLECTORS ON RIGID STEEL POST



NOMINAL WEIGHT = 1.12 LBS/FT
 MINIMUM MOMENT OF INERTIA ABOUT X-X AXIS = 0.031 in.⁴

RIGID STEEL POST DETAIL



DELINEATOR REFLECTOR DETAIL

NOTES:

DELINEATORS 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. DELINEATORS INSTALLED ON FLEXIBLE POSTS SHALL NOT BE PLACED BEHIND GUARDRAIL.

FLEXIBLE POST DELINEATORS 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 RAMP, WHITE DELINEATORS SHALL BE PLACED ON THE RIGHT AND YELLOW DELINEATORS SHALL ALSO BE PLACED ON THE LEFT FOR A RIGHT-CURVING RAMP WITH A RADIUS OF 1000' OR LESS.

WHERE DELINEATION ON ONE SIDE OF THE ROADWAY OR RAMP ENDS AND DELINEATION ON THE OTHER SIDE APPEARS, AN OVERLAP OF TWO DELINEATOR INSTALLATIONS SHALL BE USED.

RED DELINEATORS SHALL BE LOCATED ON THE BACK OF RAMP DELINEATORS TO FACE WRONG-WAY TRAFFIC MOVEMENTS. PLACEMENT SHALL START AT RAMP TERMINAL AND END 1/4 MILE IN ADVANCE OF THE DECELERATION LANE.

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

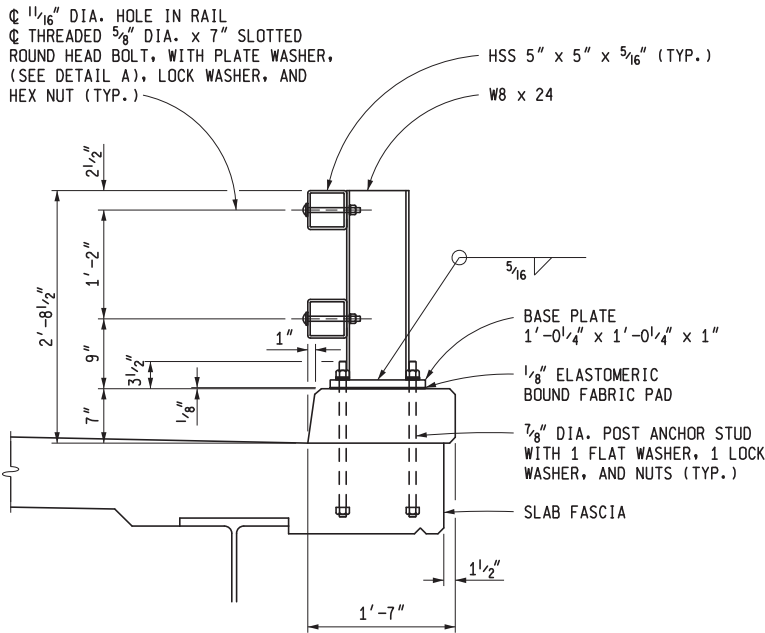
DELINEATOR PLACEMENT SHOULD CONTINUE WHERE GUARDRAIL OR CONCRETE BARRIER IS PRESENT. DO NOT PLACE DELINEATORS BEHIND GUARDRAIL APPROACH TERMINALS EXCEPT AS SHOWN ON SHEET 6 OF THIS STANDARD. IF TERRAIN OR OTHER FACTORS PROHIBIT POST MOUNTED DELINEATOR PLACEMENT, INSTALLATION OF GUARDRAIL OR BARRIER MOUNTED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

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

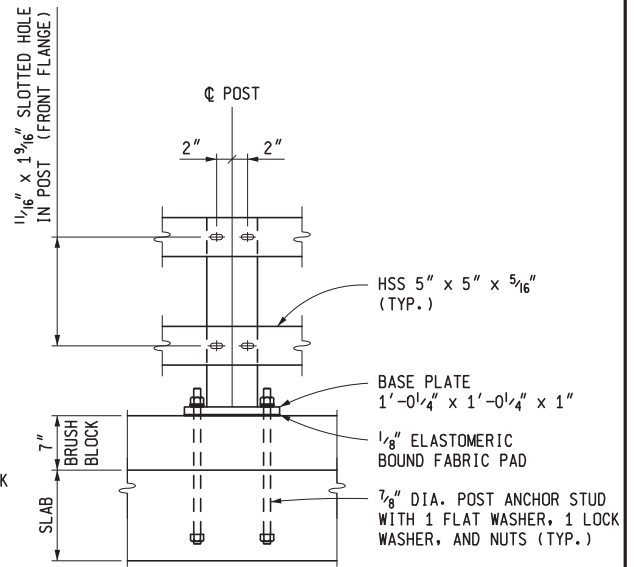
MICHIGAN DEPARTMENT OF TRANSPORTATION
 BUREAU OF DEVELOPMENT STANDARD PLAN FOR

DELINEATOR INSTALLATIONS

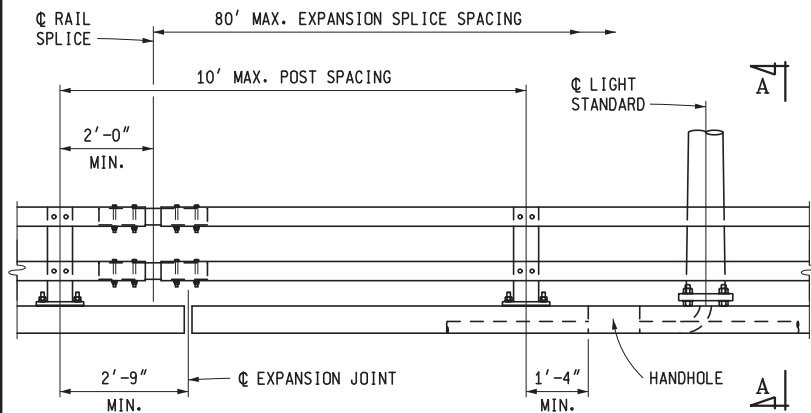
5-18-2020 F.H.W.A. APPROVAL	3-4-2019 PLAN DATE	R-127-G	SHEET 8 OF 8
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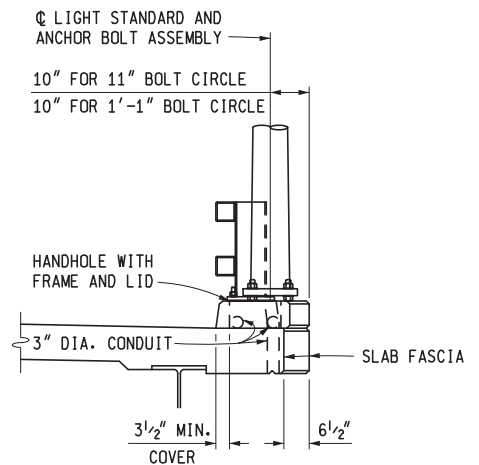
SECTION THROUGH
BRUSH BLOCK AND RAILING



POST ELEVATION



RAILING ELEVATION



SECTION A-A

MDOT
Michigan Department of Transportation

PREPARED BY
DESIGN DIVISION

DRAWN BY: B.L.T.

CHECKED BY: V.Z.

DEPARTMENT DIRECTOR
Kirk T. Stuedle

Randel R. Van Portfliet
APPROVED BY: DIRECTOR, BUREAU OF FIELD SERVICES

Bradley C. Wiefelrich
APPROVED BY: DIRECTOR, BUREAU OF DEVELOPMENT

Digitally signed by Randel R. Van Portfliet
DN: cn=Randel R. Van Portfliet, o=Michigan
Department of Transportation, ou=Director,
Bureau of Field Services/Superior Region Engineer,
email=vportfliet@michigan.gov, c=US
Date: 2015.12.10 14:02:16 -0500

Digitally signed by Bradley C. Wiefelrich
DN: cn=Bradley C. Wiefelrich, o=Michigan
Department of Transportation, ou=Design
Division, email=wiefelrich@michigan.gov, c=US
Date: 2015.12.10 13:25:45 -0500

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

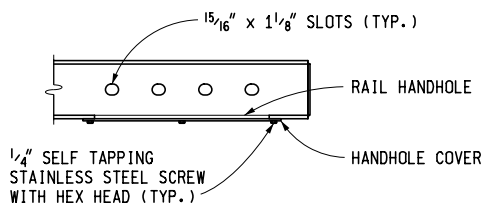
BRIDGE RAILING, 2 TUBE

5-20-2016
F.H.W.A. APPROVAL

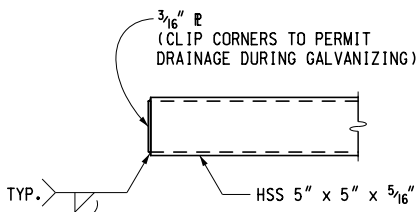
11-20-2015
PLAN DATE

B-21-J

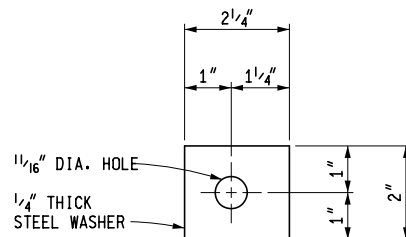
SHEET
1 OF 4



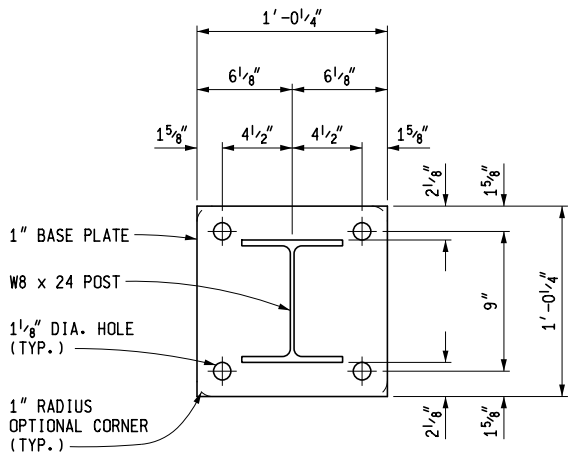
END OF RAIL SECTION



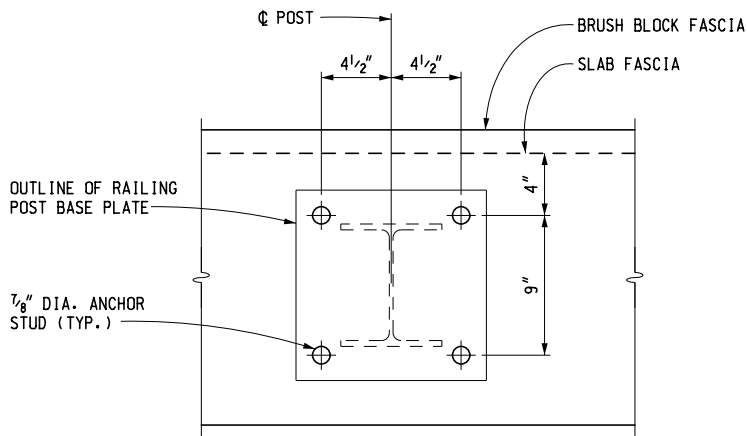
END OF RAIL



DETAIL A

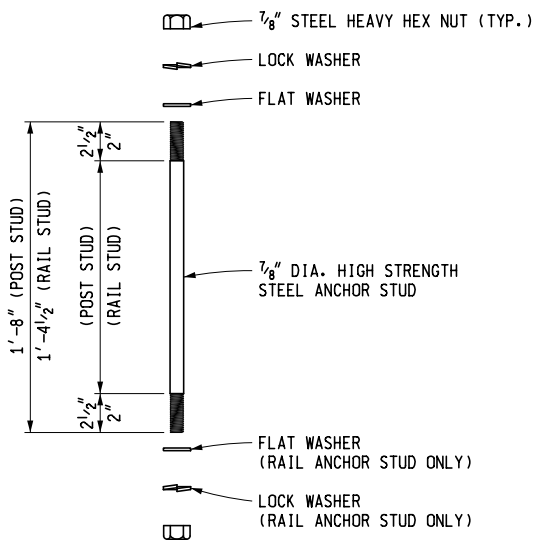


BASE PLATE DETAIL



ANCHOR STUD LAYOUT

NOTE: SURFACE UNDER POST IS TO BE FINISHED LEVEL



ANCHOR STUD DETAIL

NOTES:

DETAILS SHOWN ARE IN ACCORDANCE WITH CURRENT AASHTO SPECIFICATIONS. ALL WORK AND MATERIAL SHALL BE IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS.

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

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

FENCING MAY BE ATTACHED TO THE NON-TRAFFIC SIDE OF THE 2 TUBE RAILING TO PROTECT PEDESTRIANS.

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

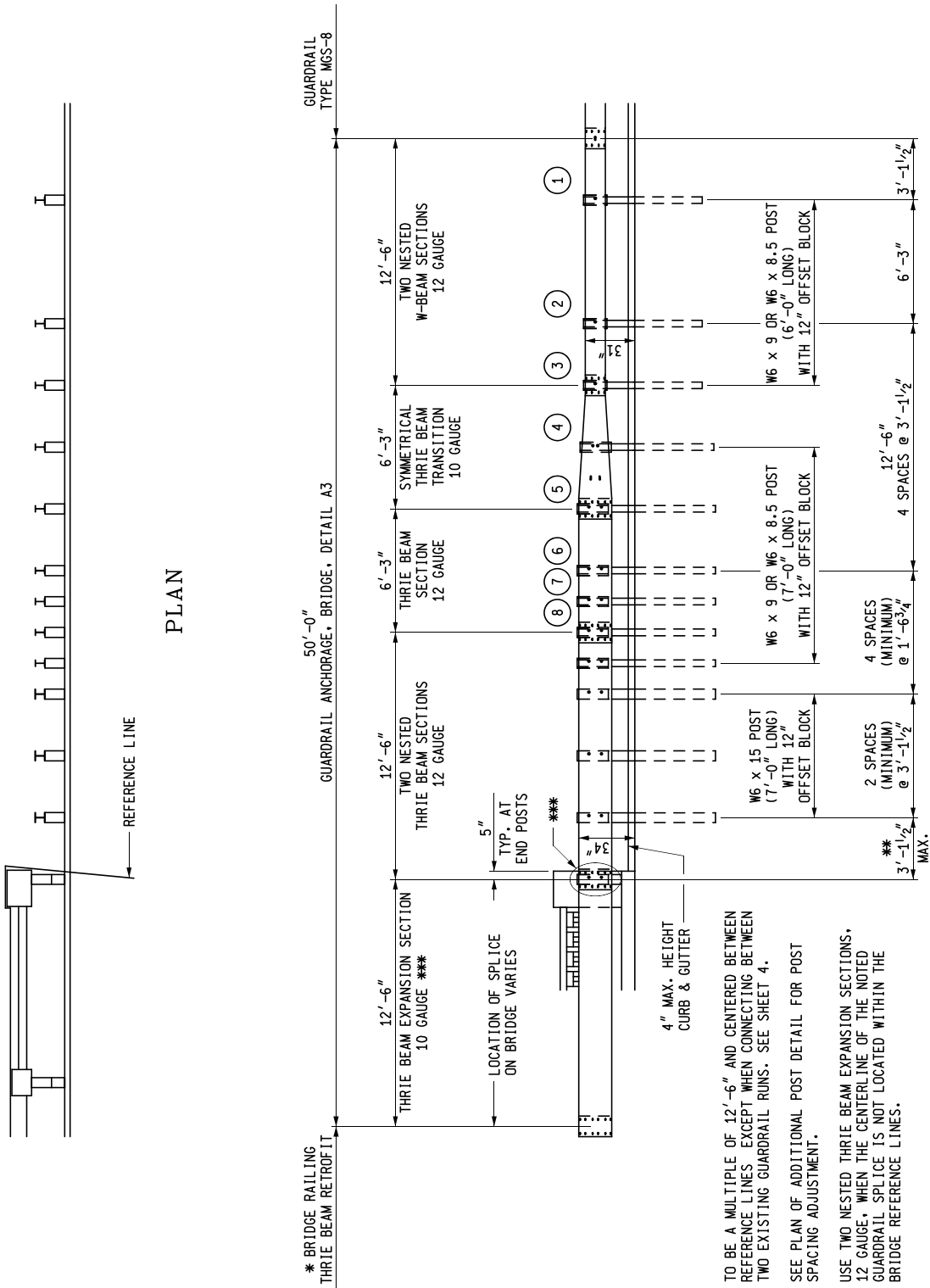
BRIDGE RAILING, 2 TUBE

5-20-2016
F.H.W.A. APPROVAL

11-20-2015
PLAN DATE

B-21-J

SHEET
4 OF 4



PLAN

ELEVATION

DETAILS FOR CONNECTING GUARDRAIL TYPE MGS-8 TO BRIDGE RAILING, THRIE BEAM RETROFIT

* BRIDGE RAILING THRIE BEAM RETROFIT

* TO BE A MULTIPLE OF 12'-6" AND CENTERED BETWEEN REFERENCE LINES. EXCEPT WHEN CONNECTING BETWEEN TWO EXISTING GUARDRAIL RUNS. SEE SHEET 4.

** SEE PLAN OF ADDITIONAL POST DETAIL FOR POST SPACING ADJUSTMENT.

*** USE TWO NESTED THRIE BEAM EXPANSION SECTIONS, 12 GAUGE, WHEN THE CENTERLINE OF THE NOTED GUARDRAIL SPLICE IS NOT LOCATED WITHIN THE BRIDGE REFERENCE LINES.



PREPARED BY DESIGN DIVISION

DRAWN BY: B.L.T.

CHECKED BY: V.Z.

DEPARTMENT DIRECTOR Paul C. Ajegba

APPROVED BY: Matthew J. Chynoweth, P.E. Oct 14 2021 4:27 PM DIRECTOR, BUREAU OF BRIDGES AND STRUCTURES

APPROVED BY: Gregg Brunner, P.E. Oct 14 2021 12:29 PM DIRECTOR, BUREAU OF FIELD SERVICES

APPROVED BY: Bradley C. Wiefelrich Oct 14 2021 10:58 AM DIRECTOR, BUREAU OF DEVELOPMENT

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF DEVELOPMENT STANDARD PLAN FOR

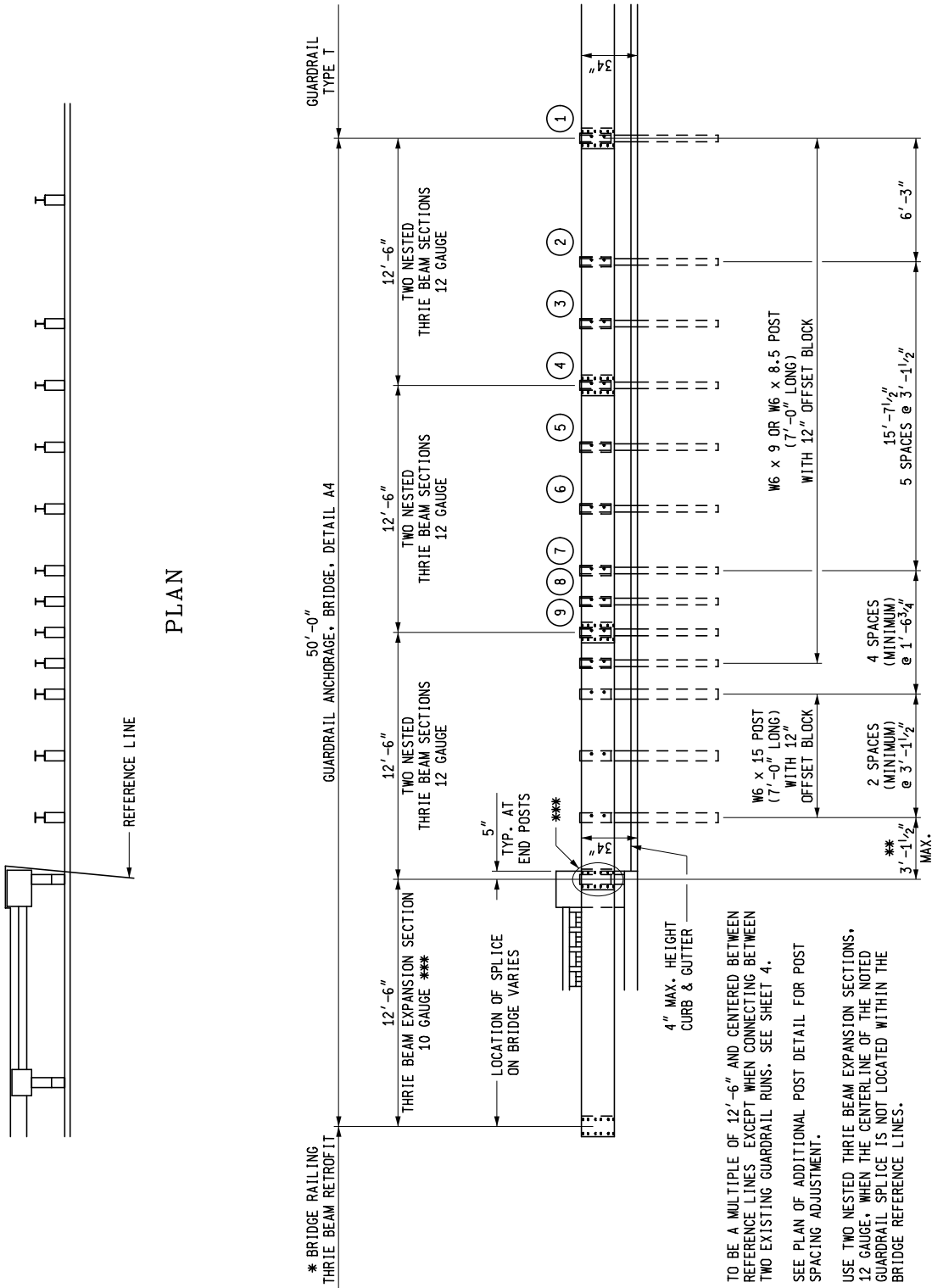
BRIDGE RAILING, THRIE BEAM RETROFIT (R4 TYPE BRIDGE RAILING)

4-7-2022 F.H.W.A. APPROVAL

10-23-2019 PLAN DATE

B-22-E

SHEET 1 OF 5



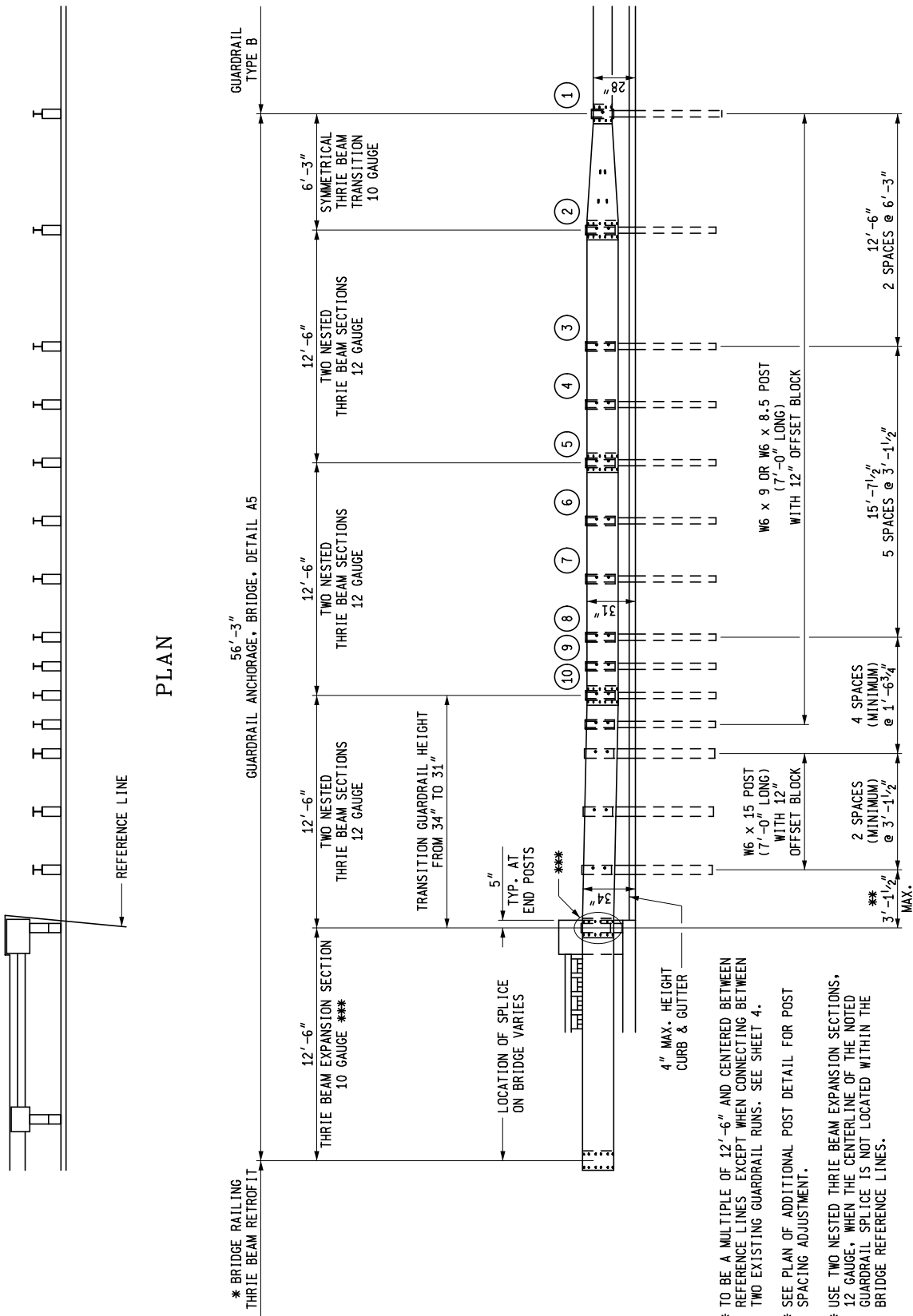
* TO BE A MULTIPLE OF 12'-6" AND CENTERED BETWEEN REFERENCE LINES EXCEPT WHEN CONNECTING BETWEEN TWO EXISTING GUARDRAIL RUNS. SEE SHEET 4.

** SEE PLAN OF ADDITIONAL POST DETAIL FOR POST SPACING ADJUSTMENT.

*** USE TWO NESTED THRIE BEAM EXPANSION SECTIONS, 12 GAUGE, WHEN THE CENTERLINE OF THE NOTED GUARDRAIL SPLICE IS NOT LOCATED WITHIN THE BRIDGE REFERENCE LINES.

DETAILS FOR CONNECTING GUARDRAIL TYPE T TO BRIDGE RAILING, THRIE BEAM RETROFIT

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF DEVELOPMENT STANDARD PLAN FOR		
BRIDGE RAILING, THRIE BEAM RETROFIT		
(R4 TYPE BRIDGE RAILING)		
4-7-2022 F.H.W.A. APPROVAL	10-23-2019 PLAN DATE	B-22-E
		SHEET 2 OF 5



PLAN

ELEVATION

DETAILS FOR CONNECTING GUARDRAIL TYPE B TO BRIDGE RAILING, THRIE BEAM RETROFIT

56'-3" GUARDRAIL ANCHORAGE, BRIDGE, DETAIL A5

* BRIDGE RAILING THRIE BEAM RETROFIT

GUARDRAIL TYPE B

REFERENCE LINE

12'-6" THRIE BEAM EXPANSION SECTION 10 GAUGE ***

12'-6" TWO NESTED THRIE BEAM SECTIONS 12 GAUGE

12'-6" TWO NESTED THRIE BEAM SECTIONS 12 GAUGE

12'-6" TWO NESTED THRIE BEAM SECTIONS 12 GAUGE

6'-3" SYMMETRICAL THRIE BEAM TRANSITION 10 GAUGE

TRANSITION GUARDRAIL HEIGHT FROM 34" TO 31"

5" TYP. AT END POSTS

LOCATION OF SPLICE ON BRIDGE VARIES

4" MAX. HEIGHT CURB & GUTTER

* TO BE A MULTIPLE OF 12'-6" AND CENTERED BETWEEN REFERENCE LINES. EXCEPT WHEN CONNECTING BETWEEN TWO EXISTING GUARDRAIL RUNS. SEE SHEET 4.

** SEE PLAN OF ADDITIONAL POST DETAIL FOR POST SPACING ADJUSTMENT.

*** USE TWO NESTED THRIE BEAM EXPANSION SECTIONS, 12 GAUGE, WHEN THE CENTERLINE OF THE NOTED GUARDRAIL SPLICE IS NOT LOCATED WITHIN THE BRIDGE REFERENCE LINES.

W6 x 9 OR W6 x 8.5 POST (7'-0" LONG) WITH 12" OFFSET BLOCK

W6 x 15 POST (7'-0" LONG) WITH 12" OFFSET BLOCK

4 SPACES (MINIMUM) @ 1'-6 3/4"

2 SPACES (MINIMUM) @ 3'-1 1/2"

5 SPACES @ 3'-1 1/2" MAX.

2 SPACES @ 6'-3"

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

BRIDGE RAILING,
THRIE BEAM RETROFIT
(R4 TYPE BRIDGE RAILING)

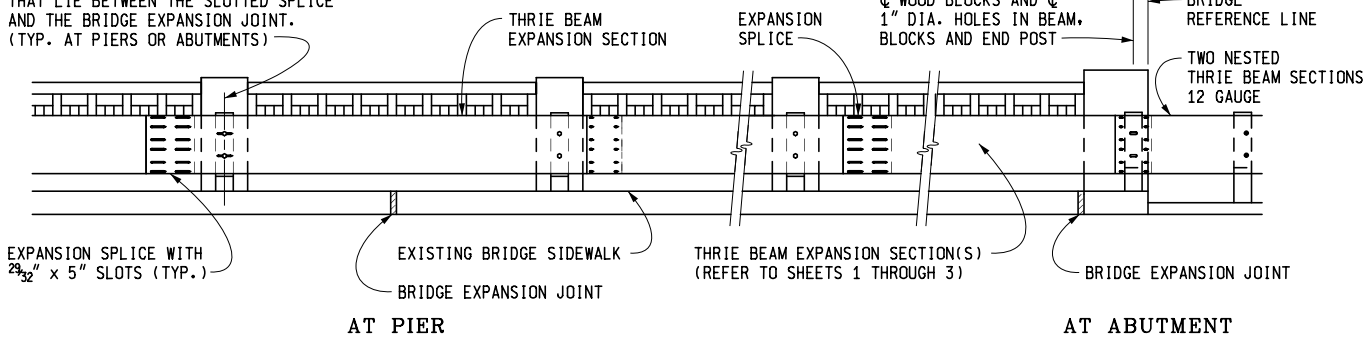
4-7-2022
F.H.W.A. APPROVAL

10-23-2019
PLAN DATE

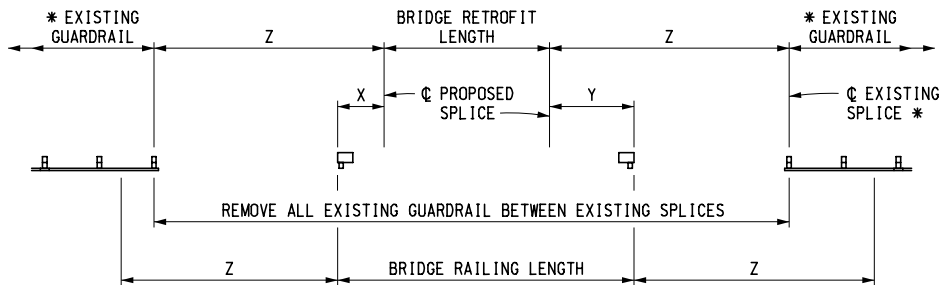
B-22-E

SHEET
3 OF 5

PLACE 1" x 5" SLOTS FOR POST STUDS IN THRIE BEAM EXPANSION SECTION AT POSTS THAT LIE BETWEEN THE SLOTTED SPLICE AND THE BRIDGE EXPANSION JOINT. (TYP. AT PIERS OR ABUTMENTS)



ELEVATION SHOWING THRIE BEAM RETROFIT OVER BRIDGE EXPANSION JOINTS



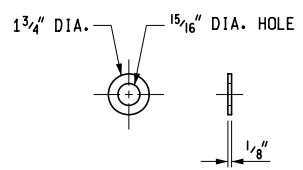
* GUARDRAIL TYPE B OR TYPE T WITH 6'-3" POST SPACING DEPICTED IN DIAGRAM. SPLICE LOCATION WILL BE LOCATED AT MIDSPAN BETWEEN POSTS WITH GUARDRAIL TYPE MGS-8 AND A 6'-3" POST SPACING.

Z = 50'-0" WHEN CONNECTING TO BEAM GUARDRAIL, TYPE MGS-8. USE GUARDRAIL ANCHORAGE, BRIDGE, DETAIL A3
 Z = 50'-0" WHEN CONNECTING TO BEAM GUARDRAIL, TYPE T. USE GUARDRAIL ANCHORAGE, BRIDGE, DETAIL A4
 Z = 56'-3" WHEN CONNECTING TO BEAM GUARDRAIL, TYPE B. USE GUARDRAIL ANCHORAGE, BRIDGE, DETAIL A5

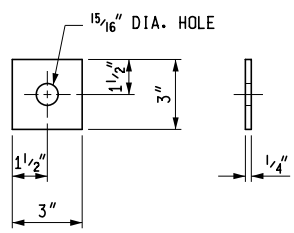
SKETCH FOR RETROFITTING BETWEEN TWO EXISTING RUNS OF GUARDRAIL

INSTRUCTIONS FOR LAYING OUT RETROFIT BETWEEN TWO EXISTING RUNS OF GUARDRAIL

1. MEASURE THE APPROPRIATE "Z" DISTANCE FROM ONE END OF THE BRIDGE RAILING AND LOCATE THE FIRST EXISTING SPLICE BACK TOWARD THE BRIDGE.
2. FROM THIS SPLICE, MEASURE THE SAME "Z" DISTANCE BACK TOWARD THE BRIDGE TO OBTAIN THE "X" DIMENSION. THIS DIMENSION WILL VARY FROM 0 TO 12'-6".
3. REPEAT STEPS 1 AND 2, FROM OPPOSITE END OF THE BRIDGE TO OBTAIN "Y" DIMENSION.
4. SUBTRACT THE SUM OF "X" + "Y" FROM BRIDGE RAILING LENGTH. THIS WILL BE THE BRIDGE RETROFIT LENGTH.
5. DIVIDE THE BRIDGE RETROFIT LENGTH BY 12'-6" TO OBTAIN THE NUMBER OF BEAM ELEMENTS PLUS A REMAINDER. THE REMAINDER WILL BE THE LENGTH OF A SHORTENED ELEMENT.
6. WHEN THE REMAINDER IS LESS THAN 2'-6", ADD 12'-6" TO THE REMAINDER AND DIVIDE BY TWO. THE BRIDGE RETROFIT WILL CONTAIN TWO SHORTENED BEAM ELEMENTS WITH ONE LESS 12'-6" BEAM ELEMENT THAN CALCULATED IN STEP 5.

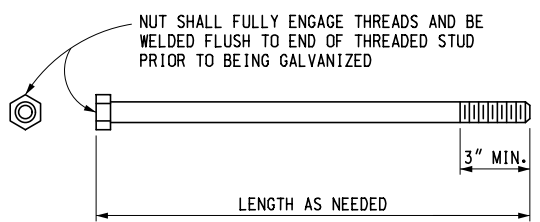


ROUND WASHER



SQUARE WASHER

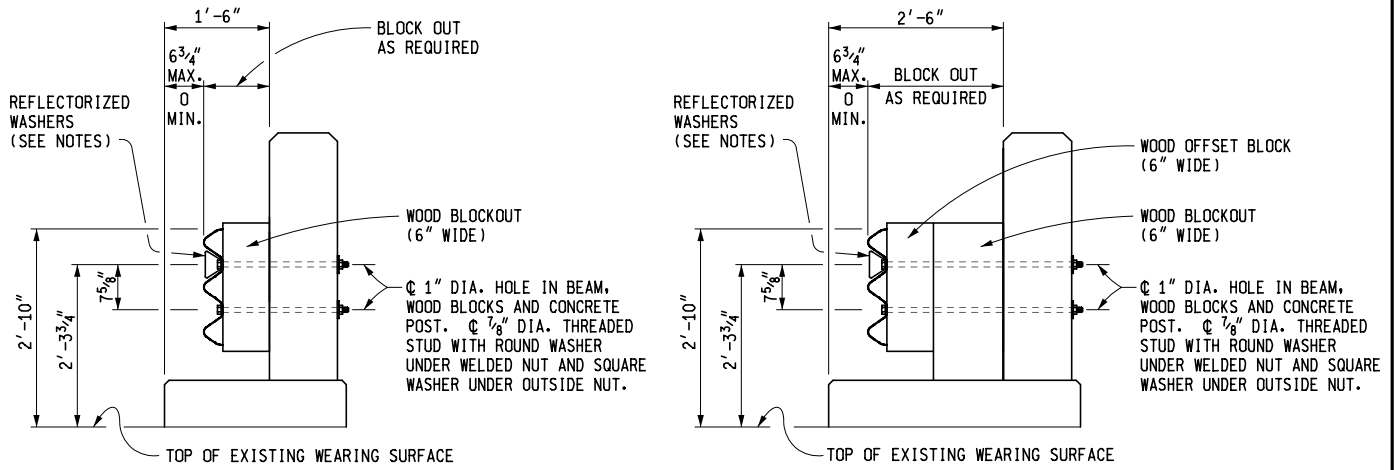
WASHERS USED WITH 7/8" DIA. STUDS



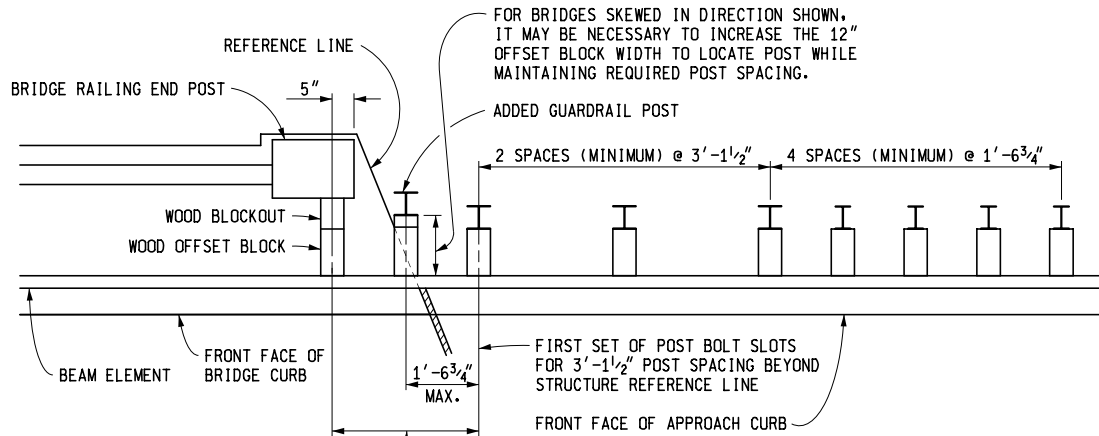
7/8" DIA. THREADED STUD

MICHIGAN DEPARTMENT OF TRANSPORTATION
 BUREAU OF DEVELOPMENT STANDARD PLAN FOR
**BRIDGE RAILING,
 THRIE BEAM RETROFIT**
 (R4 TYPE BRIDGE RAILING)

4-7-2022 F.H.W.A. APPROVAL	10-23-2019 PLAN DATE	B-22-E	SHEET 4 OF 5
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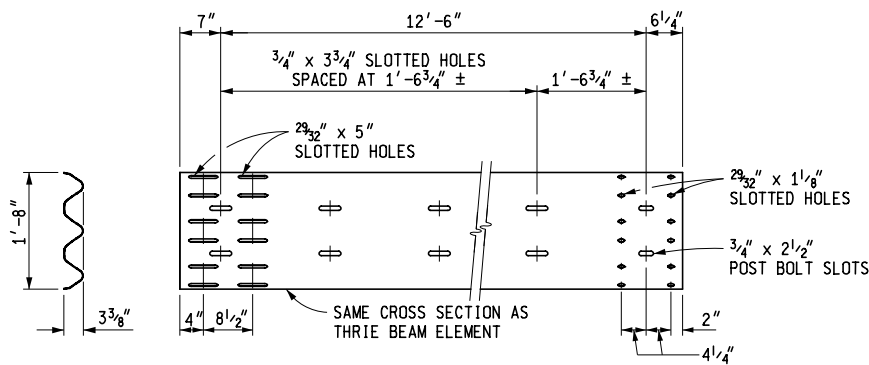


SECTIONS THRU R4 RAILING



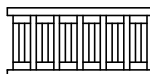
WHEN THIS DISTANCE EXCEEDS 3'-1 1/2", DRILL ADDITIONAL HOLES FOR POST BOLTS IN BEAM ELEMENT AND PLACE AN ADDITIONAL POST, BLOCK AND OFFSET BLOCK (AS SHOWN) IMMEDIATELY ADJACENT TO STRUCTURE

PLAN OF ADDITIONAL POST DETAIL



THRIE BEAM EXPANSION SECTION

NOTE:



R4 TYPE BRIDGE RAILINGS CAN BE IDENTIFIED AS HAVING CONCRETE POSTS AND REMOVABLE METAL PANELS WITH GRIDS OF THIS PATTERN.

NOTES:

THIS STANDARD IS INTENDED FOR USE IN UPGRADING OF EXISTING R4 TYPE BRIDGE RAILINGS AND APPROACH GUARDRAIL.

BRIDGE RAILING, THRIE BEAM RETROFIT AND GUARDRAIL ANCHORAGES SHALL CONFORM TO THE CURRENT STANDARD PLAN R-60-SERIES, WHERE APPLICABLE, EXCEPT AS SHOWN ON THIS PLAN.

ALL WORK AND MATERIAL SHALL BE IN ACCORDANCE WITH SECTIONS 807 & 908 OF THE STANDARD SPECIFICATIONS.

REFLECTORIZED WASHERS SHALL BE SPACED AT 25'-0" INTERVALS AT BEAM ELEMENT SPLICES. THEY SHALL BE ATTACHED AT UPPER POST BOLT SLOTS WITH STANDARD SPLICE BOLTS.

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

**BRIDGE RAILING,
THRIE BEAM RETROFIT
(R4 TYPE BRIDGE RAILING)**

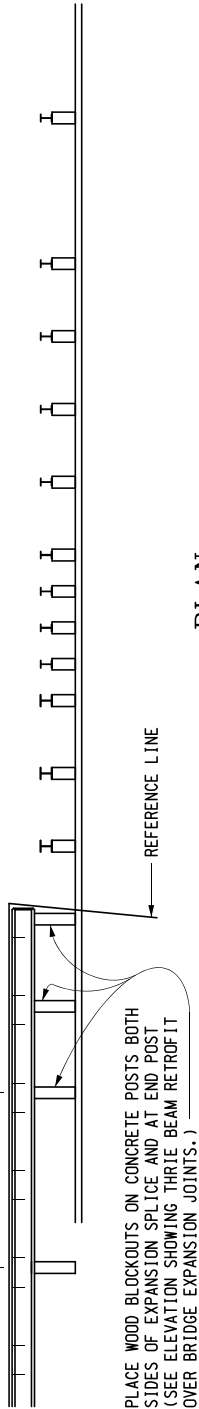
4-7-2022
F.H.W.A. APPROVAL

10-23-2019
PLAN DATE

B-22-E

SHEET
5 OF 5

SPACE WOOD BLOCKOUTS AT ALTERNATE CONCRETE POSTS (CONCRETE HEADWALL - SEE NOTES)



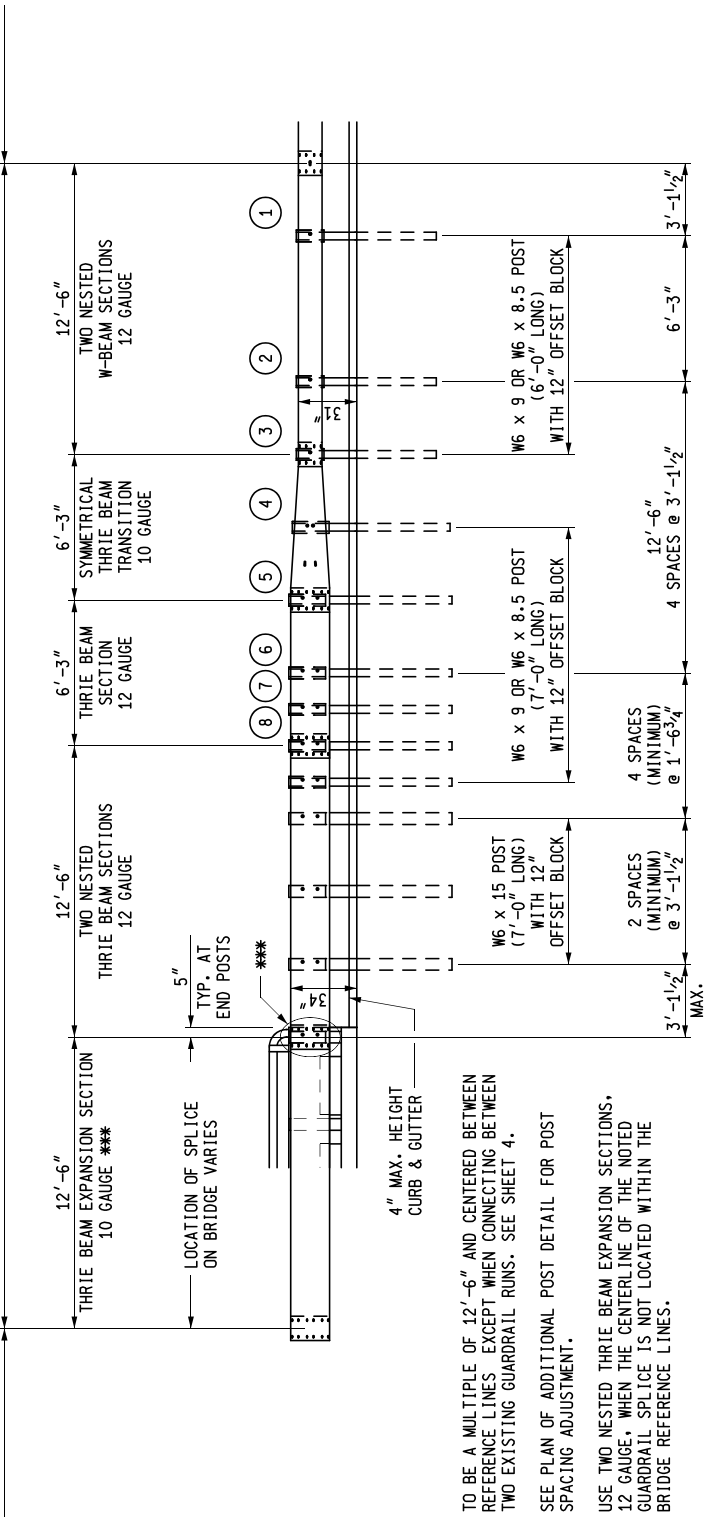
PLACE WOOD BLOCKOUTS ON CONCRETE POSTS BOTH SIDES OF EXPANSION SPLICE AND AT END POST (SEE ELEVATION SHOWING THRIE BEAM RETROFIT OVER BRIDGE EXPANSION JOINTS.)

PLAN

* BRIDGE RAILING THRIE BEAM RETROFIT

50'-0" GUARDRAIL ANCHORAGE, BRIDGE, DETAIL A3

GUARDRAIL TYPE MGS-8



ELEVATION

* TO BE A MULTIPLE OF 12'-6" AND CENTERED BETWEEN REFERENCE LINES. EXCEPT WHEN CONNECTING BETWEEN TWO EXISTING GUARDRAIL RUNS. SEE SHEET 4.

** SEE PLAN OF ADDITIONAL POST DETAIL FOR POST SPACING ADJUSTMENT.

*** USE TWO NESTED THRIE BEAM EXPANSION SECTIONS, 12 GAUGE, WHEN THE CENTERLINE OF THE NOTED GUARDRAIL SPLICE IS NOT LOCATED WITHIN THE BRIDGE REFERENCE LINES.

DETAILS FOR CONNECTING GUARDRAIL TYPE MGS-8 TO BRIDGE RAILING, THRIE BEAM RETROFIT



PREPARED BY DESIGN DIVISION

DRAWN BY: B.L.T.
CHECKED BY: V.Z.

DEPARTMENT DIRECTOR
Paul C. Ajegba

APPROVED BY: Matthew J. Chynoweth, P.E. Matthew J. Chynoweth
Oct 14 2021 4:28 PM
DIRECTOR, BUREAU OF BRIDGES AND STRUCTURES

APPROVED BY: Gregg Brunner, P.E. Gregg Brunner
Oct 14 2021 12:29 PM
DIRECTOR, BUREAU OF FIELD SERVICES

APPROVED BY: Bradley C. Wiefersich Bradley C. Wiefersich
Oct 14 2021 10:58 AM
DIRECTOR, BUREAU OF DEVELOPMENT

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

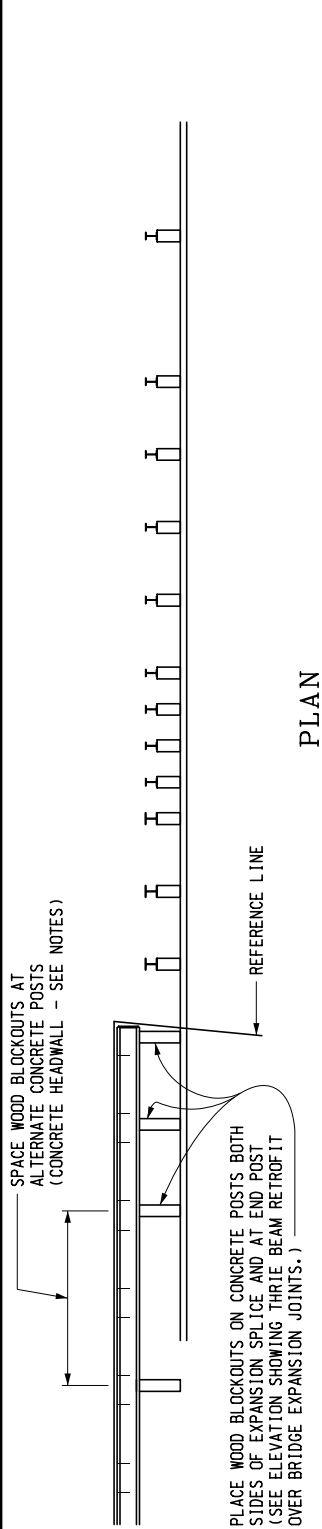
BRIDGE RAILING,
THRIE BEAM RETROFIT
(OPEN PARAPET TYPE BRIDGE RAILING)

4-7-2022
F.H.W.A. APPROVAL

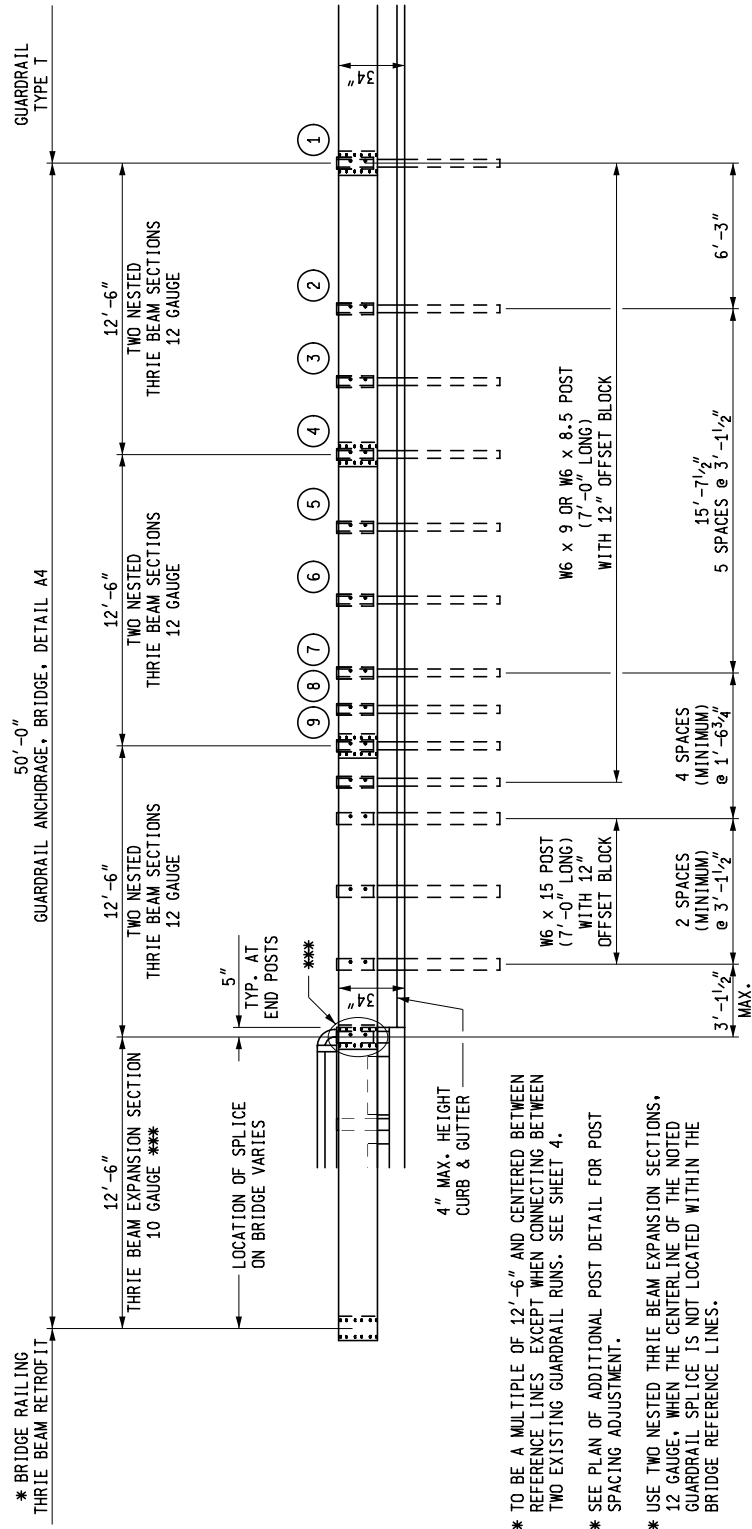
10-23-2019
PLAN DATE

B-23-F

SHEET
1 OF 6



PLAN



ELEVATION

* BRIDGE RAILING THRIE BEAM RETROFIT

50'-0" GUARDRAIL ANCHORAGE, BRIDGE, DETAIL A4

GUARDRAIL TYPE T

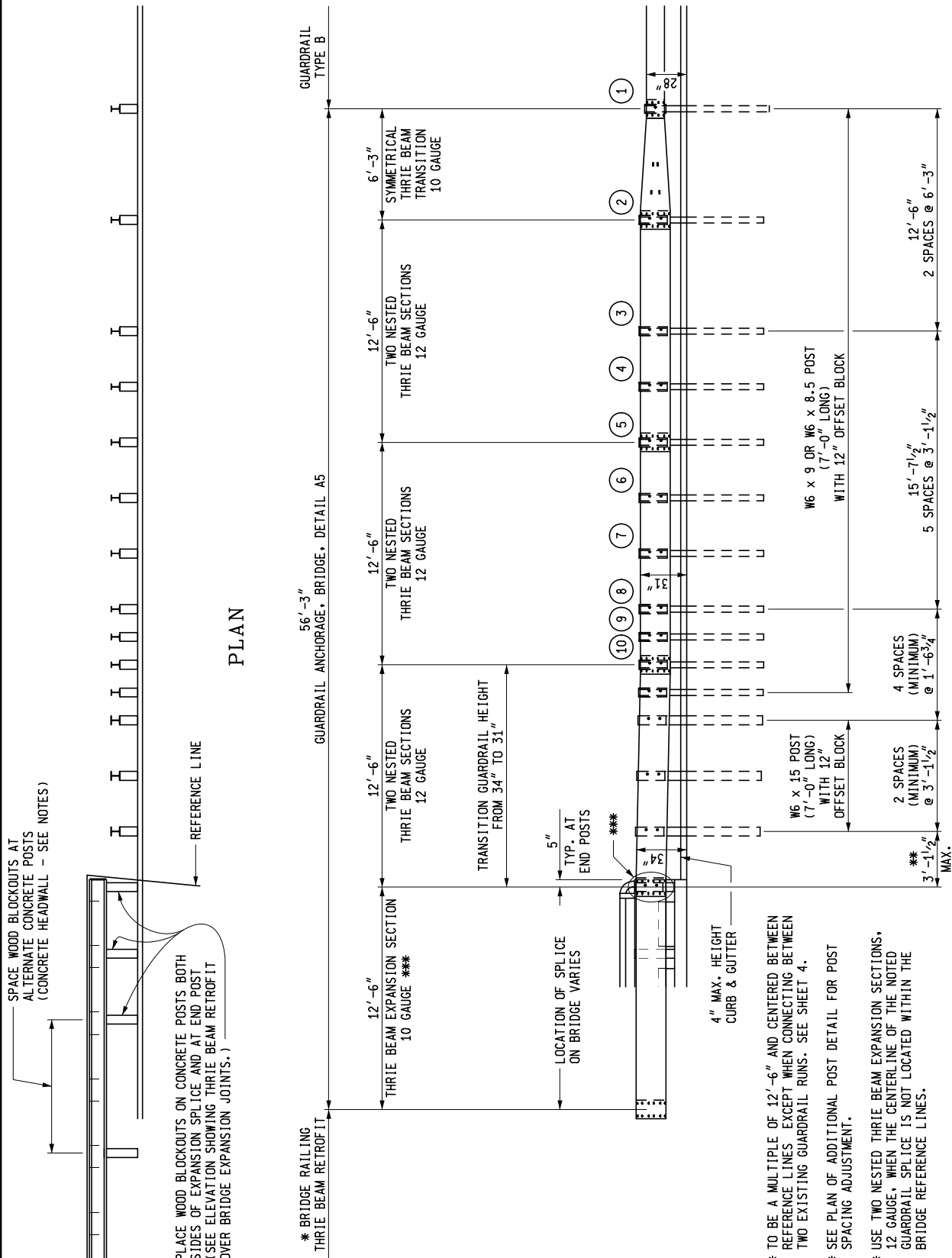
* TO BE A MULTIPLE OF 12'-6" AND CENTERED BETWEEN REFERENCE LINES EXCEPT WHEN CONNECTING BETWEEN TWO EXISTING GUARDRAIL RUNS. SEE SHEET 4.

*** SEE PLAN OF ADDITIONAL POST DETAIL FOR POST SPACING ADJUSTMENT.

*** USE TWO NESTED THRIE BEAM EXPANSION SECTIONS, 12 GAUGE, WHEN THE CENTERLINE OF THE NOTED GUARDRAIL SPLICE IS NOT LOCATED WITHIN THE BRIDGE REFERENCE LINES.

DETAILS FOR CONNECTING GUARDRAIL TYPE T TO BRIDGE RAILING, THRIE BEAM RETROFIT

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF DEVELOPMENT STANDARD PLAN FOR BRIDGE RAILING, THRIE BEAM RETROFIT (OPEN PARAPET TYPE BRIDGE RAILING)		
4-7-2022 F.H.W.A. APPROVAL	10-23-2019 PLAN DATE	B-23-F
		SHEET 2 OF 6



PLAN

ELEVATION

DETAILS FOR CONNECTING GUARDRAIL TYPE B TO BRIDGE RAILING, THRIE BEAM RETROFIT

SPACE WOOD BLOCKOUTS AT ALTERNATE CONCRETE POSTS (CONCRETE HEADWALL - SEE NOTES)

PLACE WOOD BLOCKOUTS ON CONCRETE POSTS BOTH SIDES OF EXPANSION SPLICE AND AT END POST (SEE ELEVATION SHOWING THRIE BEAM RETROFIT OVER BRIDGE EXPANSION JOINTS.)

* BRIDGE RAILING THRIE BEAM RETROFIT

56'-3" GUARDRAIL ANCHORAGE, BRIDGE, DETAIL A5

GUARDRAIL TYPE B

12'-6" TWO NESTED THRIE BEAM SECTIONS 12 GAUGE

12'-6" TWO NESTED THRIE BEAM SECTIONS 12 GAUGE

12'-6" TWO NESTED THRIE BEAM SECTIONS 12 GAUGE

6'-3" SYMMETRICAL THRIE BEAM TRANSITION 10 GAUGE

TRANSITION GUARDRAIL HEIGHT FROM 34" TO 31"

5" TYP. AT END POSTS

LOCATION OF SPLICE ON BRIDGE VARIES

4" MAX. HEIGHT CURB & GUTTER

* TO BE A MULTIPLE OF 12'-6" AND CENTERED BETWEEN REFERENCE LINES EXCEPT WHEN CONNECTING BETWEEN TWO EXISTING GUARDRAIL RUNS. SEE SHEET 4.

** SEE PLAN OF ADDITIONAL POST DETAIL FOR POST SPACING ADJUSTMENT.

*** USE TWO NESTED THRIE BEAM EXPANSION SECTIONS, 12 GAUGE, WHEN THE CENTERLINE OF THE NOTED GUARDRAIL SPLICE IS NOT LOCATED WITHIN THE BRIDGE REFERENCE LINES.

W6 x 9 OR W6 x 8.5 POST (7'-0" LONG) WITH 12" OFFSET BLOCK

W6 x 15 POST (7'-0" LONG) WITH 12" OFFSET BLOCK

4 SPACES (MINIMUM) @ 1'-6 3/4"

2 SPACES (MINIMUM) @ 3'-1 1/2"

5 SPACES @ 3'-1 1/2" MAX.

12'-6" 2 SPACES @ 6'-3"

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF DEVELOPMENT STANDARD PLAN FOR

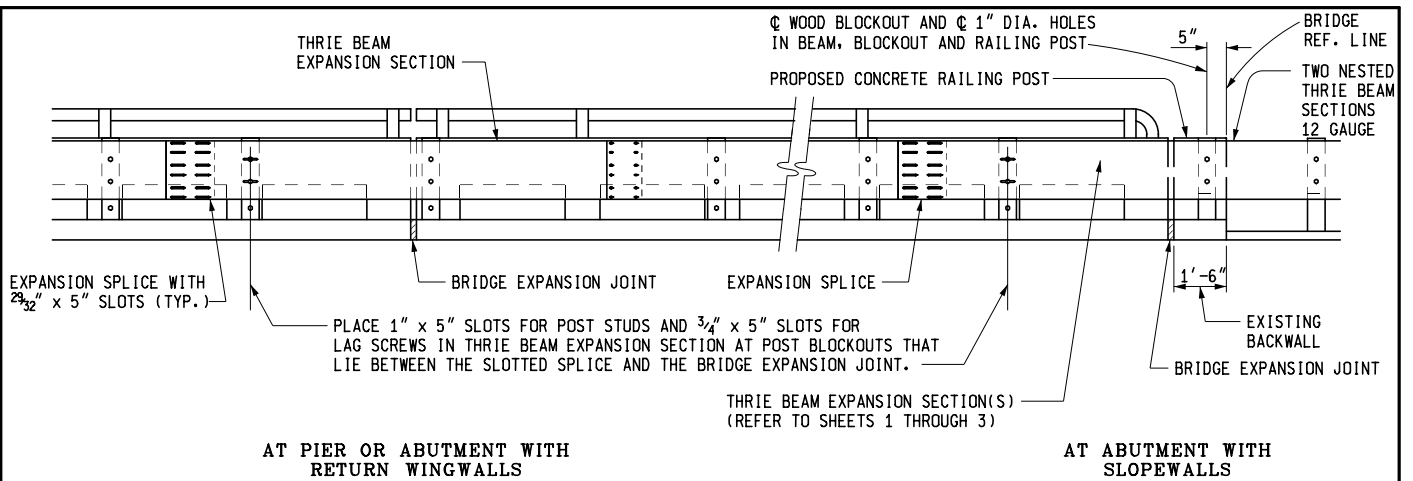
BRIDGE RAILING, THRIE BEAM RETROFIT (OPEN PARAPET TYPE BRIDGE RAILING)

4-7-2022 F.H.W.A. APPROVAL

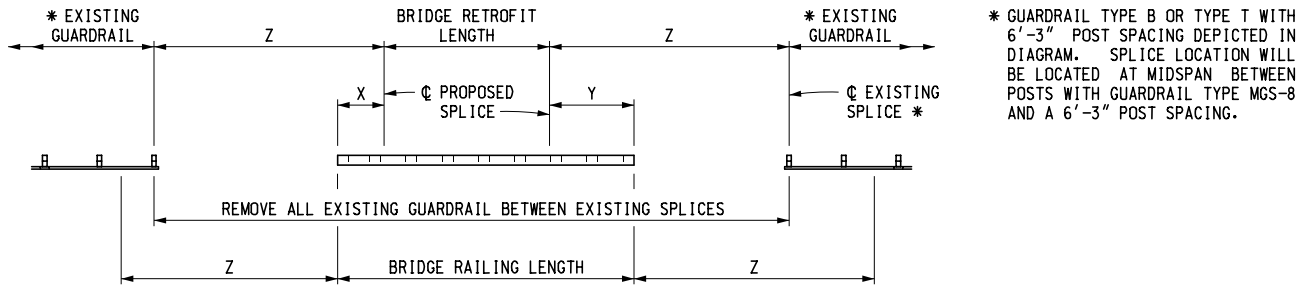
10-23-2019 PLAN DATE

B-23-F

SHEET 3 OF 6



AT PIER OR ABUTMENT WITH RETURN WINGWALLS
 AT ABUTMENT WITH SLOPEWALLS
ELEVATION SHOWING THRIE BEAM RETROFIT OVER BRIDGE EXPANSION JOINTS

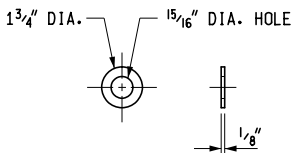


Z = 50'-0" WHEN CONNECTING TO BEAM GUARDRAIL, TYPE MGS-8. USE GUARDRAIL ANCHORAGE, BRIDGE, DETAIL A3
 Z = 50'-0" WHEN CONNECTING TO BEAM GUARDRAIL, TYPE T. USE GUARDRAIL ANCHORAGE, BRIDGE, DETAIL A4
 Z = 56'-3" WHEN CONNECTING TO BEAM GUARDRAIL, TYPE B. USE GUARDRAIL ANCHORAGE, BRIDGE, DETAIL A5

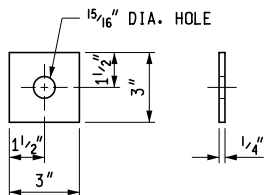
SKETCH FOR RETROFITTING BETWEEN TWO EXISTING RUNS OF GUARDRAIL

INSTRUCTIONS FOR LAYING OUT RETROFIT BETWEEN TWO EXISTING RUNS OF GUARDRAIL

1. MEASURE THE APPROPRIATE "Z" DISTANCE FROM ONE END OF THE BRIDGE RAILING AND LOCATE THE FIRST EXISTING SPLICE BACK TOWARD THE BRIDGE.
2. FROM THIS SPLICE, MEASURE THE SAME "Z" DISTANCE BACK TOWARD THE BRIDGE TO OBTAIN THE "X" DIMENSION. THIS DIMENSION WILL VARY FROM 0 TO 12'-6".
3. REPEAT STEPS 1 AND 2, FROM OPPOSITE END OF THE BRIDGE TO OBTAIN "Y" DIMENSION.
4. SUBTRACT THE SUM OF "X" + "Y" FROM BRIDGE RAILING LENGTH. THIS WILL BE THE BRIDGE RETROFIT LENGTH.
5. DIVIDE THE BRIDGE RETROFIT LENGTH BY 12'-6" TO OBTAIN THE NUMBER OF BEAM ELEMENTS PLUS A REMAINDER. THE REMAINDER WILL BE THE LENGTH OF A SHORTENED ELEMENT.
6. WHEN THE REMAINDER IS LESS THAN 2'-6", ADD 12'-6" TO THE REMAINDER AND DIVIDE BY TWO. THE BRIDGE RETROFIT WILL CONTAIN TWO SHORTENED BEAM ELEMENTS WITH ONE LESS 12'-6" BEAM ELEMENT THAN CALCULATED IN STEP 5.

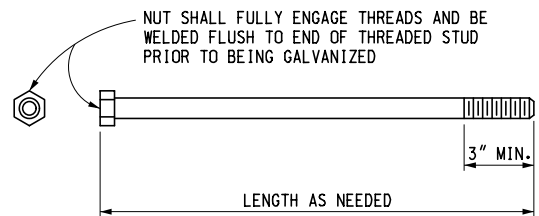


ROUND WASHER



SQUARE WASHER

WASHERS USED WITH 7/8" DIA. STUDS



7/8" DIA. THREADED STUD

MICHIGAN DEPARTMENT OF TRANSPORTATION
 BUREAU OF DEVELOPMENT STANDARD PLAN FOR

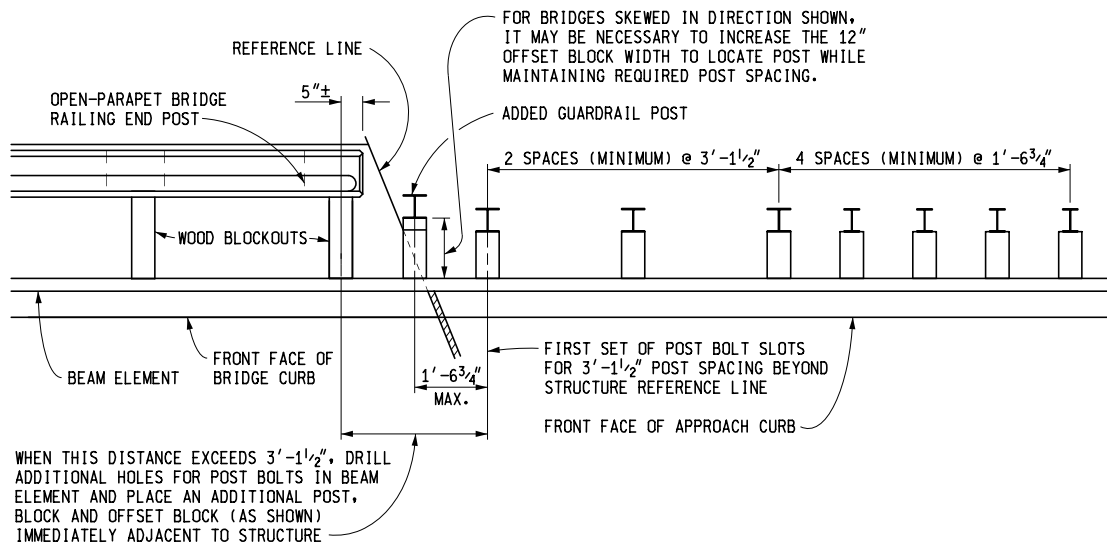
**BRIDGE RAILING,
 THRIE BEAM RETROFIT
 (OPEN PARAPET TYPE BRIDGE RAILING)**

4-7-2022
 F.H.W.A. APPROVAL

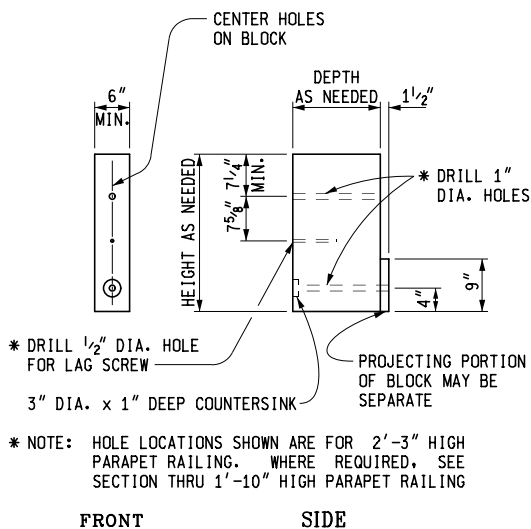
10-23-2019
 PLAN DATE

B-23-F

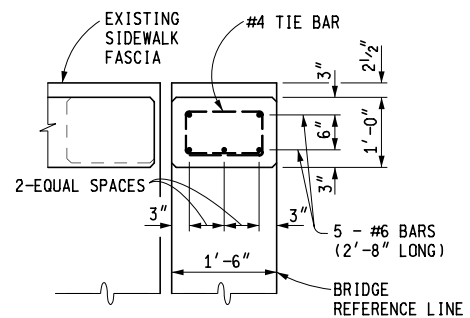
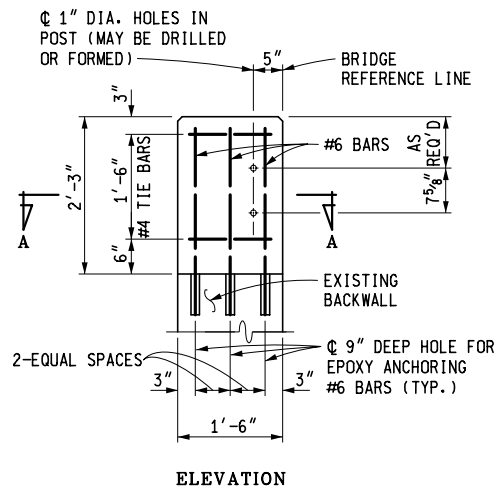
SHEET
 4 OF 6



PLAN OF ADDITIONAL POST DETAIL



WOOD BLOCKOUT DETAIL
WOOD BLOCKOUTS MAY BE MADE FROM A COMBINATION OF SEPARATE BLOCKS



CONCRETE RAILING POST DETAIL

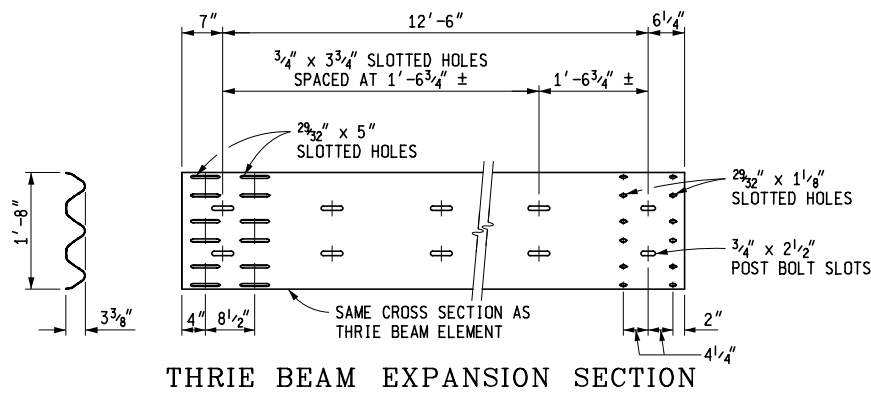
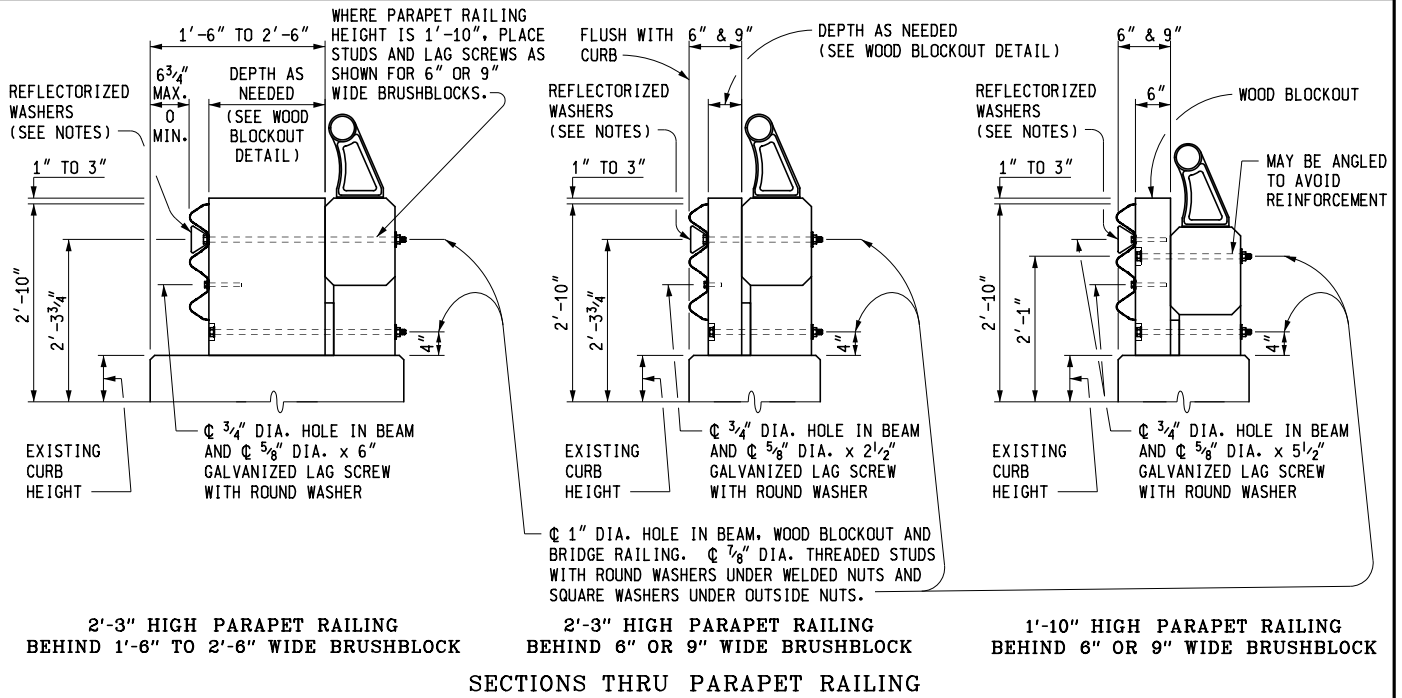
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR
**BRIDGE RAILING,
THREE BEAM RETROFIT**
(OPEN PARAPET TYPE BRIDGE RAILING)

4-7-2022
F.H.W.A. APPROVAL

10-23-2019
PLAN DATE

B-23-F

SHEET
5 OF 6



NOTES:

THIS STANDARD IS INTENDED FOR USE IN UPGRADING OF EXISTING OPEN-PARAPET TYPE BRIDGE RAILINGS AND APPROACH GUARDRAIL.

BRIDGE RAILING, THREE BEAM RETROFIT AND GUARDRAIL ANCHORAGES SHALL CONFORM TO THE CURRENT STANDARD PLAN R-60 SERIES, WHERE APPLICABLE, EXCEPT AS SHOWN ON THIS PLAN.

ALL WORK AND MATERIALS SHALL BE IN ACCORDANCE WITH SECTIONS 807 & 908 OF THE STANDARD SPECIFICATIONS.

REFLECTORIZED WASHERS SHALL BE SPACED AT 25'-0" INTERVALS AT BEAM ELEMENT SPLICES. THEY SHALL BE ATTACHED AT UPPER POST BOLT SLOTS WITH STANDARD SPLICE BOLTS.

FOR PRECAST THREE SIDED OR ARCH CULVERTS SPACE BLOCKOUTS FOR THREE BEAM GUARDRAIL AT A DISTANCE OF 10'-7 3/4" OR LESS CENTER TO CENTER. PLACE FIRST AND LAST BLOCK ON HEADWALL AS DETAILED ON THIS STANDARD.

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

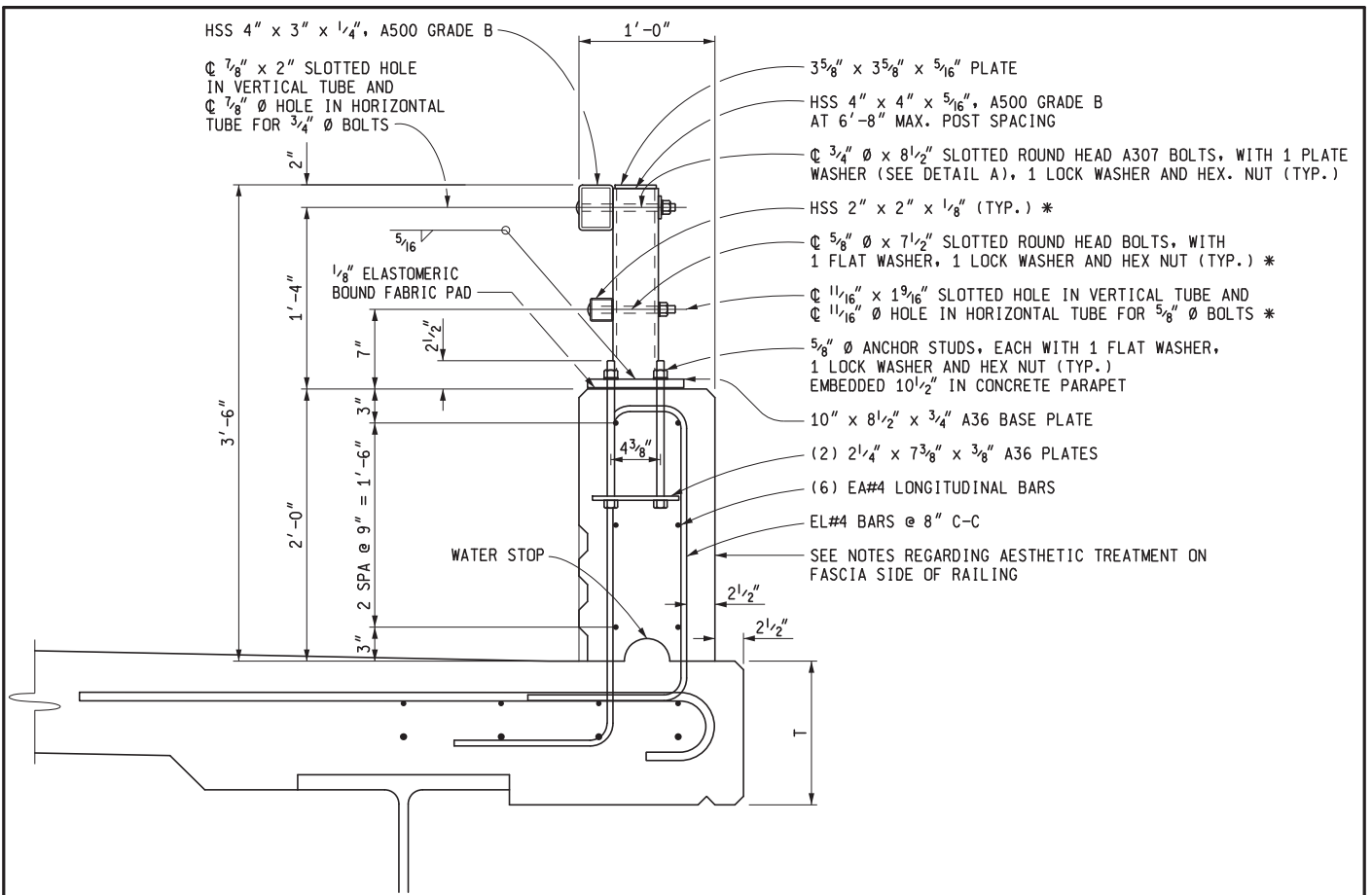
BRIDGE RAILING,
THREE BEAM RETROFIT
(OPEN PARAPET TYPE BRIDGE RAILING)

4-7-2022
F.H.W.A. APPROVAL

10-23-2019
PLAN DATE

B-23-F

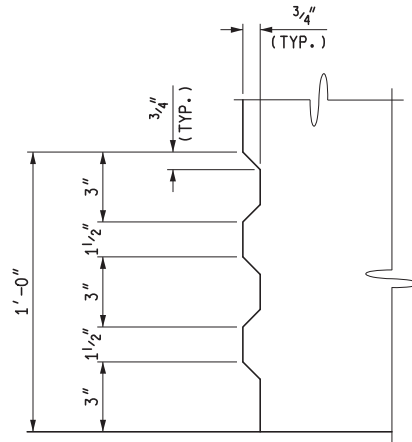
SHEET
6 OF 6



FLUSH MOUNT BRIDGE RAILING

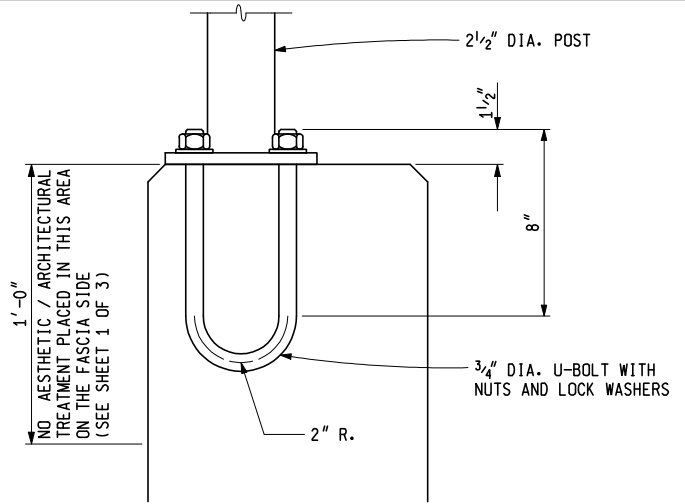
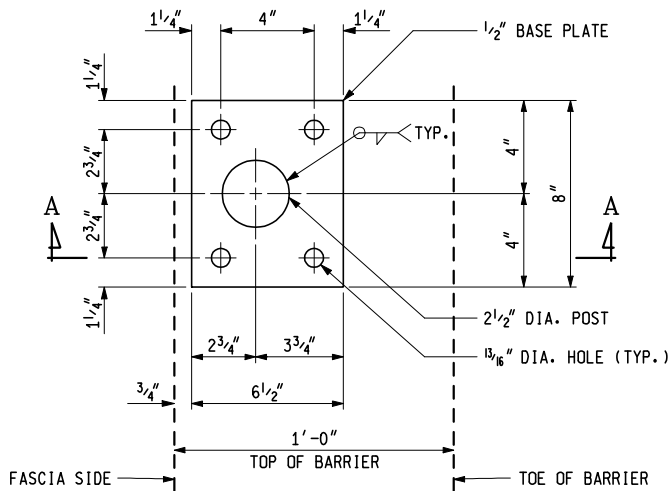
NOTES:

- ALL WORK AND MATERIAL SHALL BE IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS.
- DETAILS SHOWN ARE IN ACCORDANCE WITH CURRENT AASHTO SPECIFICATIONS.
- BRIDGE RAILING USED WITH SIDEWALK SHALL BE USED ONLY WITH THE SIDEWALK CONFIGURATION (PROFILE) SHOWN ON THIS STANDARD PLAN.
- NO SLIP FORMING OF "BRIDGE RAILING, AESTHETIC PARAPET TUBE" SHALL BE ALLOWED. RAILING SHALL BE CAST IN PLACE.
- THE LIGHT STANDARD ANCHOR BOLT ASSEMBLY IS INCLUDED IN THE BID ITEM "BRIDGE RAILING, AESTHETIC PARAPET TUBE". SEE STANDARD PLAN B-103-SERIES.
- FOR LIGHT STANDARD ANCHOR BOLT ASSEMBLY DETAILS, IF BRIDGE RAILING, AESTHETIC PARAPET TUBE IS PLACED FLUSH ON THE BRIDGE DECK (WITHOUT SIDEWALK), THE LIGHTING CONDUIT SHALL NOT BE PLACED IN THE RAILING.
- A RUBBED FINISH ON THE VERTICAL AND TOP CONCRETE SURFACES OF THE PARAPET RAILING IS REQUIRED.
- AESTHETIC TREATMENT AS DETAILED ON THIS SHEET SHALL BE ADDED TO THE FASCIA SIDE OF RAILING IF NO AESTHETIC TREATMENT IS DETAILED ON THE PLAN SHEETS AND SHALL BE INCLUDED IN THE BID ITEM "BRIDGE RAILING, AESTHETIC PARAPET TUBE". AESTHETIC TREATMENT DETAILED ON THE PLAN SHEETS MAY BE UP TO 1" IN CONCRETE DEPTH WITHOUT MODIFICATION TO THE RAILING WIDTH AND SHALL BE INCLUDED IN THE BID ITEM "BRIDGE RAILING, AESTHETIC PARAPET TUBE". AESTHETIC TREATMENT REQUIRING ADDITIONAL RAILING WIDTH OR THE USE OF ELASTOMERIC FORM LINERS SHALL BE PAID FOR SEPARATELY.
- * THE HSS 2" x 2" x 1/8" RAIL, SLOTTED HOLE, AND 5/8" BOLT ARE NOT REQUIRED WHEN RAILING IS USED IN COMBINATION WITH PEDESTRIAN FENCING (SEE STANDARD PLAN B-41-SERIES).

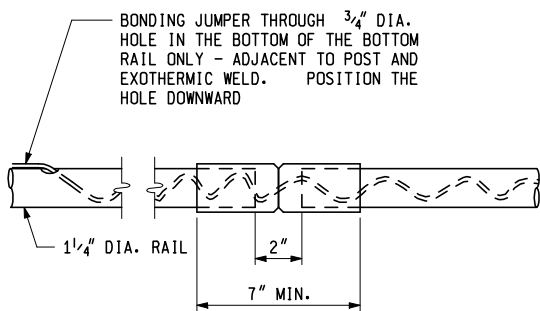


AESTHETIC TREATMENT DETAIL

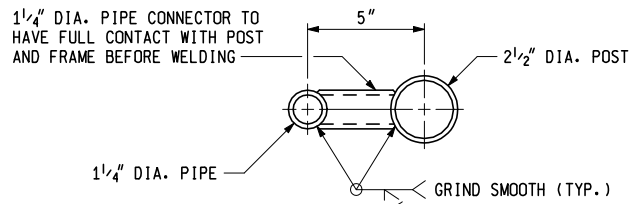
<p>PREPARED BY DESIGN DIVISION</p> <p>DRAWN BY: <u>B.L.T.</u></p> <p>CHECKED BY: <u>V.Z.</u></p>	<p>DEPARTMENT DIRECTOR Kirk T. Stuedle</p> <p>Kimberly Avery APPROVED BY: DIRECTOR, BUREAU OF FIELD SERVICES</p> <p>Bradley C. Wieferich APPROVED BY: DIRECTOR, BUREAU OF DEVELOPMENT</p>	<p>MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF DEVELOPMENT STANDARD PLAN FOR</p> <p>BRIDGE RAILING, AESTHETIC PARAPET TUBE</p>	
	<p>7-25-2017 F.H.W.A. APPROVAL</p>	<p>11-2-2016 PLAN DATE</p>	<p>B-25-K</p>



SECTION A - A
BASE PLATE DETAILS



EXPANSION SLEEVE DETAIL



PIPE CONNECTION DETAIL

USE AT ANTI-CLIMB SHIELD ONLY

NOTES:

ALL FENCE POSTS SHALL BE 2 1/2" NOMINAL, (2.875" O.D.) PIPE AND ANTI-CLIMB SHIELD PIPE FRAMES SHALL BE 1 1/4" NOMINAL, (1.66" O.D.) PIPE, IN CONFORMANCE WITH ASTM F669, CLASS 1C.

HORIZONTAL RAILS SHALL BE 1 1/4" NOMINAL (1.66" O.D.) PIPE IN CONFORMANCE WITH ASTM F669, CLASS 1C OR ASTM F1083.

ALL FENCE COMPONENTS, UNLESS OTHERWISE INDICATED, SHALL BE GALVANIZED ACCORDING TO MDOT'S CURRENT STANDARD SPECIFICATIONS FOR CONSTRUCTION.

ALL POSTS, ANTI-CLIMB SHIELDS OR OTHER COMPONENTS TO BE FABRICATED SHALL BE FURNISHED "BLACK" AND THEN GALVANIZED AFTER FABRICATION.

DAMAGED GALVANIZED SURFACES (NEW AND EXISTING) SHALL BE REPAIRED IN CONFORMANCE WITH MDOT'S CURRENT STANDARD SPECIFICATIONS FOR CONSTRUCTION.

FENCE FABRIC SHALL BE #9 GAGE MESH AND BE GALVANIZED OR ALUMINUM COATED IN CONFORMANCE WITH MDOT'S CURRENT STANDARD SPECIFICATIONS FOR CONSTRUCTION. MESH SIZE OPENING SHALL BE 2" UNLESS 1" MESH SIZE OPENING IS APPROVED BY THE TRAFFIC AND SAFETY DIVISION AND NOTED ON DESIGN PLANS. ALL DETAILS ON STANDARD PLAN SHALL APPLY REGARDLESS OF MESH SIZE OPENINGS.

GALVANIZED 3/8" DIAMETER TRUSS RODS SHALL EXTEND DIAGONALLY FROM THE TOP CONNECTION CLIP AT EACH TENSION BAR TO THE ADJACENT POST, EXCEPT ACROSS EXPANSION JOINTS AND AT LIGHT STANDARDS WITH A CURVED FENCE DETAIL, WHEN THERE ARE TWO OR MORE CONTINUOUS PANELS OF FABRIC.

ALL POSTS SHALL BE INSTALLED PLUMB AND MAY BE SHIMMED WITH NON-METALLIC SHIMS, APPROVED BY THE ENGINEER. COSTS FOR SHIMMING SHALL BE INCLUDED IN THE PAY ITEM "FENCE, STRUCTURE".

THE GROUNDING CABLE SHALL BE PLACED IN A NON-METALLIC CONDUIT, FROM THE END POST CONNECTION TO THE GROUND ROD CONNECTION. THE CONDUIT SHALL BE SECURED TO THE STRUCTURE USING EITHER EXPANSION BOLTS OR ADHESIVE ANCHORED BOLTS WITH GALVANIZED METAL STRIPS, AS APPROVED BY THE ENGINEER.

IN THE EVENT THAT THE INSTALLATION OF A GROUND ROD IS IMPRACTICAL, THE GROUNDING CABLE SHALL BE CONNECTED TO THE NEAREST LIGHT STANDARD USING A MECHANICAL CLIP, ONLY AFTER OBTAINING PERMISSION FROM THE LOCAL PUBLIC LIGHTING AUTHORITY.

EXPANSION JOINT SLEEVES, FOR HORIZONTAL RAILS, SHALL BE THE MANUFACTURER'S STANDARD OVERSIZED SLEEVES, CRIMPED IN THE MIDDLE.

NO SLIP FORMING OF BRIDGE RAILING, AESTHETIC PARAPET TUBE SHALL BE ALLOWED. RAILINGS SHALL BE CAST IN PLACE.

THE U-BOLTS FOR FENCING BASE PLATES SHALL BE ACCURATELY POSITIONED ACCORDING TO THE PLANS AND FIRMLY HELD BY MEANS OF A TEMPLATE.

THE HSS 2" x 2" x 1/8" RAIL SHALL NOT BE REQUIRED ON THE BRIDGE RAILING, AESTHETIC PARAPET TUBE USED IN COMBINATION WITH PEDESTRAIN FENCING.

ALL LABOR, MATERIAL AND EQUIPMENT REQUIRED TO INSTALL PEDESTRIAN FENCING SHALL BE INCLUDED IN PAY ITEM "FENCE, STRUCTURE".

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

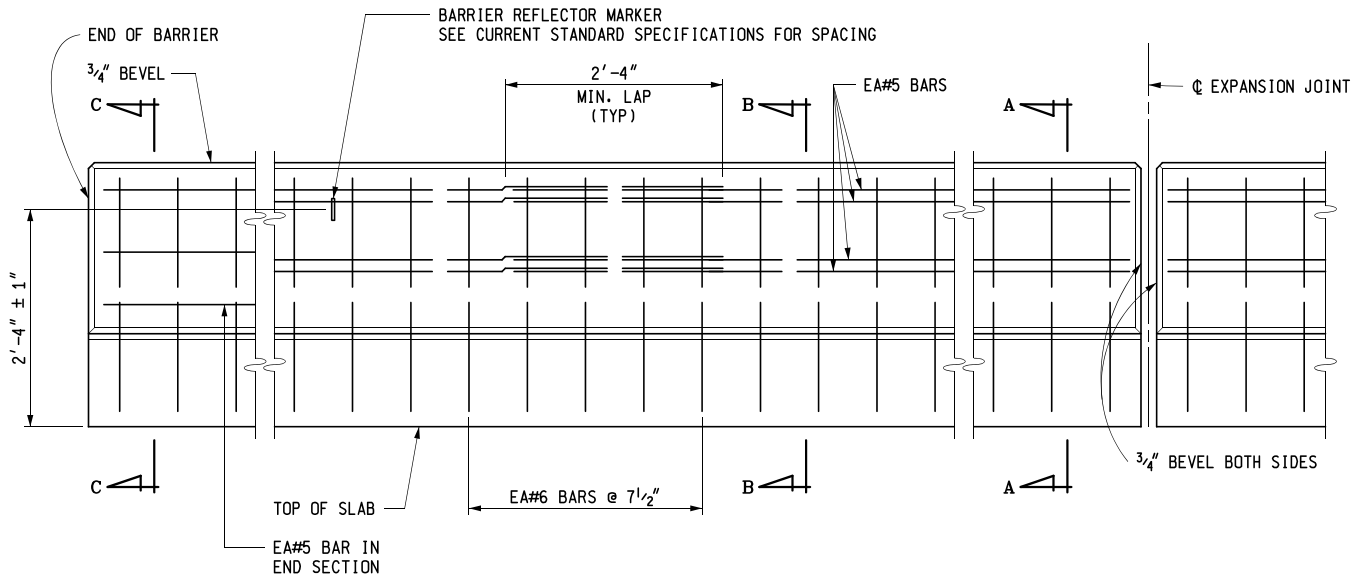
FENCING FOR BRIDGE RAILING,
AESTHETIC PARAPET TUBE

10-21-2008
F.H.W.A. APPROVAL

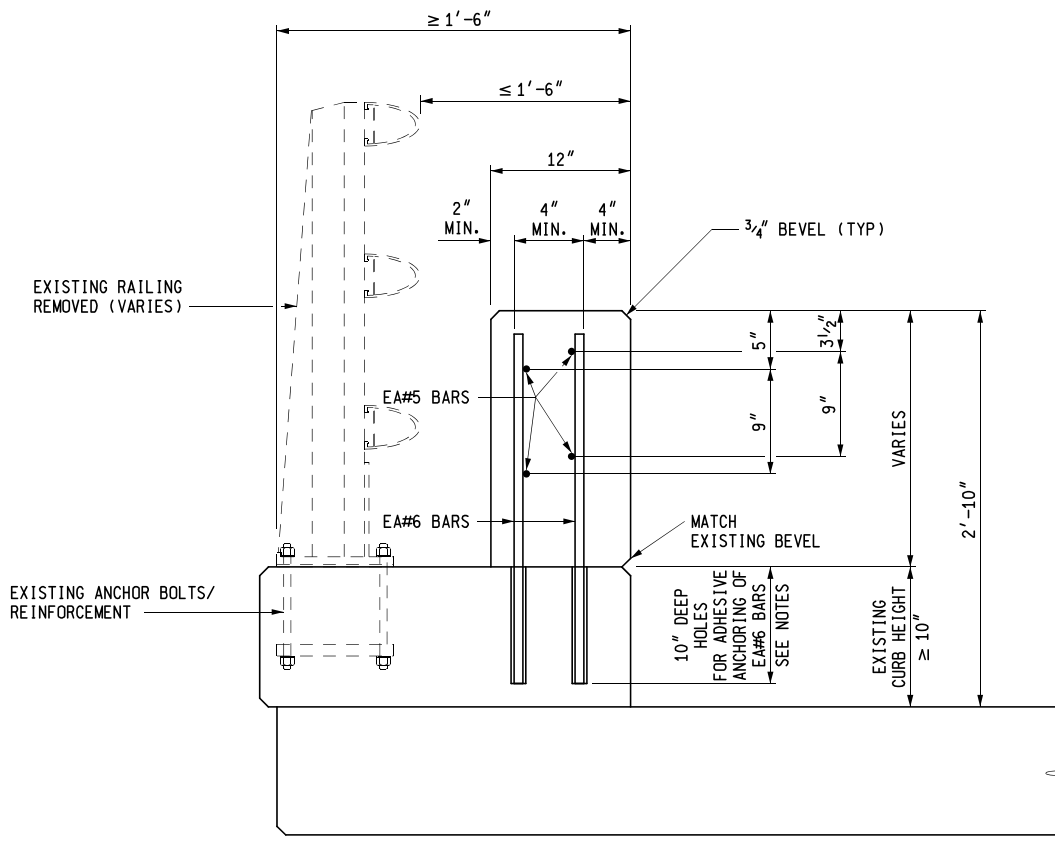
6-20-2008
PLAN DATE

B-41-C

SHEET
3 OF 3



BRIDGE BARRIER RAILING ELEVATION



SECTION A-A



PREPARED BY
DESIGN DIVISION

DRAWN BY: B.L.T.
CHECKED BY: V.Z.

DEPARTMENT DIRECTOR
Paul C. Ajegba

APPROVED BY: Matthew J. Chynoweth, P.E. Matthew J. Chynoweth
Oct 14 2021 4:28 PM
DIRECTOR, BUREAU OF BRIDGES AND STRUCTURES

APPROVED BY: Gregg Brunner, P.E. Gregg Brunner
Oct 14 2021 12:30 PM
DIRECTOR, BUREAU OF FIELD SERVICES

APPROVED BY: Bradley C. Wiefelrich Bradley C. Wiefelrich
Oct 14 2021 10:59 AM
DIRECTOR, BUREAU OF DEVELOPMENT

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

**BRIDGE RAILING,
CONCRETE BLOCK RETROFIT
(CURB HEIGHT ≥ 10")**

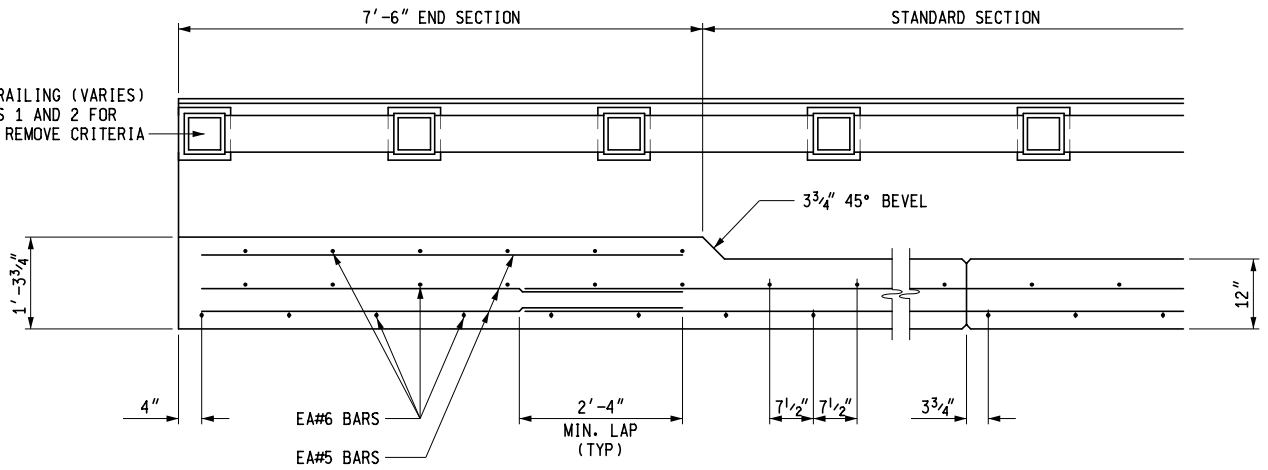
4-7-2022
F.H.W.A. APPROVAL

9-29-2021
PLAN DATE

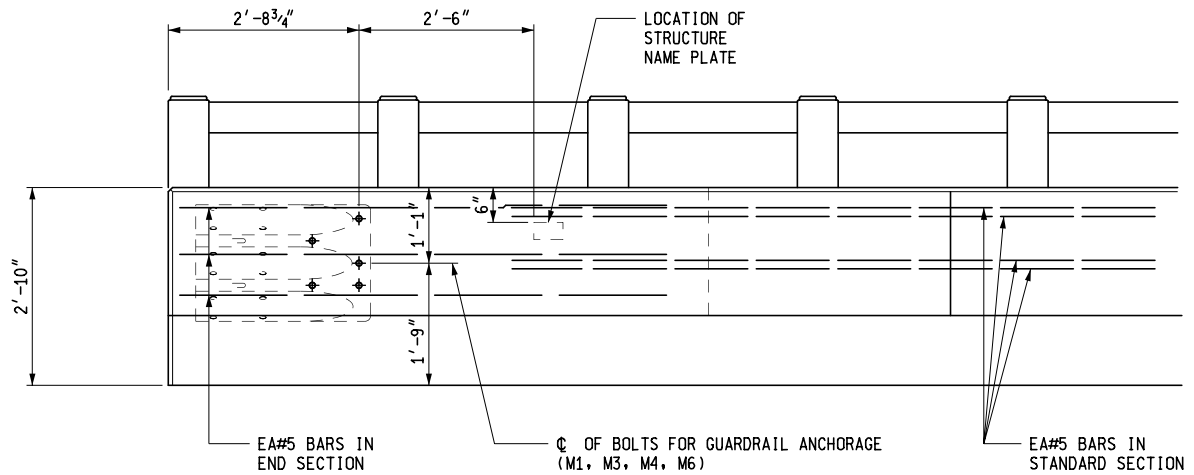
B-50-A

SHEET
1 OF 3

EXISTING RAILING (VARIES)
SEE SHEETS 1 AND 2 FOR
REMAIN OR REMOVE CRITERIA



PLAN VIEW

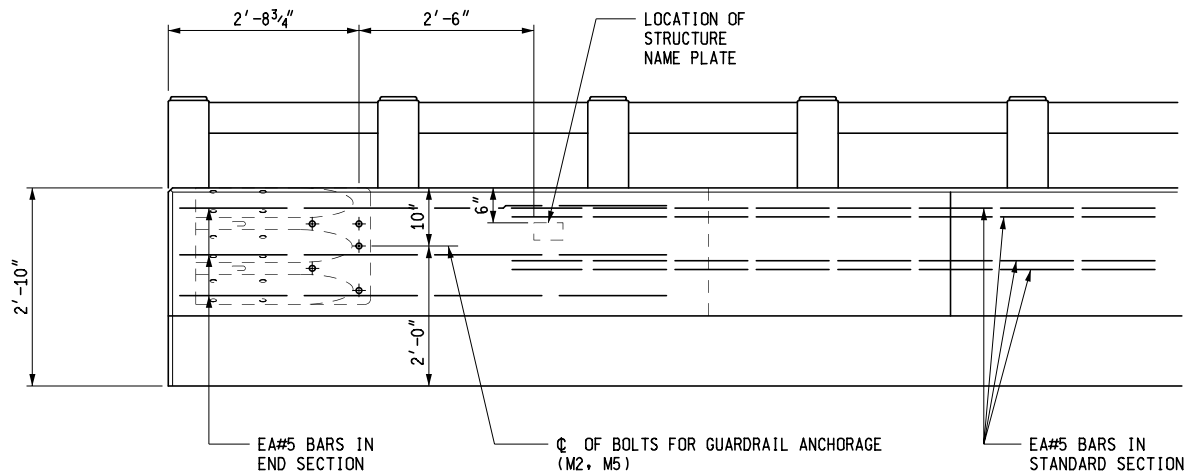


EA#5 BARS IN END SECTION

LOCATION OF STRUCTURE NAME PLATE

EA#5 BARS IN STANDARD SECTION

CL OF BOLTS FOR GUARDRAIL ANCHORAGE (M1, M3, M4, M6)
SEE STANDARD PLAN R-67-SERIES FOR DETAILS. BOLTS TO BE FURNISHED AND INSTALLED BY THE BRIDGE CONTRACTOR. INCLUDED IN THE BID ITEM "BRIDGE RAILING, CONC BLOCK RETROFIT".



EA#5 BARS IN END SECTION

LOCATION OF STRUCTURE NAME PLATE

EA#5 BARS IN STANDARD SECTION

CL OF BOLTS FOR GUARDRAIL ANCHORAGE (M2, M5)
SEE STANDARD PLAN R-67-SERIES FOR DETAILS. BOLTS TO BE FURNISHED AND INSTALLED BY THE BRIDGE CONTRACTOR. INCLUDED IN THE BID ITEM "BRIDGE RAILING, CONC BLOCK RETROFIT".

ELEVATION VIEW
SHOWING HORIZONTAL REINFORCEMENT

NOTES:

CONCRETE BLOCK RETROFIT IS INTENDED FOR PLACEMENT ON TOP OF CURBS/
SIDEWALKS $\geq 10"$ THICK.

DETAILS SHOWN ARE IN ACCORDANCE WITH CURRENT AASHTO SPECIFICATIONS.

ALL WORK AND MATERIAL SHALL BE IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS.

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

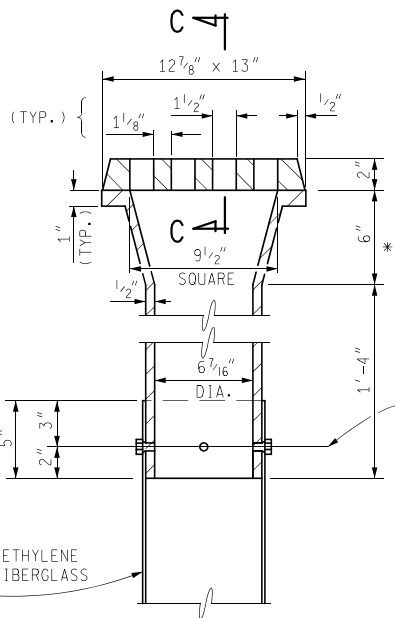
BRIDGE RAILING,
CONCRETE BLOCK RETROFIT
(CURB HEIGHT $\geq 10"$)

4-7-2022
F.H.W.A. APPROVAL

9-29-2021
PLAN DATE

B-50-A

SHEET
3 OF 3

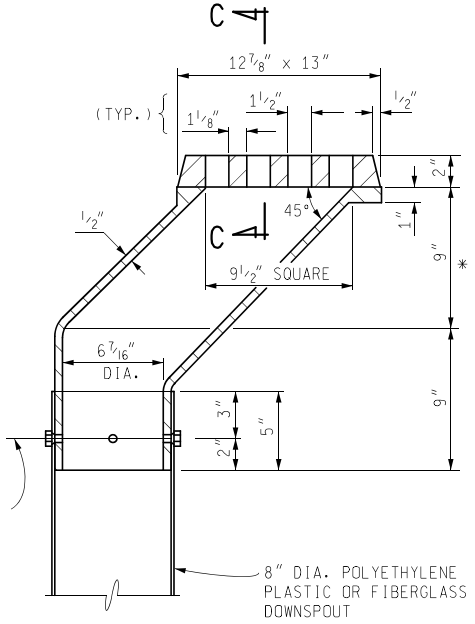


* TRANSITION SQUARE TO ROUND

Ø 4 - 1/2" Ø HOLES IN DRAIN CASTING TAPPED OVERSIZE TO ACCOMMODATE 1/2" Ø X 1 1/4" GALV. HEX CAP SCREWS WITH FLAT WASHERS.
 Ø 4 - 9/16" Ø HOLES IN DOWNSPOUT

8" DIA. POLYETHYLENE PLASTIC OR FIBERGLASS DOWNSPOUT

SECTION A-A (TYPE 1)

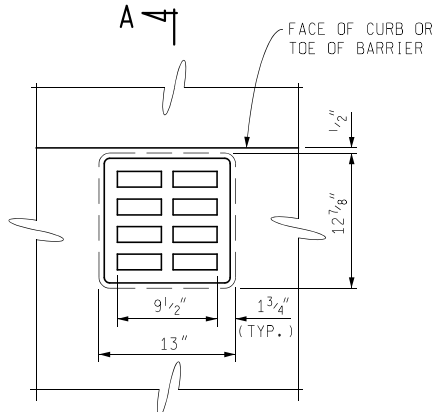


8" DIA. POLYETHYLENE PLASTIC OR FIBERGLASS DOWNSPOUT

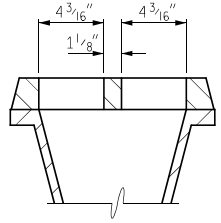
SECTION A-A (TYPE 2)

DRAIN CASTING ASSEMBLY DETAILS

(BRACKETS NOT SHOWN)



PLAN OF DRAIN CASTING



SECTION C-C

NOTES:

- USE GRAY IRON CASTINGS IN ACCORDANCE WITH STANDARD SPECIFICATIONS.
- USE POLYETHYLENE PLASTIC PIPE OR FIBERGLASS-REINFORCED THERMOSETTING RESIN PIPE IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS. USE ASTM DR 17 AS AN APPROVED ALTERNATE.
- USE GALVANIZED STEEL BRACKETS IN ACCORDANCE WITH AASHTO M270 GRADE 36.
- USE BOLTS (FASTENERS), NUTS, WASHERS AND INSERTS (TAPPED OVERSIZE) IN ACCORDANCE WITH 906.07 OF THE STANDARD SPECIFICATIONS. BOLTS AND WASHERS MAY BE STAINLESS STEEL SAE TYPE 304.



PREPARED BY DESIGN DIVISION

DRAWN BY: B.L.T.
 CHECKED BY: V.Z.

DEPARTMENT DIRECTOR
 Paul C. Ajegba

APPROVED BY: Matthew J. Chynoweth, P.E. Matthew J. Chynoweth
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 DIRECTOR, BUREAU OF BRIDGES AND STRUCTURES

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 DIRECTOR, BUREAU OF FIELD SERVICES

APPROVED BY: Bradley C. Wiefelrich Bradley C. Wiefelrich
 Oct 14 2021 10:59 AM
 DIRECTOR, BUREAU OF DEVELOPMENT

MICHIGAN DEPARTMENT OF TRANSPORTATION
 BUREAU OF DEVELOPMENT STANDARD PLAN FOR

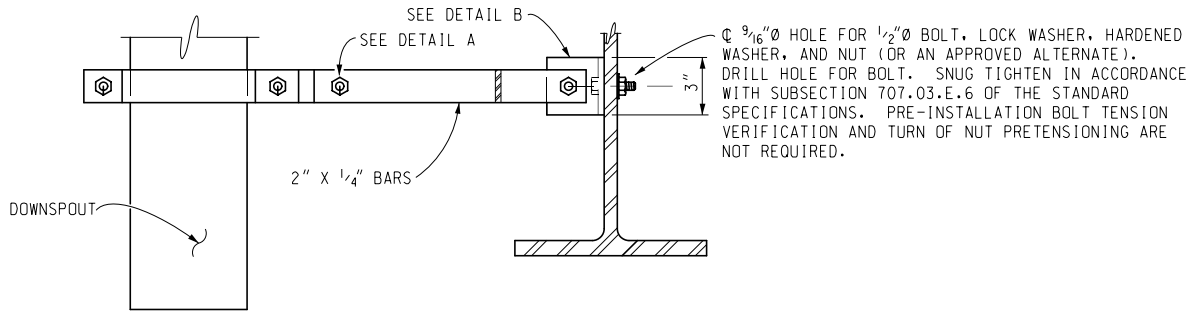
DRAIN CASTING ASSEMBLY DETAILS

4-7-2022
 F.H.W.A. APPROVAL

9-9-2021
 PLAN DATE

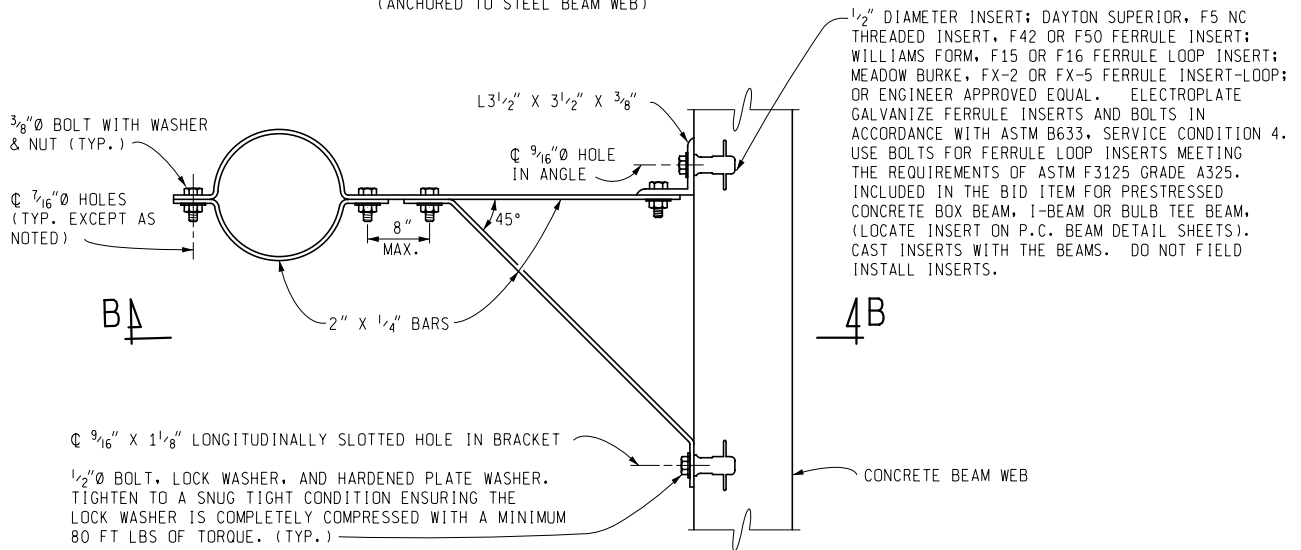
B-101-G

SHEET 1 OF 2



SECTION B-B

(ANCHORED TO STEEL BEAM WEB)

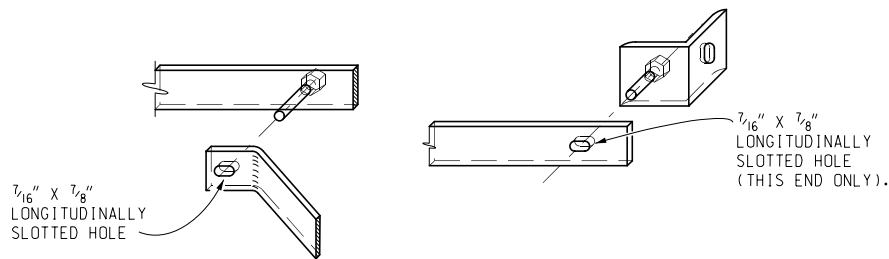


PLAN VIEW OF BRACKET

(ANCHORED TO CONCRETE BEAM WEB)

BRACKET DETAILS

(FOR CONCRETE OR STEEL BEAMS)

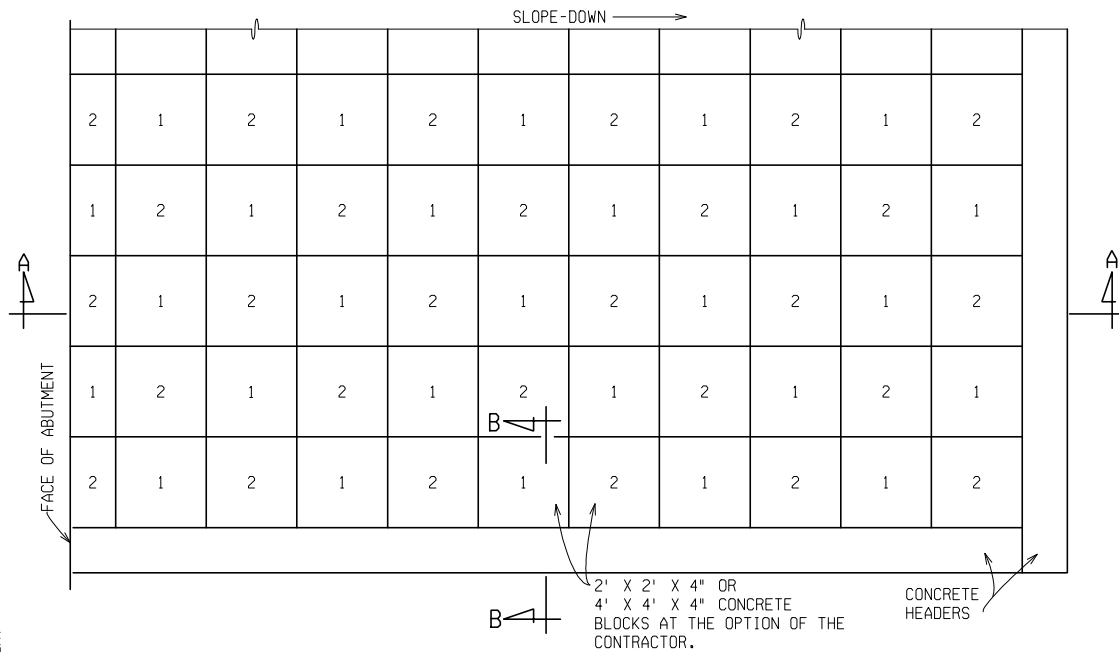


DETAIL A

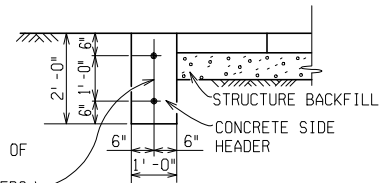
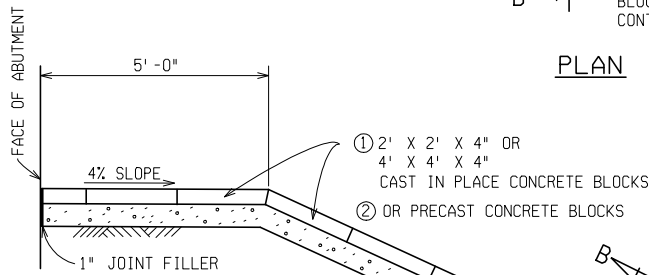
DETAIL B

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF DEVELOPMENT STANDARD PLAN FOR			
<h2 style="margin: 0;">DRAIN CASTING ASSEMBLY DETAILS</h2>			
4-7-2022 F.H.W.A. APPROVAL	9-9-2021 PLAN DATE	B-101-G	SHEET 2 OF 2

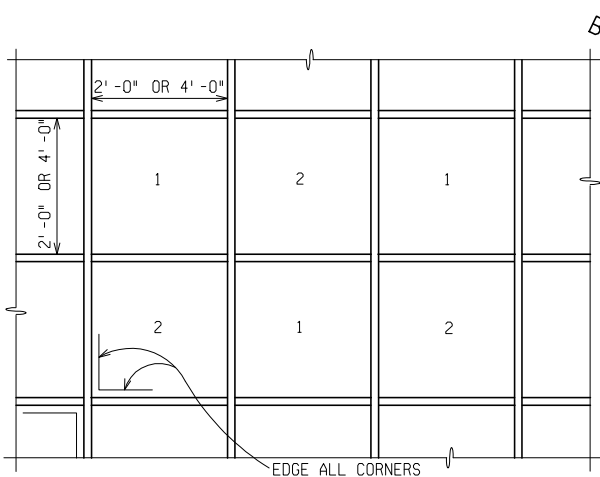
SLOPE PAVING, CONCRETE



PLAN

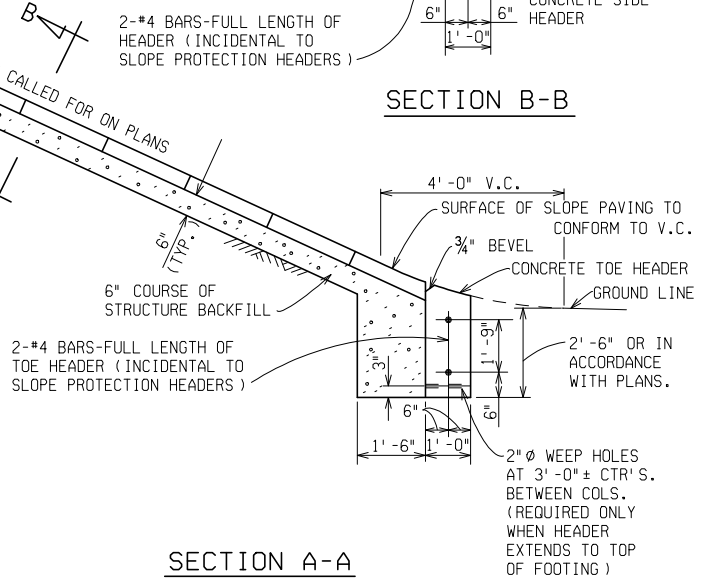


SECTION B-B



POUR SEQUENCE

FORMS ARE REMOVED AFTER POURS NO. 1 ARE CAST. IT IS PERMISSIBLE TO POUR THE SLOPE PAVING BLOCKS CONTINUOUSLY IN ROWS RATHER THAN ALTERNATELY AS SHOWN. IF THIS METHOD IS SELECTED, FULL DEPTH METAL DIVIDERS SHALL BE USED BETWEEN ALL BLOCKS.



SECTION A-A

ESTIMATED CONCRETE QUANTITIES

SLOPE PAVING, CONCRETE	0.01 yd ³ /ft ²
SIDE HEADER, CONCRETE	0.075 yd ³ /lineal ft
TOE HEADER, CONCRETE	0.103 yd ³ /lineal ft



PREPARED BY
DESIGN DIVISION

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CHECKED BY: VZ

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HIGHWAY TECHNICAL SERVICES

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY TECHNICAL SERVICES
STANDARD PLAN FOR

STANDARD SLOPE PAVING DETAILS

11-26-2001
F.H.W.A. APPROVAL

PLAN DATE

B-102-C

SHEET
1 OF 2