Road & Bridge Design Publications

Monthly Update – November 2023

Revisions for the month of **November** are listed and displayed below and will be included in projects submitted for the **March** letting.

E-mail road related questions to MDOT-Road-Design-Standards@michigan.gov.
E-mail bridge related questions to MDOT-Bridge-Design-Standards@michigan.gov.

Standard Plans

R-28-K: Curb Ramp and Detectable Warning Details: Revised the maximum sidewalk cross slope from 2% to 2.1% and the term "practicable" to "feasible" to match the final ruling of Public Right of Way Accessibility Guidelines (PROWAG).

R-29-J: Driveway Openings & Approaches, and Concrete Sidewalk: Revised the maximum sidewalk cross slope from 2% to 2.1% to match the final ruling of PROWAG.

B-25-L: Bridge Railing, Aesthetic Parapet Tube: Revised the maximum sidewalk cross slope from 2% to 2.1% on sheets 2 & 7 to match the final ruling of PROWAG and removed the word current from Standard Specifications for Construction and AASHTO on sheets 1 & 3.

B-27-B: Bridge Railing, 3 Tube with Pickets: Revised the maximum sidewalk cross slope from 2% to 2.1% on sheet 1 to match the final ruling of PROWAG and removed the word current from Standard Specifications for Construction and AASHTO on sheet 7.

Road Design Manual

6.03.05C: Measurement and Payment (Drainage Structure Cover Adjust): Modified descriptions for Case 1 & Case 2 to clarify when each should be used. (No change to existing policy.)

6.08.05: Curb Ramps: Revised the maximum sidewalk cross slope from 2% to 2.1% and the terms "practicable" to "feasible" and "impracticable" to "infeasible" to match the final ruling of PROWAG.

6.08.06: Building Entrances: Revised the terms "practicable" to "feasible" and "impracticable" to "infeasible" to match the final ruling of PROWAG.

Bridge Design Guides

6.29.10C & 6.19.17E: Revised the maximum sidewalk cross slope from 2% to 2.1% to match the final ruling of PROWAG.

Michigan Department of Transportation

Road & Bridge Design Publications

Monthly Update – November 2023

Bridge Design Manual

7.01.04 (LRFD) & 12.08.08: Clarification made (additional information added) to the vehicle collision force policy.

7.01.15 (LRFD): Clarified beam location and construction joints at crown of bridge deck.

7.02.27 (LRFD): Revised the maximum sidewalk cross slope from 2% to 2.1% to match the final ruling of PROWAG.

Updates to the MDOT Cell Library, Sample Plans, and other automated tools may be required in tandem with some of this month's updates. Until such updates can be made, it is the designer's/detailer's responsibility to manually incorporate any necessary revisions to notes and plan details to reflect these revisions.

Index to Special Details

11-27-2023

⑥

SPECIAL DETAIL NUMBER	NUMBER OF SHEETS	TITLE	CURRENT DATE
21	2	GUARDRAIL AT INTERSECTIONS	6-6-22
24	8	GUARDRAIL ANCHORED IN BACKSLOPE TYPES 4B, 4T, & 4MGS-8	12-6-22
99	2	CHAIN LINK FENCE WITH WIRE ROPE	12-6-22
*R-28-K	7	CURB RAMP AND DETECTABLE WARNING DETAILS	11-8-23
*R-29-J	4	DRIVEWAY OPENINGS & APPROACHES, AND CONCRETE SIDEWALK	11-8-23
R-32-F	8	APPROACH CURB & GUTTER DOWNSPOUTS	9-20-22
R-32-SD	6	APPROACH CURB & GUTTER DOWNSPOUTS (FOR SAFETY SHAPES)	4-24-23
R-43-J	2	LOCATION OF TRANSVERSE JOINTS IN PLAIN CONCRETE PAVEMENT	1-4-22
R-44-G	7	CONCRETE PAVEMENT REPAIR	9-18-23
R-45-K	2	PAVEMENT REINFORCEMENT FOR BRIDGE APPROACH	1-4-22
R-53-A	22	TEMPORARY CONCRETE BARRIER LIMITED DEFLECTION	8-14-15
R-56-F	6	GUARDRAIL MEDIAN OBJECT PROTECTION	4-11-23
R-60-J	16	GUARDRAIL TYPES A, B, BD, T, TD, MGS-8, & MGS-8D	8-15-23
R-62-H	4	GUARDRAIL APPROACH TERMINAL TYPE 2M	6-16-22
R-63-C	17	GUARDRAIL APPROACH TERMINAL TYPES 3B & 3T	3-7-23
R-66-E	4	GUARDRAIL DEPARTING TERMINAL TYPES B, T, & MGS	9-14-23
R-67-G	16	GUARDRAIL ANCHORAGE, BRIDGE, DETAILS	12-6-22
R-67-SD	6	GUARDRAIL ANCHORAGE, BRIDGE, DETAILS (FOR SAFETY SHAPES)	4-4-23
R-72-D	6	GUARDRAIL LONG SPAN INSTALLATIONS	8-23-22
R-73-F	3	GUARDRAIL OVER BOX OR SLAB CULVERTS	8-1-19
R-80-F	8	GRANULAR BLANKETS, UNDERDRAINS, OUTLET ENDINGS, & BULKHEADS	6-28-21
R-88-E	4	STEEL END SECTION	3-7-23
R-100-I	4	SEEDING AND TREE PLANTING	8-3-21
R-110-B	3	PAVEMENT SAFETY EDGE	6-14-21
R-112-J	10	SHOULDER AND CENTER LINE CORRUGATIONS	8-2-23
R-126-I	5	PLACEMENT OF TEMPORARY CONCRETE & STEEL BARRIER	8-25-15
R-127-H	8	DELINEATOR INSTALLATIONS	8-11-23

*** Denotes New or Revised Special Detail to be included in projects for (beginning with) the March letting.**

Notes:

Former Standard Plans IV-87, IV-89, IV-90, and IV-91 Series, used for building cast-in-place concrete head walls 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, Special Structures Unit will provide special details for inclusion in construction plans for MDOT jobs. To assure prompt delivery, requests ***must*** **be made in advance.** Contact: MDOT-TriezenbergSquad@Michigan.gov

Former Standard Plans IV-93 and IV-94 series have been replaced with precast concrete box & three-sided culverts as per the 2020 Standard Specifications for Construction.

Index to Bridge Detail Sheets

11-27-2023

⑦

DETAIL NUMBER	NUMBER OF SHEETS	TITLE	CURRENT DATE
*B-25-L	8	BRIDGE RAILING, AESTHETIC PARAPET TUBE	11-15-23
*B-27-B	7	BRIDGE RAILING, 3 TUBE WITH PICKETS	11-17-23
B-28-A	7	BRIDGE BARRIER RAILING, TYPE 7	9-2-20
B-29-A	8	BRIDGE BARRIER RAILING, TYPE 6	9-2-20
B-102-D	4	STANDARD SLOPE PAVING DETAILS	9-18-23
EJ3AF	1 to 4	EXPANSION JOINT DETAILS (See Notes)	1-23-23
EJ4S	1 to 4	EXPANSION JOINT DETAILS (See Notes)	1-23-23
PC-1N	2	PRESTRESSED CONCRETE I-BEAM DETAILS (See Notes)	11-28-22
PC-2I	2	70" PRESTRESSED CONCRETE I-BEAM DETAILS (See Notes)	11-28-22
PC-4G	2	PRESTRESSED CONCRETE 1800 BEAM DETAILS (See Notes)	11-28-22
PC-5A	2	PRESTRESSED CONCRETE BULB-TEE BEAM DETAILS (See Notes)	11-28-22

*** Denotes New or Revised Special Detail to be included in projects for (beginning with) the March letting.**

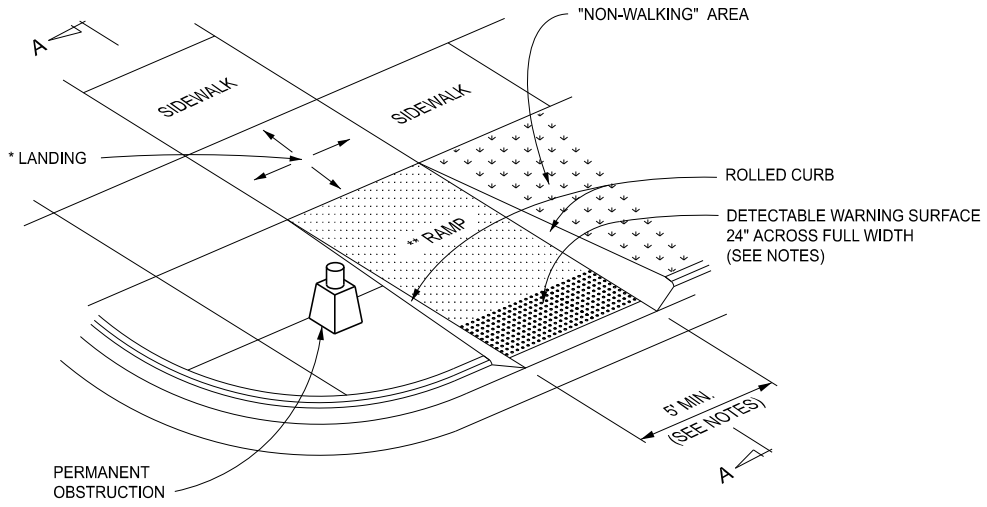
Notes:

Details EJ3AF & EJ4S are interactive, i.e., designers and detailers choose details based upon railing type and angle of crossing and fill in the project specific dimensions for the end plate. Place all details appropriate for the project (including the end plate), structure specific information, and the Expansion Joint Device quantity on the sheet. Add the sheet to the plans as a normal plan sheet. Call out and designate the location of the expansion joint device and the end plate on the Superstructure Sheet in the plan set.

Details PC-1N, PC-2I, PC-4G, and PC-5A shall have structure specific information and quantities added to the sheet. The sheet shall then be added to the plans as a normal plan sheet.

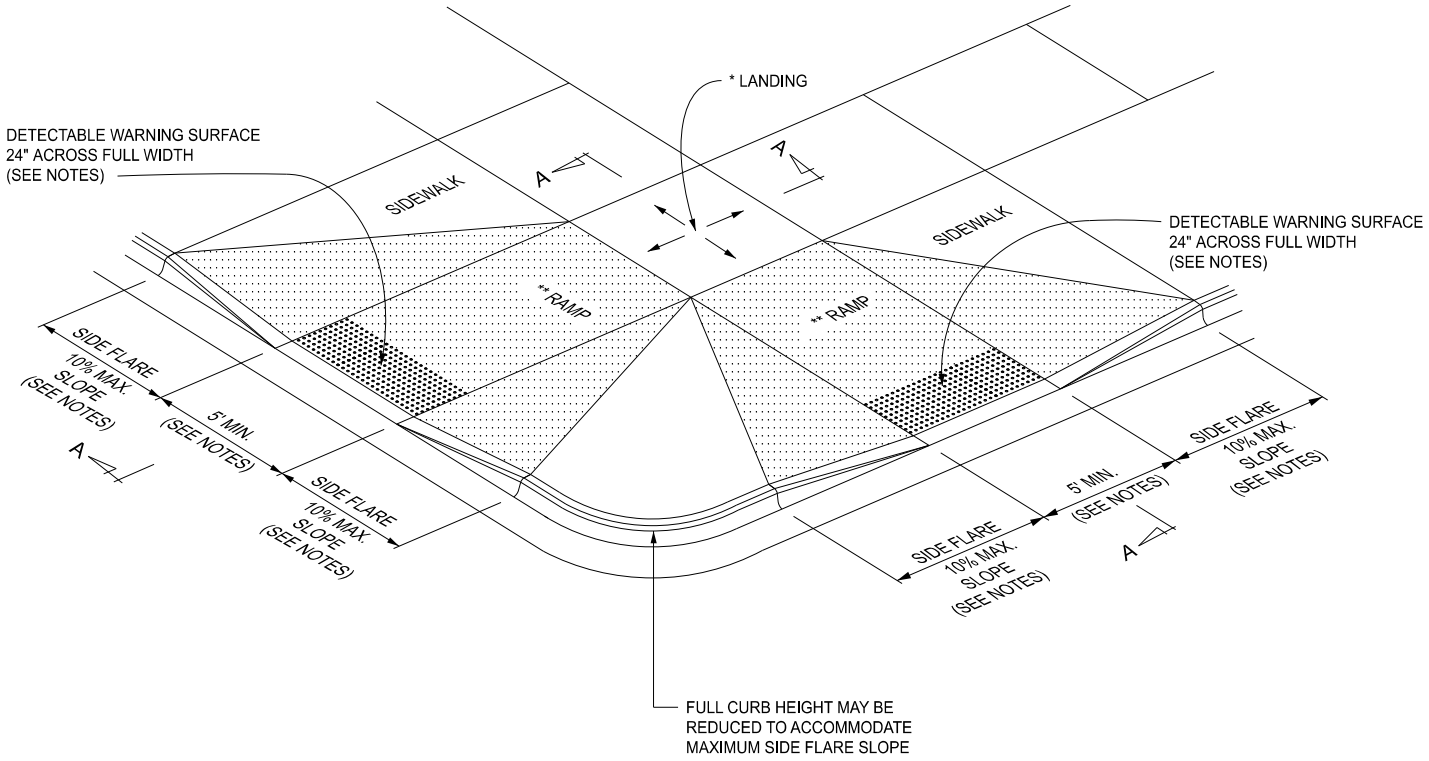
* MAXIMUM LANDING SLOPE IS 2.1% IN EACH DIRECTION OF TRAVEL. LANDING MINIMUM DIMENSIONS 5' x 5'. SEE NOTES.

** MAXIMUM RAMP CROSS SLOPE IS 2.1%, RUNNING SLOPE 5% - 7% (8.3% MAXIMUM). SEE NOTES.



CURB RAMP TYPE R

(ROLLED SIDES)



CURB RAMP TYPE F

(FLARED SIDES, TWO RAMPS SHOWN)

APPROVED BY: _____
DIRECTOR, BUREAU OF FIELD SERVICES

APPROVED BY: _____
DIRECTOR, BUREAU OF DEVELOPMENT

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Michigan Department of Transportation

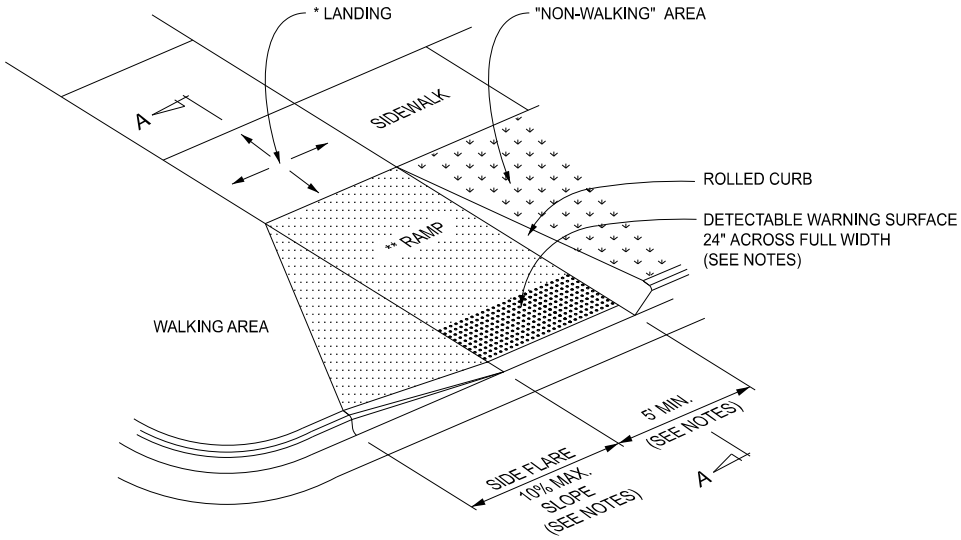
DEPARTMENT DIRECTOR
BRADLEY C. WIEFERICH, PE

STANDARD PLAN FOR
CURB RAMP AND
DETECTABLE WARNING DETAILS

(SPECIAL DETAIL)	11/08/2023	R-28-K	SHEET
FHWA APPROVAL	PLAN DATE		1 OF 7

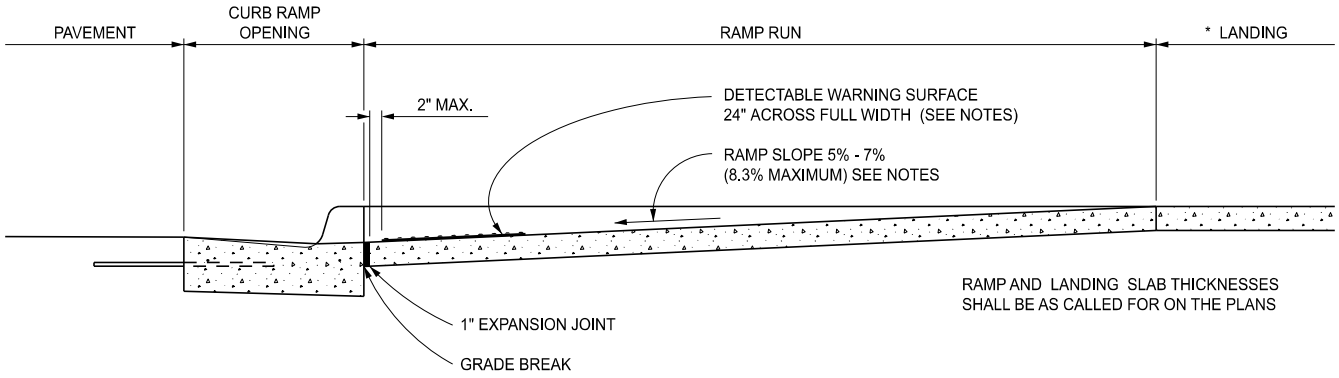
* MAXIMUM LANDING SLOPE IS 2.1% IN EACH DIRECTION OF TRAVEL. LANDING MINIMUM DIMENSIONS 5' x 5'. SEE NOTES.

** MAXIMUM RAMP CROSS SLOPE IS 2.1%, RUNNING SLOPE 5% - 7% (8.3% MAXIMUM). SEE NOTES.



CURB RAMP TYPE RF

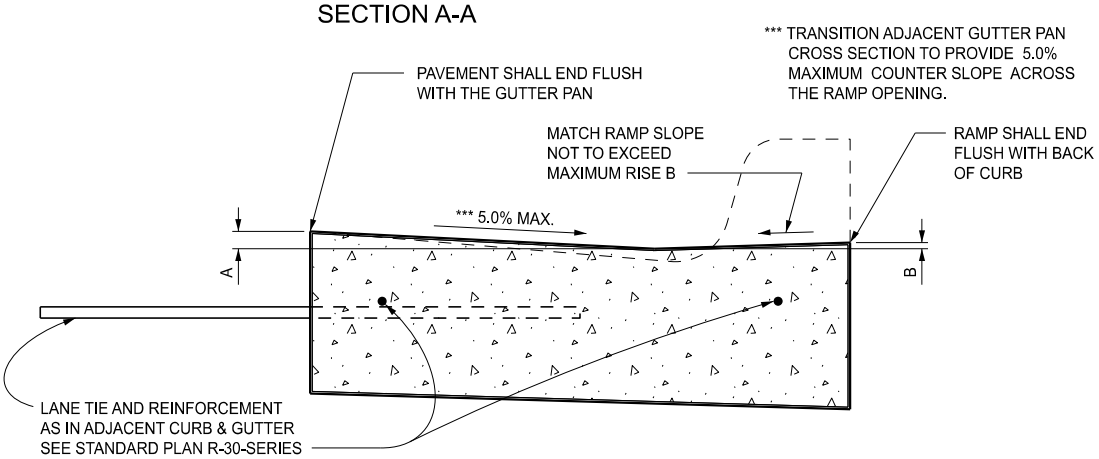
(ROLLED / FLARED SIDES)



SECTION A-A

CURB TYPE	MAXIMUM RISE (INCHES)	
	A	B
B1	¾	1
B2	¾	1
B3	¾	1
D1	¾	1
D2	¾	1
D3	¾	1
C1	½	½
C2	½	½
C3	¾	½
C4	¾	½
C5	1	½
C6	1	½
F1	½	½
F2	½	½
F3	¾	½
F4	¾	½
F5	1	½
F6	1	½

FOR CURB TYPES SEE STANDARD PLAN R-30-SERIES



SECTION THROUGH CURB RAMP OPENING

(TYPICAL ALL RAMP TYPES)

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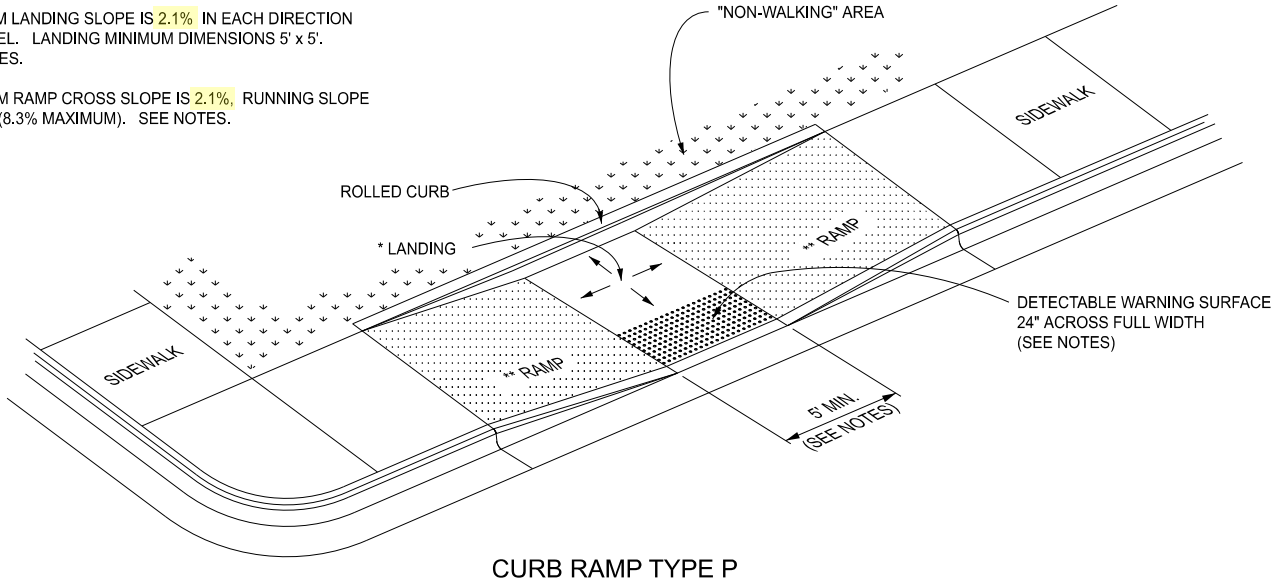
STANDARD PLAN FOR

CURB RAMP AND DETECTABLE WARNING DETAILS

(SPECIAL DETAIL) FHWA APPROVAL	11/08/2023 PLAN DATE	R-28-K	SHEET 2 OF 7

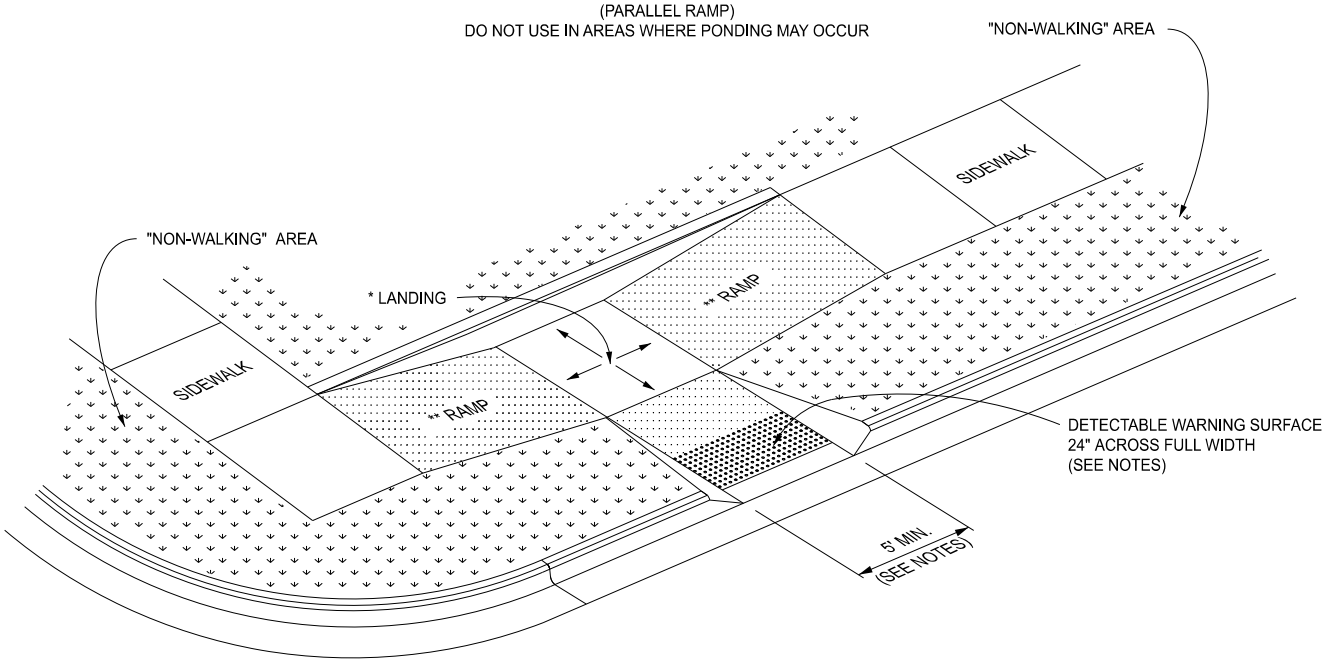
* MAXIMUM LANDING SLOPE IS 2.1% IN EACH DIRECTION OF TRAVEL. LANDING MINIMUM DIMENSIONS 5' x 5'. SEE NOTES.

** MAXIMUM RAMP CROSS SLOPE IS 2.1%, RUNNING SLOPE 5% - 7% (8.3% MAXIMUM). SEE NOTES.



CURB RAMP TYPE P

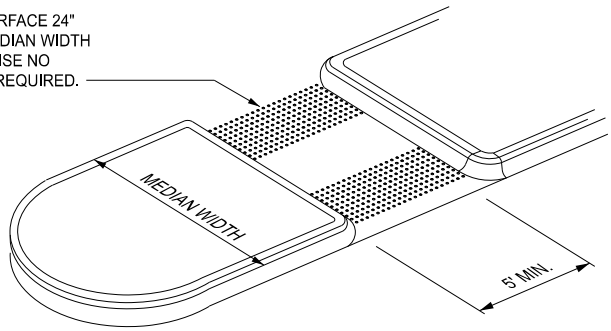
(PARALLEL RAMP)
DO NOT USE IN AREAS WHERE PONDING MAY OCCUR



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)

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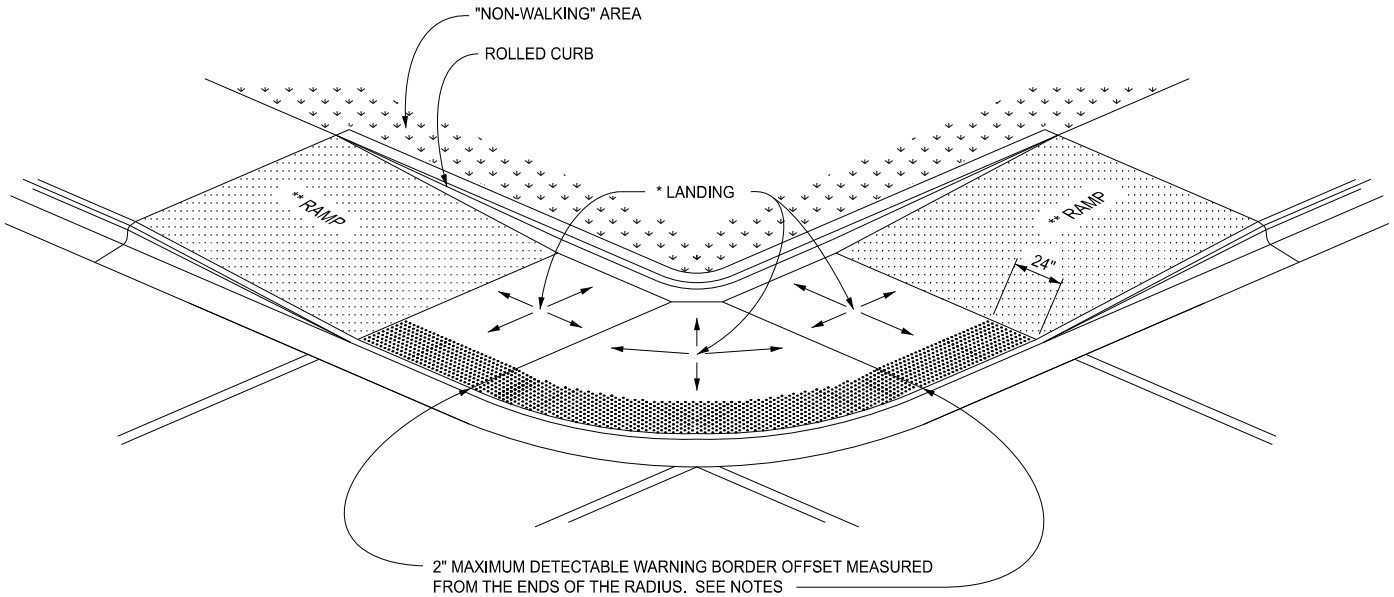
STANDARD PLAN FOR
CURB RAMP AND
DETECTABLE WARNING DETAILS

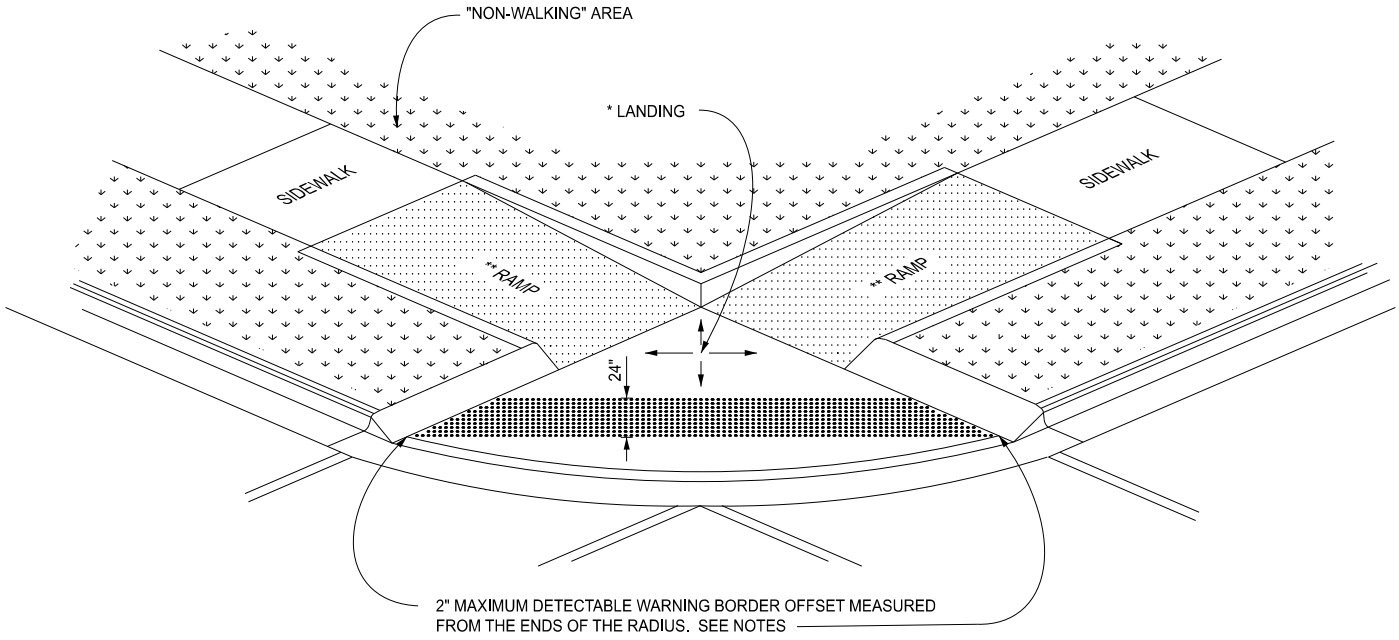
(SPECIAL DETAIL) FHWA APPROVAL	11/08/2023 PLAN DATE	R-28-K	SHEET 3 OF 7

* MAXIMUM LANDING SLOPE IS 2.1% IN EACH DIRECTION OF TRAVEL. LANDING MINIMUM DIMENSIONS 5' x 5'. SEE NOTES.

** MAXIMUM RAMP CROSS SLOPE IS 2.1%, 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

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CURB RAMP AND
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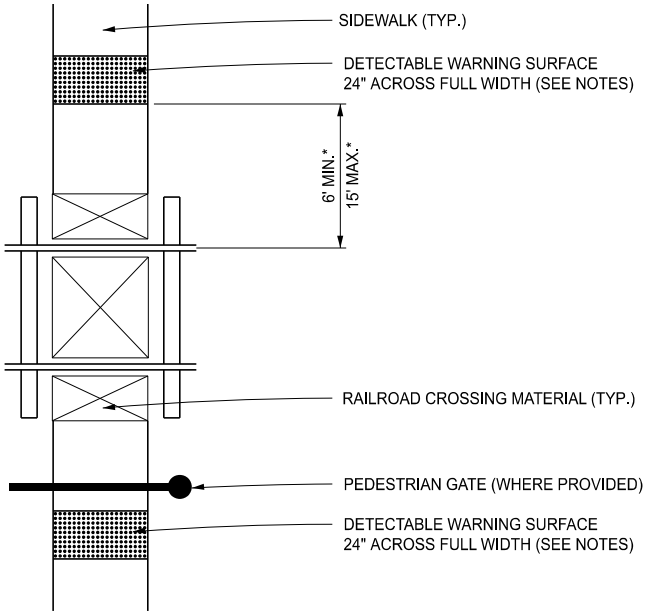
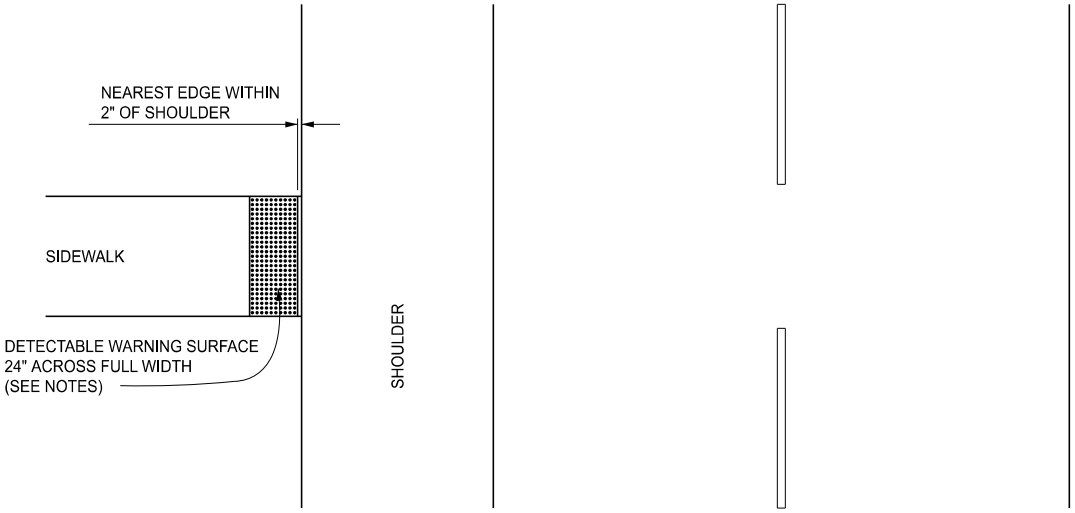
(SPECIAL DETAIL) FHWA APPROVAL	11/08/2023 PLAN DATE	R-28-K	SHEET 4 OF 7

* 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

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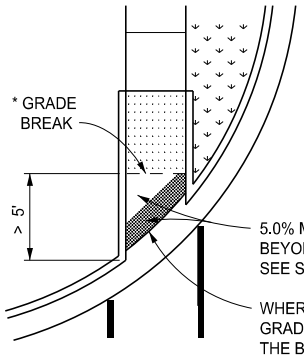
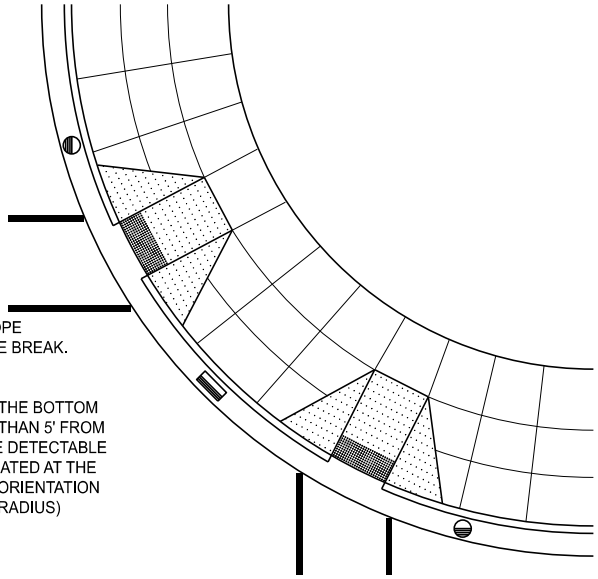
STANDARD PLAN FOR
CURB RAMP AND
DETECTABLE WARNING DETAILS

(SPECIAL DETAIL) / FHWA APPROVAL	11/08/2023 / PLAN DATE	R-28-K	SHEET 5 OF 7



CURB RAMP LOCATED IN RADIUS (TYPE R SHOWN)
(GRADE BREAK OFFSET GREATER THAN 5')

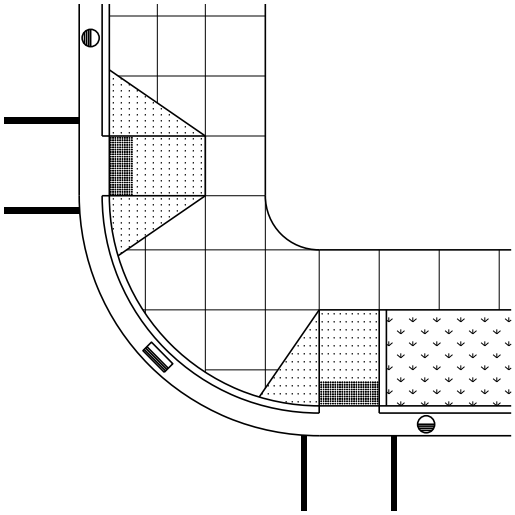


CURB RAMP PERPENDICULAR TO RADIAL CURB (TYPE F SHOWN)

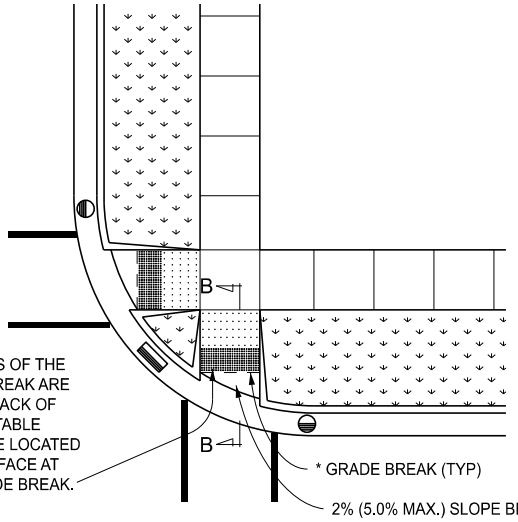
(USE WITH RADIAL CURB WHEN THE CROSSWALK AND CURB RAMP ARE NOT ALIGNED)

LEGEND

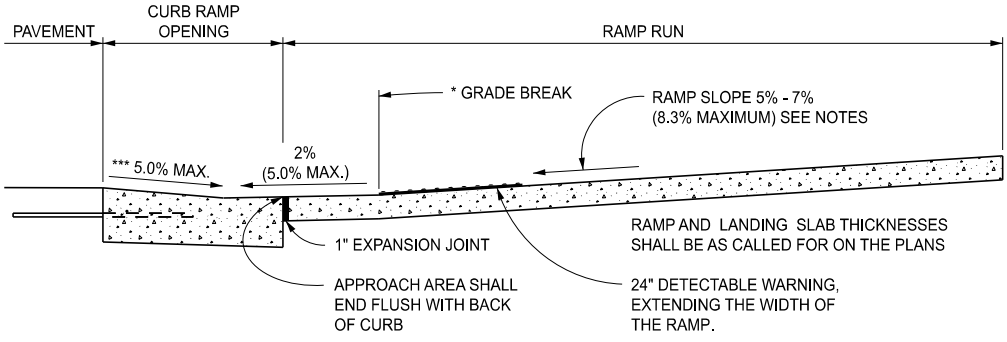
- SLOPED SURFACE
- DETECTABLE WARNING
- "NON-WALKING" AREA
- CROSSWALK MARKING
- PREFERRED LOCATION OF DRAINAGE INLET (TYP.)
- ALTERNATE LOCATION OF DRAINAGE INLET (TYP.)



CURB RAMP PERPENDICULAR TO TANGENT CURB
(TYPE F AND TYPE RF SHOWN)



CURB RAMP LOCATED IN RADIUS (TYPE R SHOWN)
(GRADE BREAK OFFSET LESS THAN 5')



* 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

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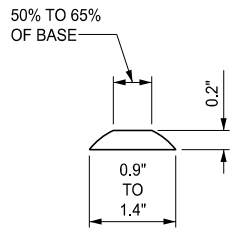
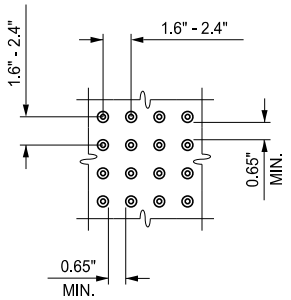
STANDARD PLAN FOR
CURB RAMP AND
DETECTABLE WARNING DETAILS

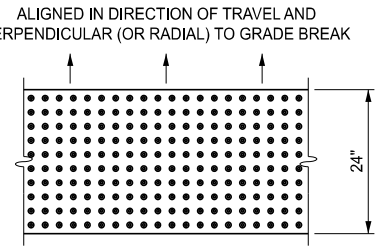
(SPECIAL DETAIL) / FHWA APPROVAL	11/08/2023 / PLAN DATE	R-28-K	SHEET 6 OF 7



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

RAMPS SHALL BE PROVIDED AT ALL CORNERS OF AN INTERSECTION WHERE THERE IS EXISTING OR PROPOSED SIDEWALK AND CURB. RAMPS 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 FEASIBLE, RAMP WIDTH MAY BE REDUCED TO NOT LESS THAN 4' AND LANDINGS TO NOT LESS THAN 4' x 4'.

CURB RAMPS WITH A RUNNING SLOPE ≤ 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 2.1% 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 2.1%. 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 RAMPS TO EXCEED 15 FEET IN LENGTH NOT INCLUDING LANDINGS OR TRANSITIONS.

DRAINAGE STRUCTURES SHOULD NOT BE PLACED IN LINE WITH RAMPS. 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 ½". 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.

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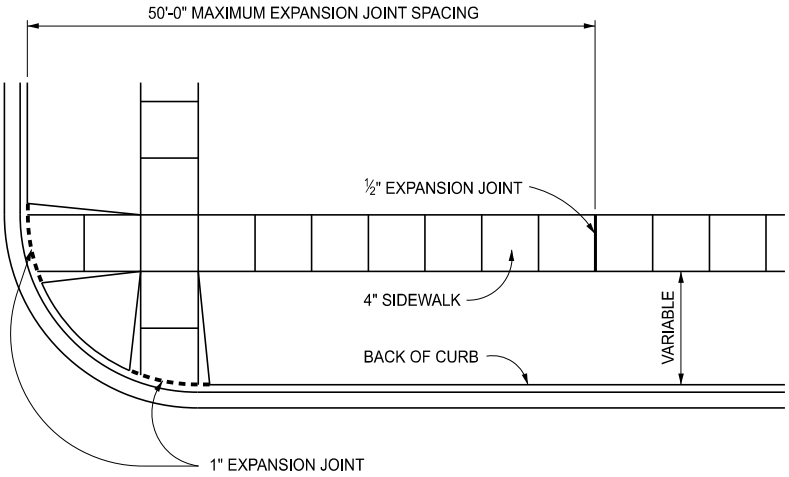
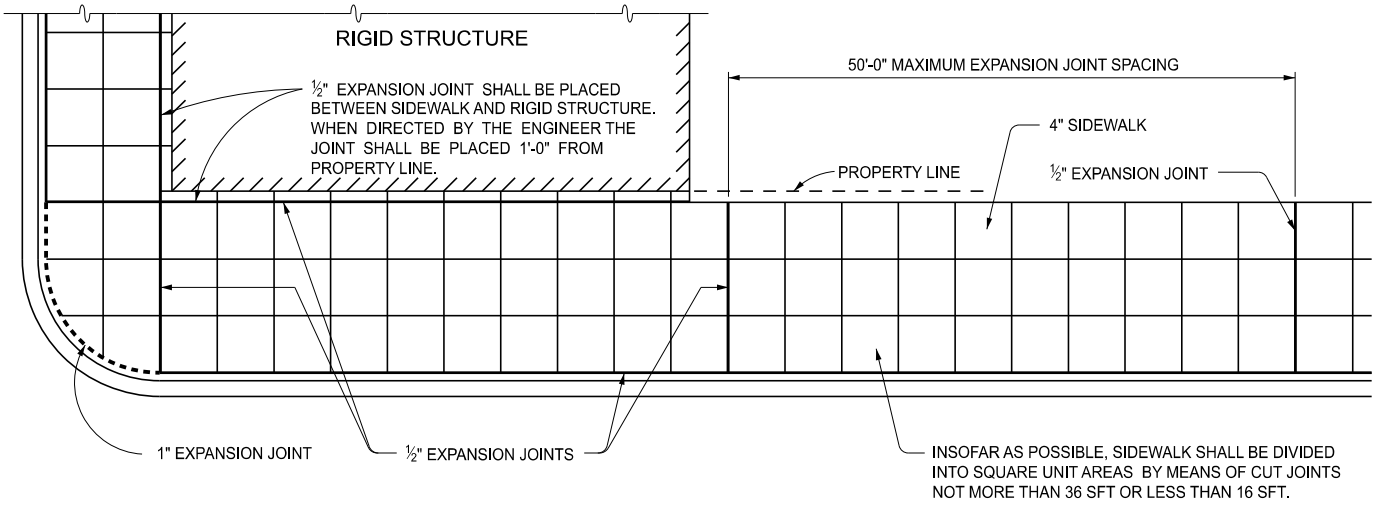
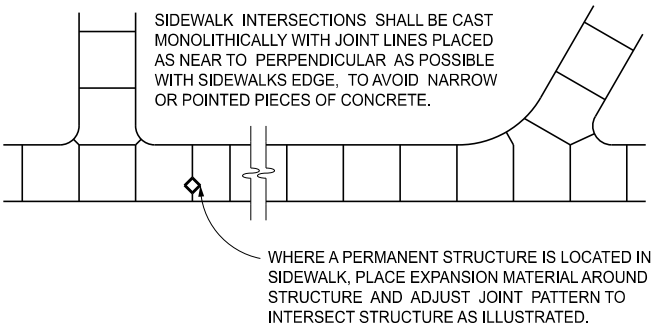
STANDARD PLAN FOR
CURB RAMP AND
DETECTABLE WARNING DETAILS

(SPECIAL DETAIL) FHWA APPROVAL	11/08/2023 PLAN DATE	R-28-K	SHEET 7 OF 7

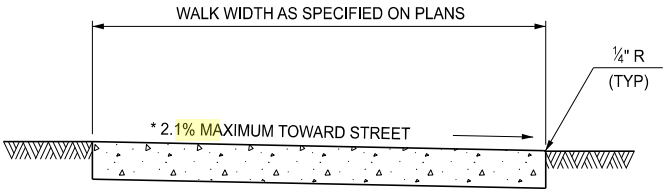




LOCATION OF JOINTS IN CONCRETE SIDEWALK



TYPICAL SIDEWALK JOINT LAYOUTS



* SEE NOTES

4" CONCRETE SIDEWALK

APPROVED BY: _____
DIRECTOR, BUREAU OF FIELD SERVICES

APPROVED BY: _____
DIRECTOR, BUREAU OF DEVELOPMENT

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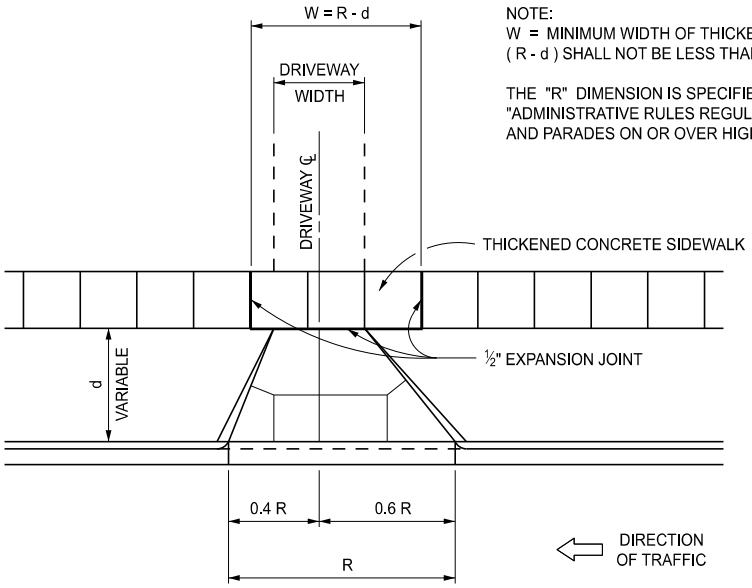
DEPARTMENT DIRECTOR
BRADLEY C. WIEFERICH, PE

STANDARD PLAN FOR
DRIVEWAY OPENINGS & APPROACHES, AND CONCRETE SIDEWALK

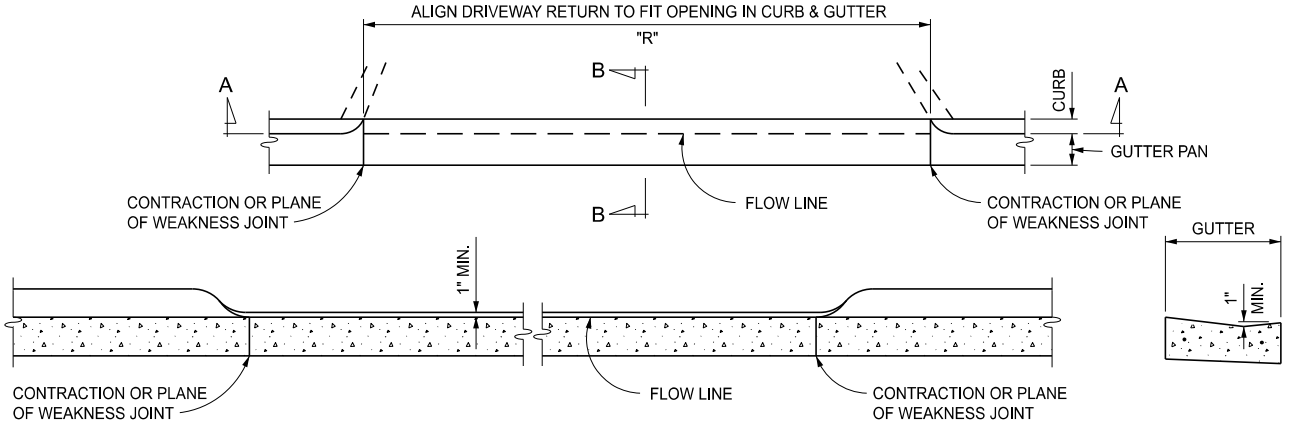
(SPECIAL DETAIL) FHWA APPROVAL	11/08/2023 PLAN DATE	R-29-J	SHEET 1 OF 4



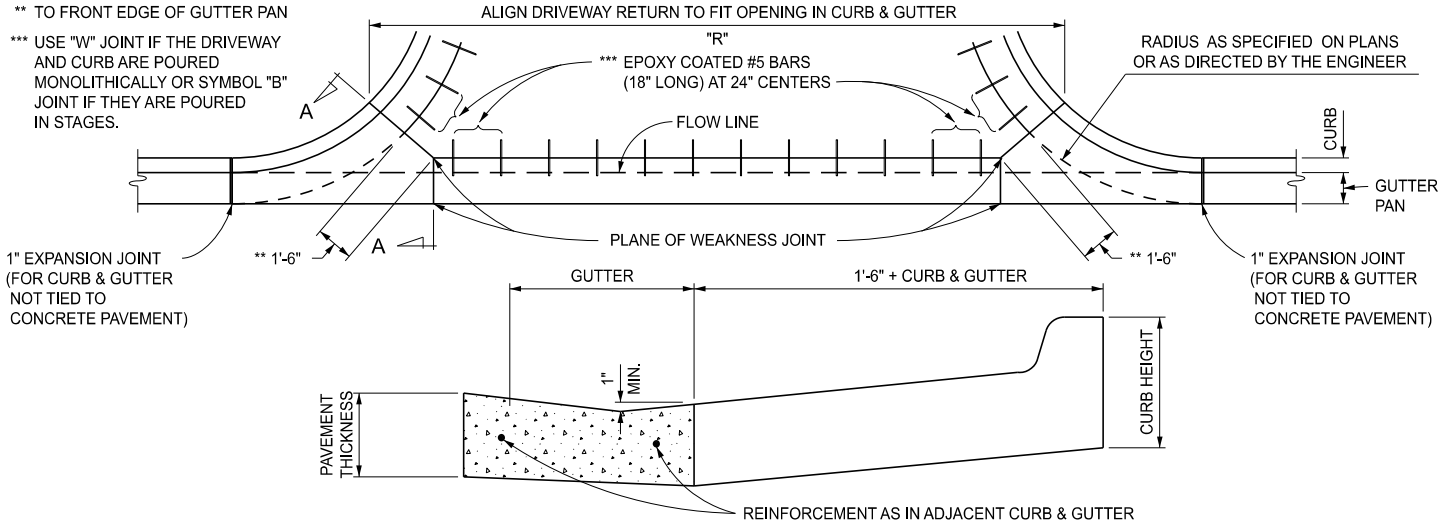
NOTE:
W = MINIMUM WIDTH OF THICKENED CONCRETE SIDEWALK.
(R - d) SHALL NOT BE LESS THAN DRIVEWAY WIDTH.

THE "R" DIMENSION IS SPECIFIED IN THE PUBLICATION "ADMINISTRATIVE RULES REGULATING DRIVEWAYS, BANNERS AND PARADES ON OR OVER HIGHWAYS".

CONCRETE DRIVEWAY OPENING LAYOUT



CONCRETE DRIVEWAY OPENING, DETAIL L



CONCRETE DRIVEWAY OPENING, DETAIL M

NOTE:
FOR ROADWAYS WITH CONCRETE PAVEMENTS, LONGITUDINAL LANE TIES WILL BE CONTINUOUS THROUGH THE DRIVEWAY OPENING AND THE SPACING OF THE #5 BARS IN CONCRETE DRIVEWAYS SHALL BE ADJUSTED TO AVOID CONFLICT WITH THE LONGITUDINAL LANE TIES.

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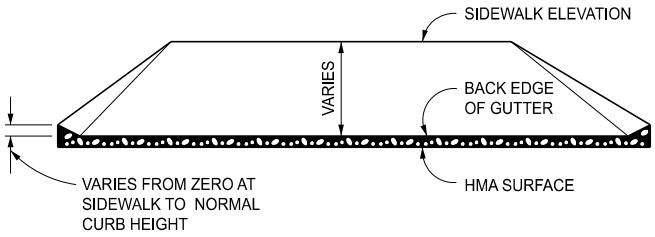
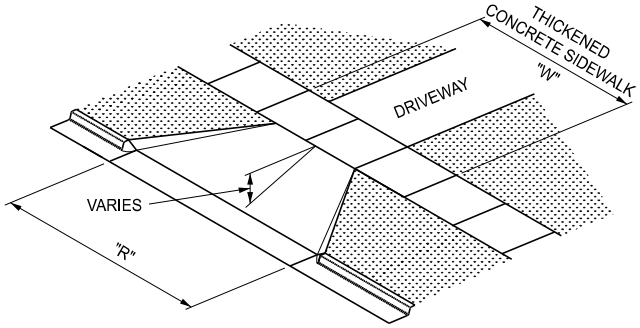
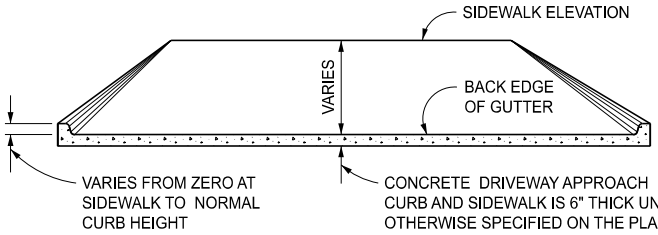
(SPECIAL DETAIL) / FHWA APPROVAL	11/08/2023 / PLAN DATE	R-29-J	SHEET 2 OF 4

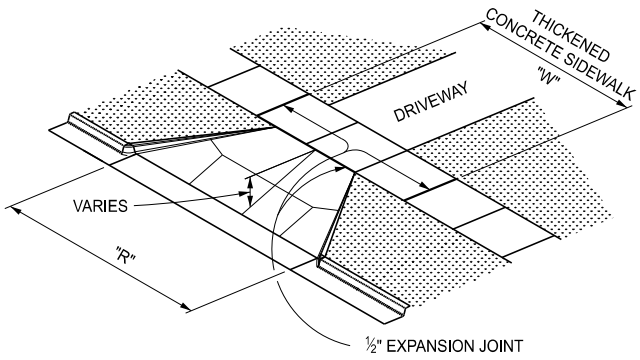




HMA DRIVEWAY APPROACH

(TO BE USED WITH DETAIL L)





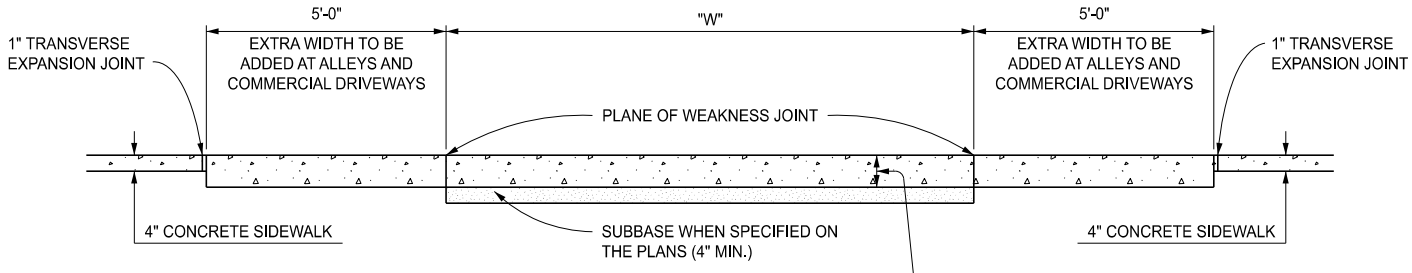
NOTES:

MONOLITHIC CURB IS INCLUDED IN THE CONCRETE DRIVEWAY APPROACH QUANTITY.

REINFORCEMENT IS NOT REQUIRED UNLESS SPECIFIED ON THE PLANS. WHEN REINFORCEMENT IS SPECIFIED, SEE CHART ON THIS SHEET.

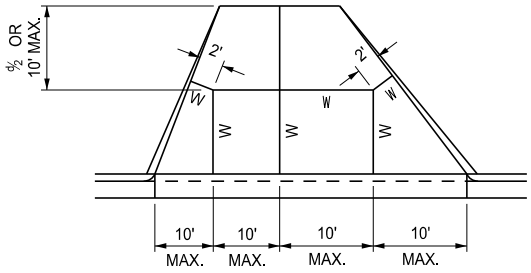
CONCRETE DRIVEWAY APPROACH

(TO BE USED WITH DETAIL L OR M)



WHEN CONCRETE DRIVEWAY APPROACH IS SPECIFIED, THE THICKENED CONCRETE SIDEWALK THICKNESS IS EQUAL TO THE THICKNESS OF THE CONCRETE DRIVEWAY APPROACH. WHEN HMA DRIVEWAY APPROACH IS SPECIFIED, THE THICKENED CONCRETE SIDEWALK THICKNESS IS 6" MIN.

THICKENED CONCRETE SIDEWALK



ADJUST DRIVEWAY JOINTS AS NEEDED TO ALIGN WITH ANY COINCIDING TRANSVERSE PAVEMENT JOINTS,

JOINT LAYOUT IS AS INDICATED OR AS DIRECTED BY THE ENGINEER.

INTERMEDIATE DRIVEWAY JOINT DETAILS

REINFORCEMENT FOR CONCRETE DRIVEWAYS		
CONCRETE DRIVEWAY THICKNESS	WIRE SIZE (6" x 6" MESH)	AVERAGE WEIGHT (LBS/100 SFT)
LESS THAN 8"	W1.4	21
	W2.9	42
8" OR GREATER	USE WIRE FABRIC REINFORCEMENT SPECIFIED ON STANDARD PLAN R-37-SERIES	

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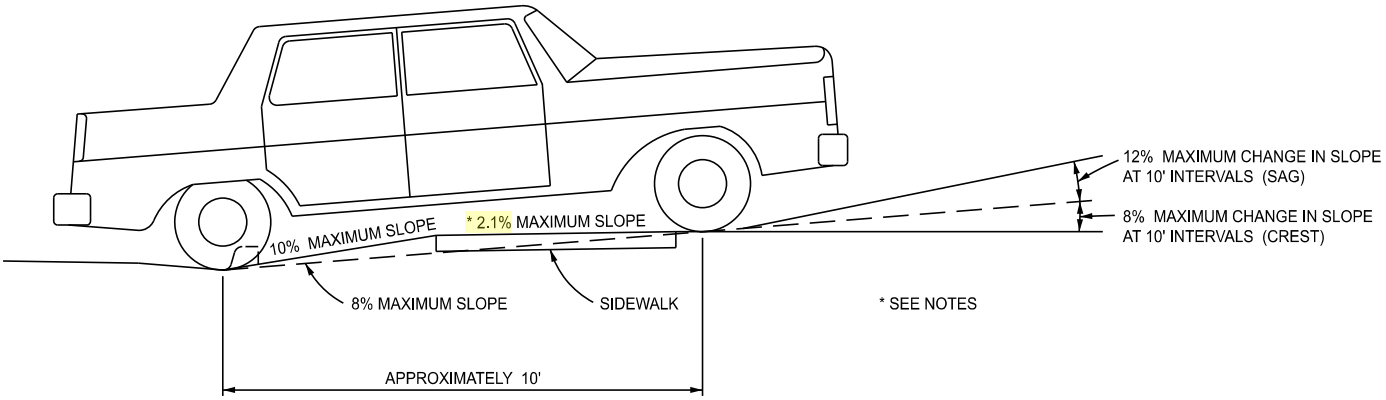
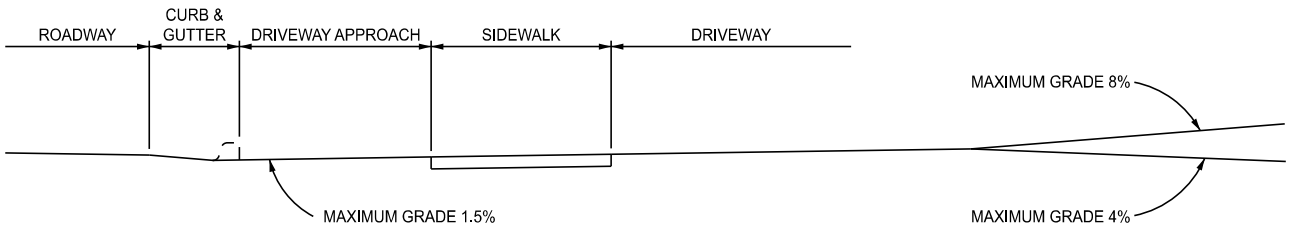
STANDARD PLAN FOR
DRIVEWAY OPENINGS & APPROACHES, AND CONCRETE SIDEWALK

(SPECIAL DETAIL) FHWA APPROVAL	11/08/2023 PLAN DATE	R-29-J	SHEET 3 OF 4



LOW VOLUME COMMERCIAL OR RESIDENTIAL DRIVEWAY SLOPES



COMMERCIAL DRIVEWAY PROFILE FOR MAJOR TRAFFIC GENERATORS

NOTES:

FOR DRIVEWAY DESIGN REFER ALSO TO "ADMINISTRATIVE RULES REGULATING DRIVEWAYS, BANNERS, AND PARADES ON OR OVER HIGHWAYS" AND GEOMETRIC DESIGN G-680-SERIES, COMMERCIAL DRIVEWAYS.

FOR CURB AND GUTTER DETAILS, SEE STANDARD PLAN R-30-SERIES.

TRANSVERSE SIDEWALK SLOPES ARE 2.1% MAXIMUM. IN ORDER TO MEET SITE CONDITIONS, IF THE TRANSVERSE SLOPE IS REQUIRED TO BE LESS THAN 1.5%, LONGITUDINAL DRAINAGE MUST be PROVIDED.

WHEN SETTING GRADES FOR COMMERCIAL DRIVES, THE TYPES OF VEHICLES USING THE DRIVE SHOULD BE CONSIDERED.

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STANDARD PLAN FOR
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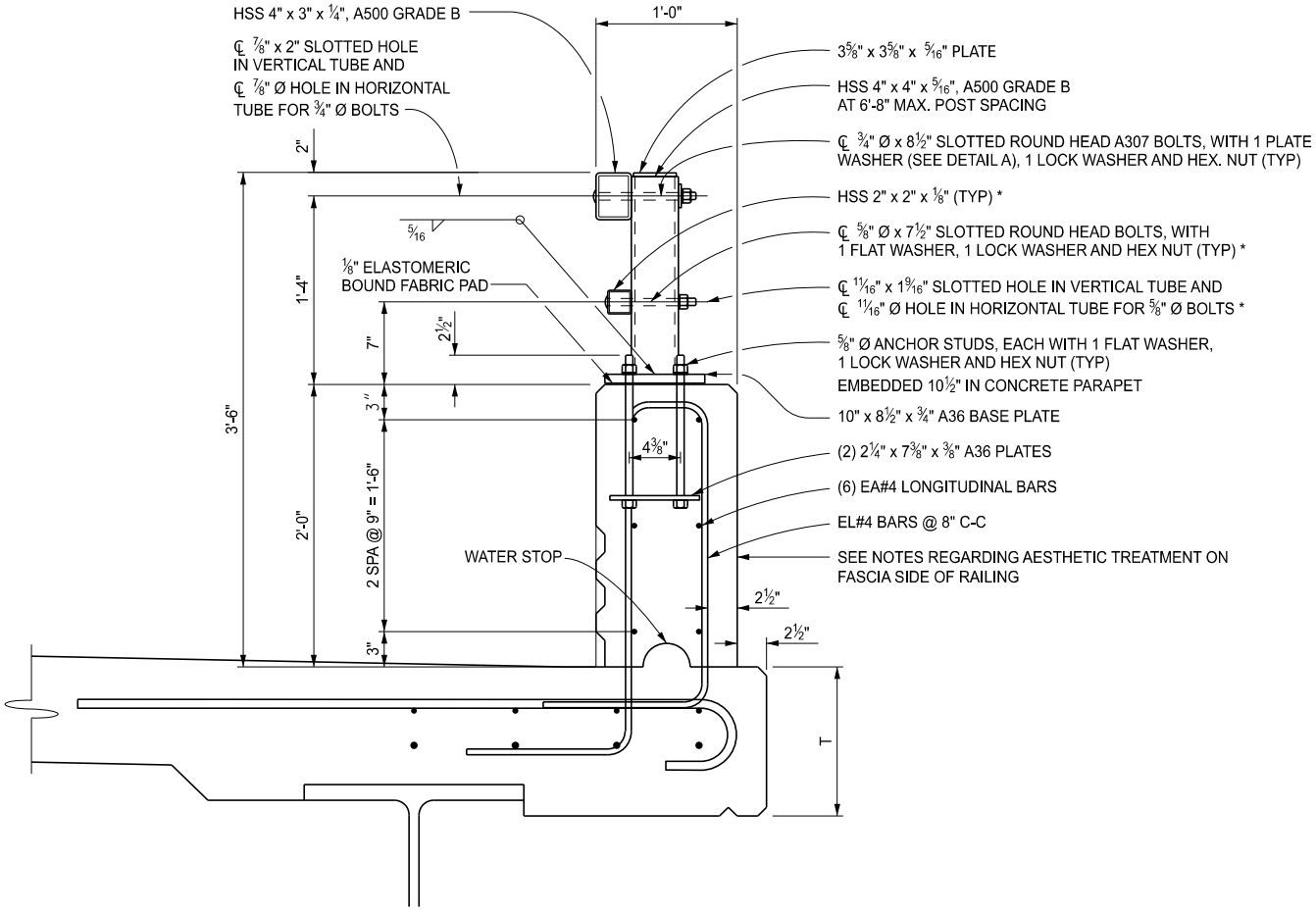
(SPECIAL DETAIL) / FHWA APPROVAL	11/08/2023 / PLAN DATE	R-29-J	SHEET 4 OF 4



FLUSH MOUNT BRIDGE RAILING

NOTES:

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

DETAILS SHOWN ARE IN ACCORDANCE WITH 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.

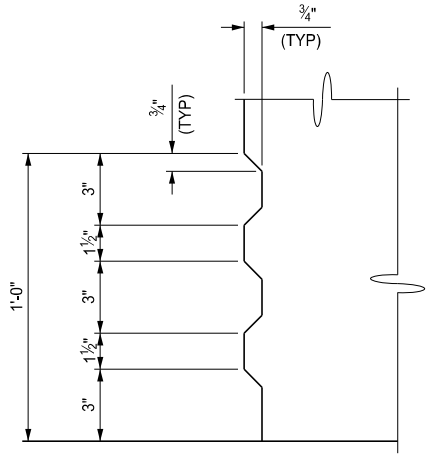
THE LIGHT STANDARD ANCHOR BOLT ASSEMBLY IS INCLUDED IN THE BID ITEM "BRIDGE RAILING, AESTHETIC PARAPET TUBE". SEE STANDARD PLAN B-103-SERIES.

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 ⅛" RAIL, SLOTTED HOLE, AND ⅝" BOLT ARE NOT REQUIRED WHEN RAILING IS USED IN COMBINATION WITH PEDESTRIAN FENCING (SEE STANDARD PLAN B-41-SERIES).



AESTHETIC TREATMENT DETAIL

APPROVED BY: _____
DIRECTOR, BUREAU OF FIELD SERVICES

APPROVED BY: _____
DIRECTOR, BUREAU OF DEVELOPMENT

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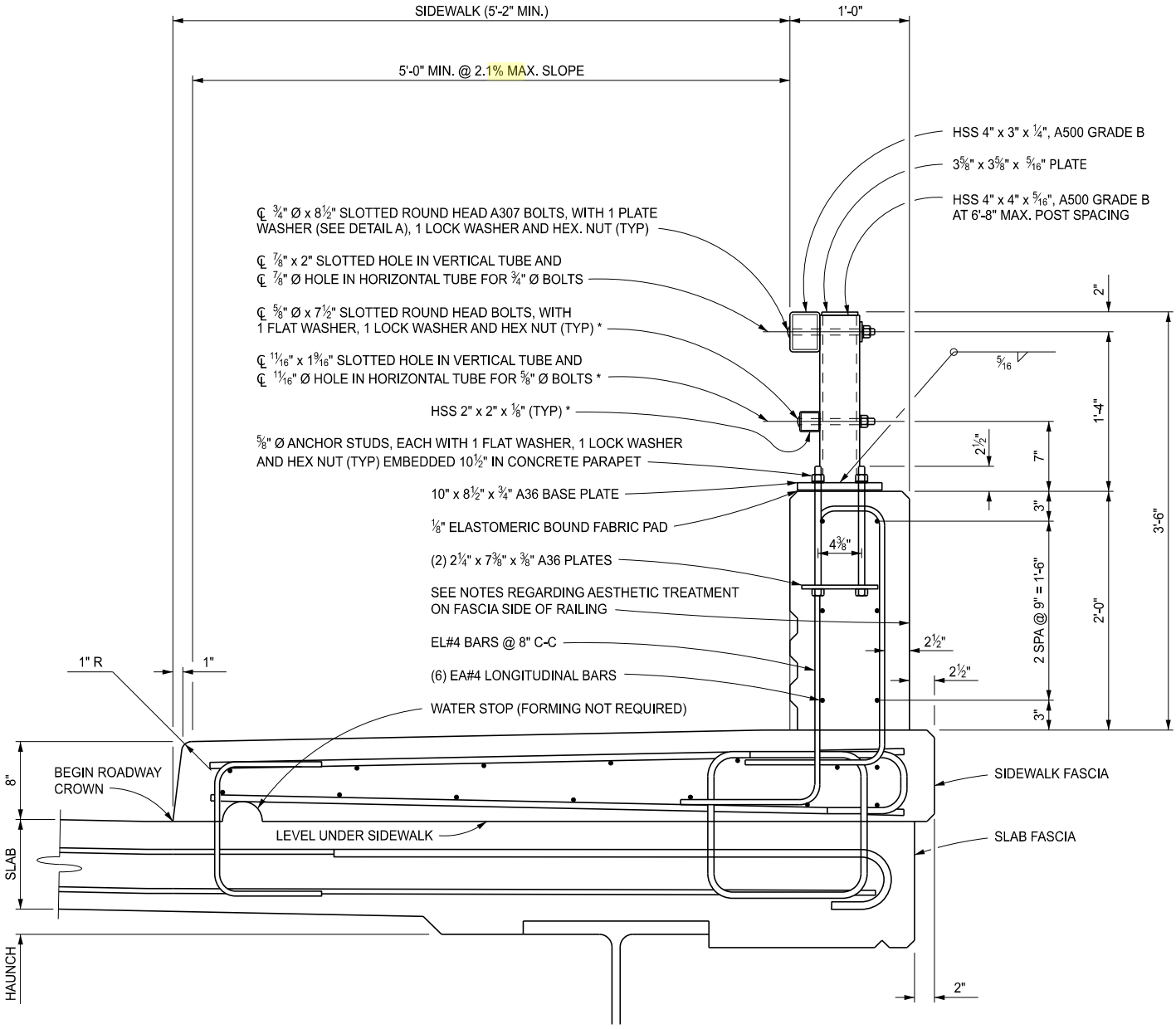
STANDARD PLAN FOR
BRIDGE RAILING, AESTHETIC PARAPET TUBE

(SPECIAL DETAIL)	11/15/2023	B-25-L	SHEET
FHWA APPROVAL	PLAN DATE		1 OF 8



BRIDGE RAILING WITH SIDEWALK

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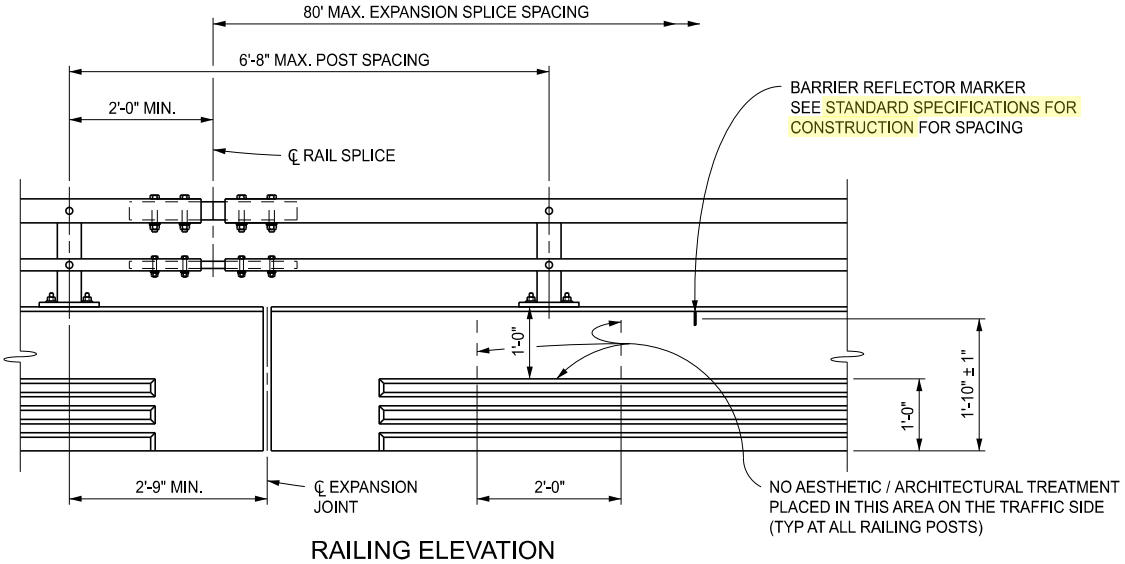
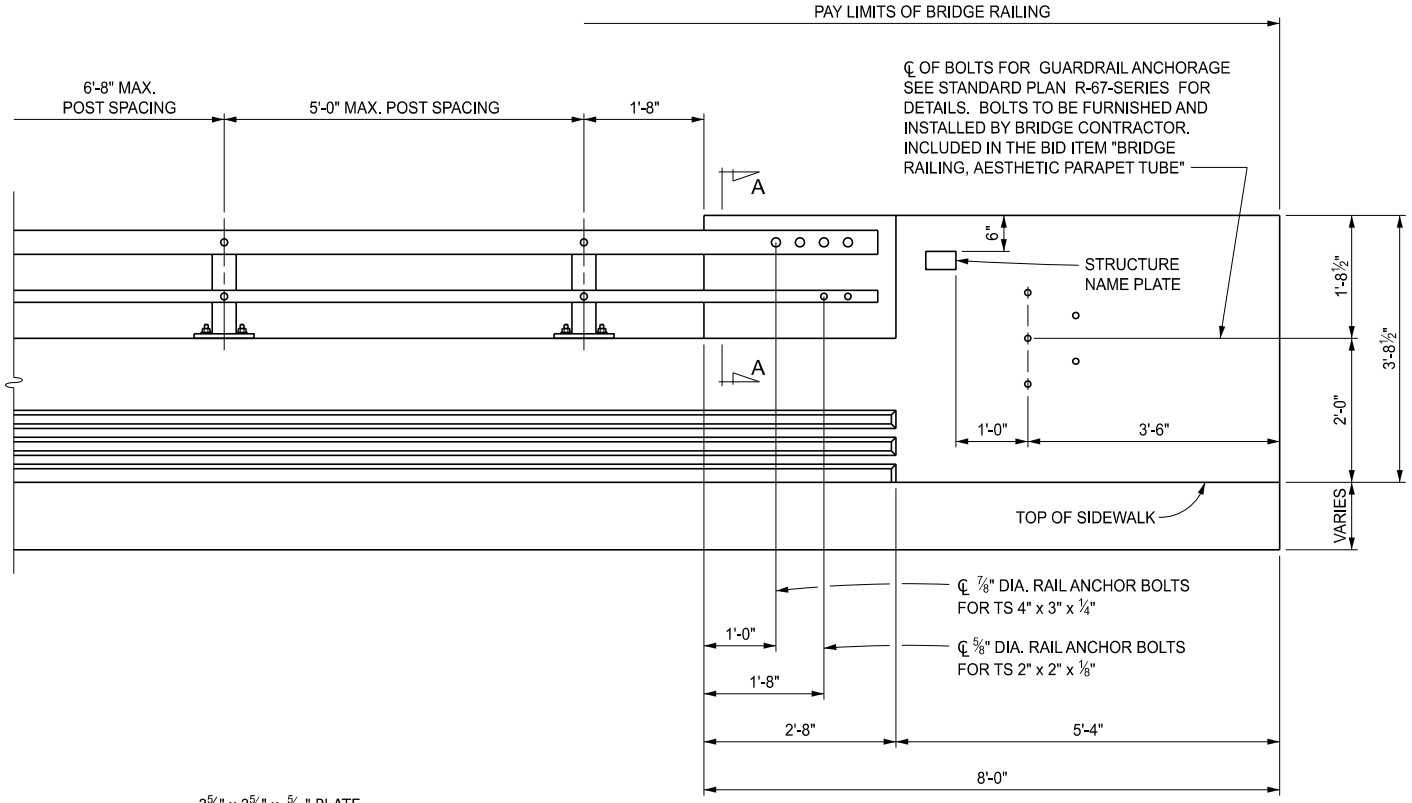
STANDARD PLAN FOR
BRIDGE RAILING, AESTHETIC PARAPET TUBE

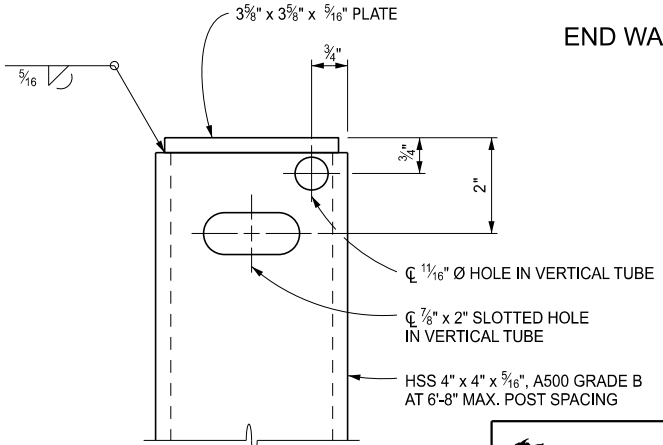
(SPECIAL DETAIL) FHWA APPROVAL	11/15/2023 PLAN DATE	B-25-L	SHEET 2 OF 8



RAILING ELEVATION



END WALL ELEVATION



VERTICAL TUBE DETAIL
FRONT VIEW

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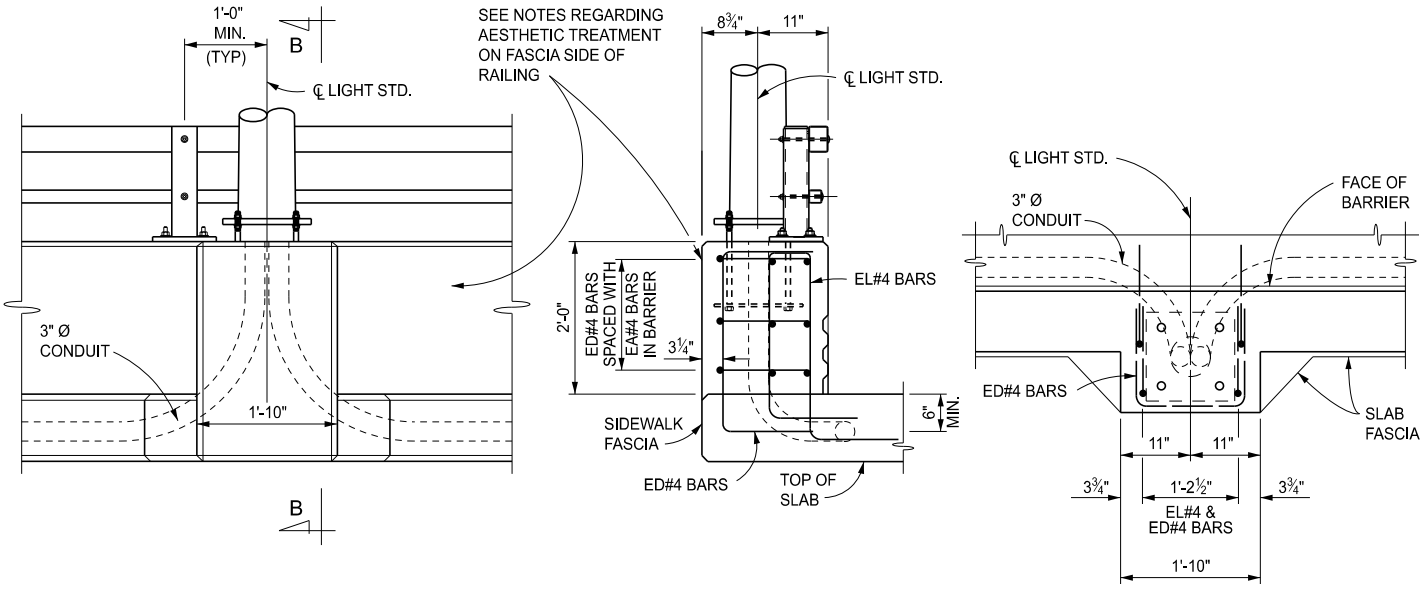
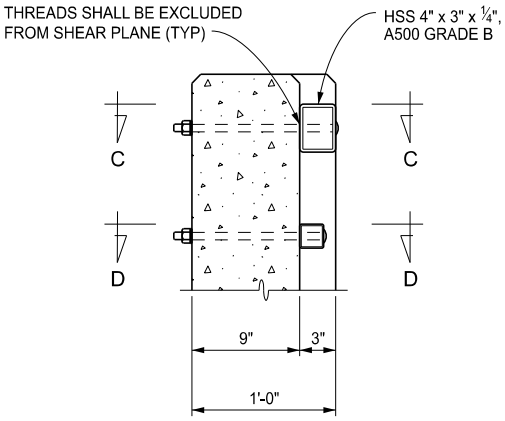
STANDARD PLAN FOR
BRIDGE RAILING, AESTHETIC PARAPET TUBE

(SPECIAL DETAIL)	11/15/2023	B-25-L	SHEET
FHWA APPROVAL	PLAN DATE		3 OF 8

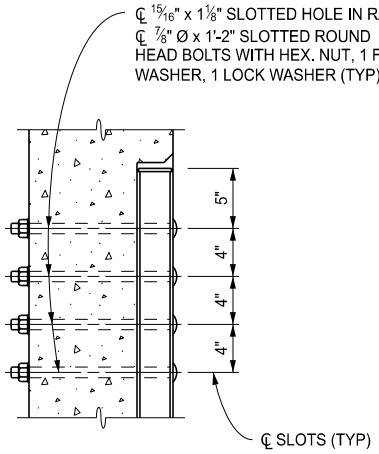


ELEVATION VIEW | SECTION B-B | PLAN VIEW

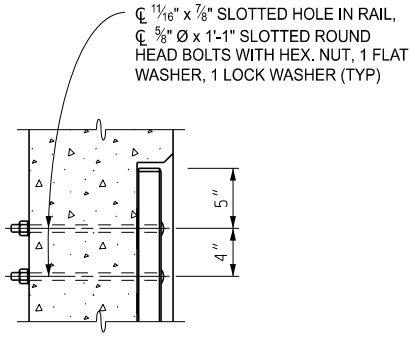
LIGHT STANDARD DETAILS



SECTION A-A



SECTION C-C



SECTION D-D

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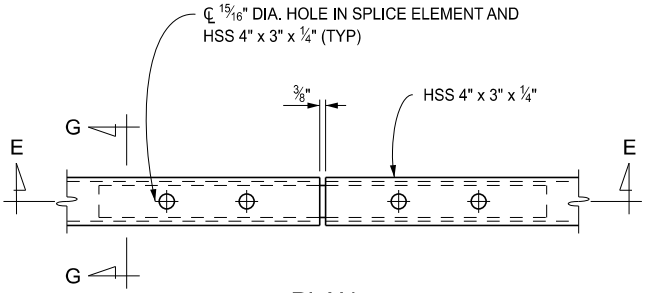
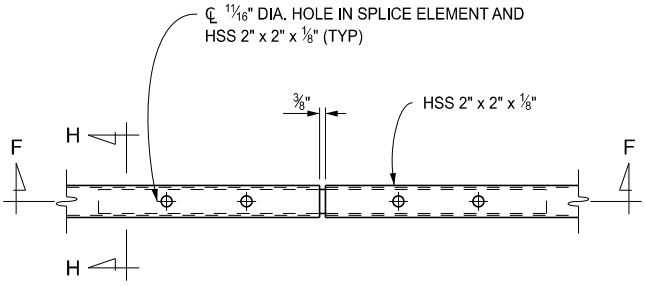
STANDARD PLAN FOR
BRIDGE RAILING, AESTHETIC PARAPET TUBE

(SPECIAL DETAIL)	11/15/2023	B-25-L	SHEET
FHWA APPROVAL	PLAN DATE		4 OF 8



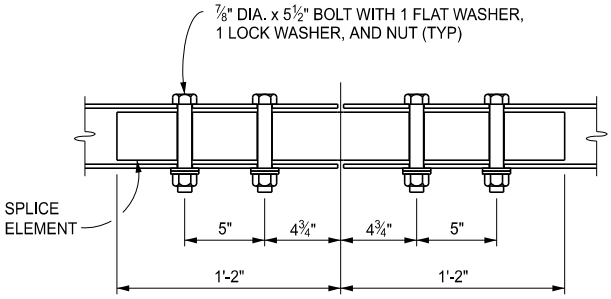
PLAN

HSS 4" x 3" x 1/4"



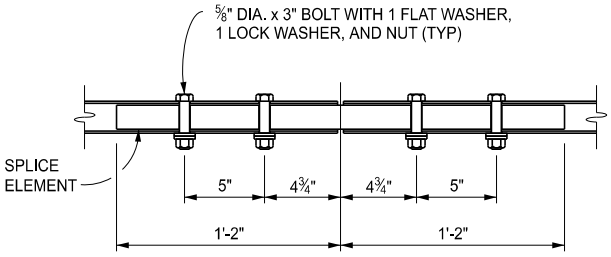
PLAN

HSS 2" x 2" x 1/8"



SECTION E-E

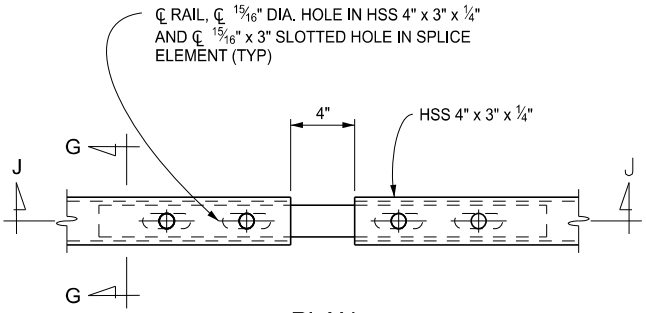
HSS 4" x 3" x 1/4"



SECTION F-F

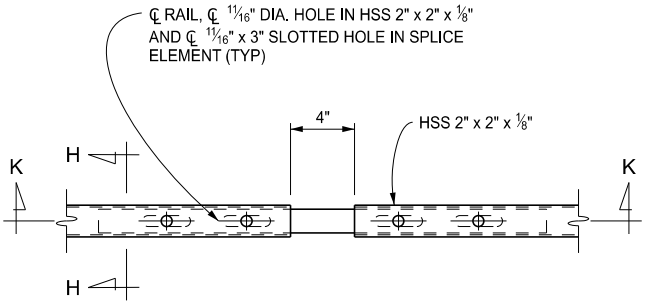
HSS 2" x 2" x 1/8"

FIXED SPLICE DETAILS



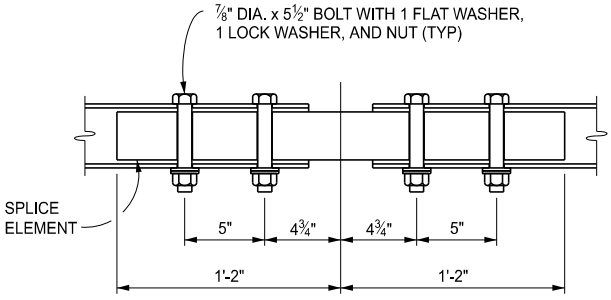
PLAN

HSS 4" x 3" x 1/4"



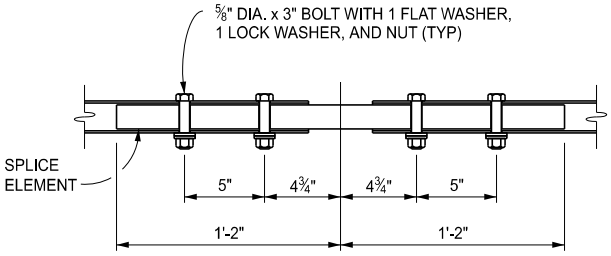
PLAN

HSS 2" x 2" x 1/8"



SECTION J-J

HSS 4" x 3" x 1/4"



SECTION K-K

HSS 2" x 2" x 1/8"

EXPANSION SPLICE DETAILS

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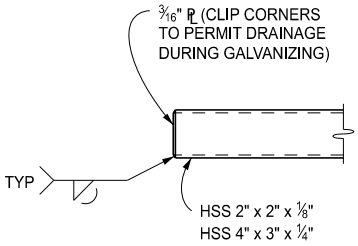
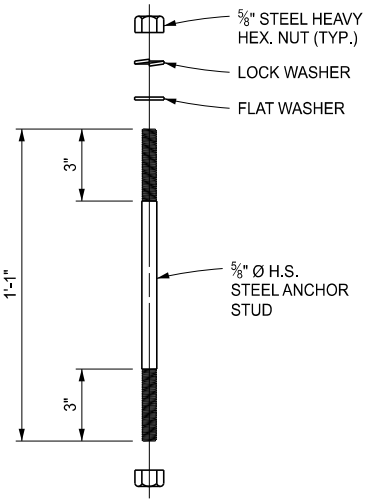
STANDARD PLAN FOR
BRIDGE RAILING, AESTHETIC PARAPET TUBE

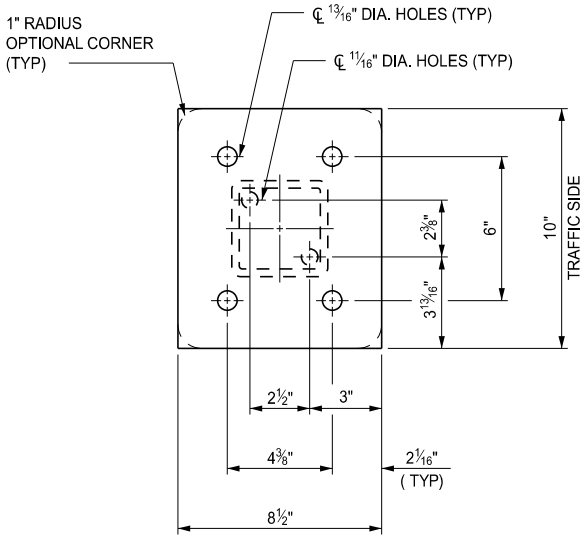
(SPECIAL DETAIL) FHWA APPROVAL	11/15/2023 PLAN DATE	B-25-L	SHEET 5 OF 8



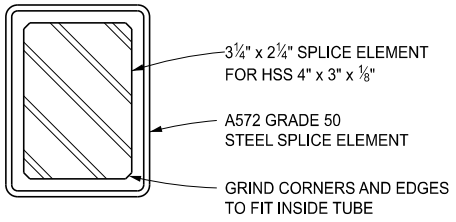
END OF RAIL



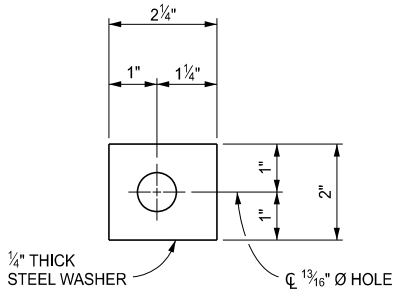
ANCHOR STUD DETAIL



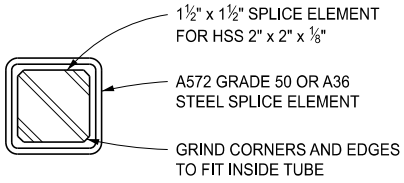
EXTERIOR BASE PLATE



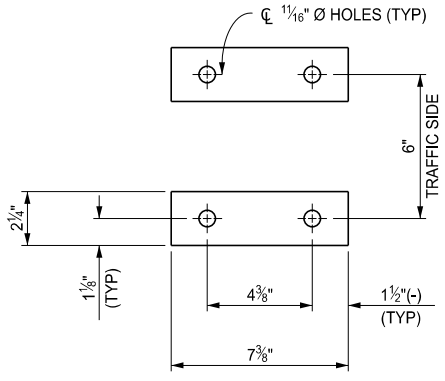
SECTION G-G



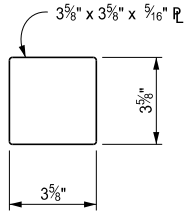
DETAIL A



SECTION H-H



EMBEDDED ANCHOR STUD PLATES



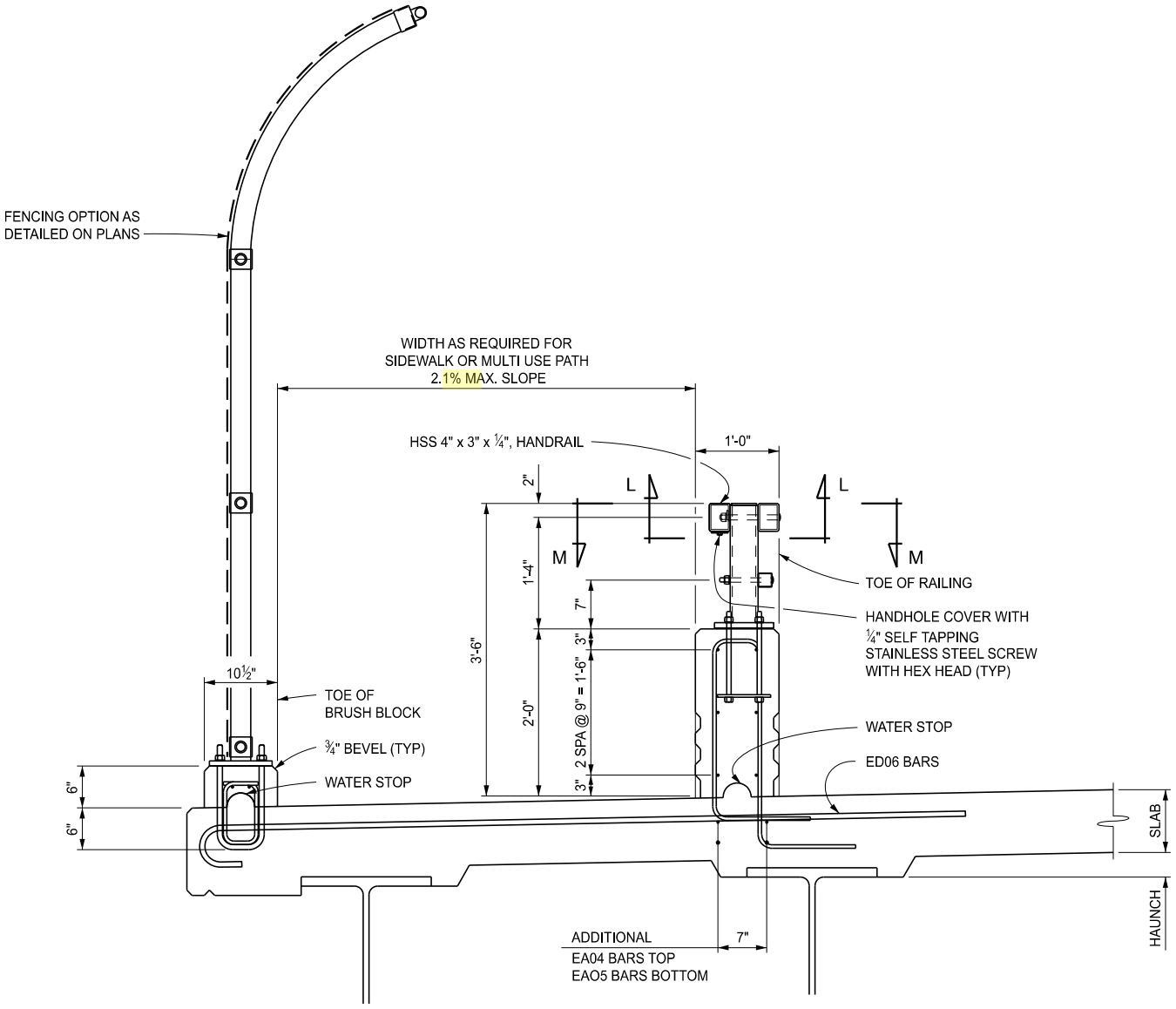
POST COVER PLATE

MDOT Michigan Department of Transportation

DEPARTMENT DIRECTOR
BRADLEY C. WIEFERICH, PE

STANDARD PLAN FOR
BRIDGE RAILING, AESTHETIC PARAPET TUBE

(SPECIAL DETAIL) FHWA APPROVAL	11/15/2023 PLAN DATE	B-25-L	SHEET 6 OF 8



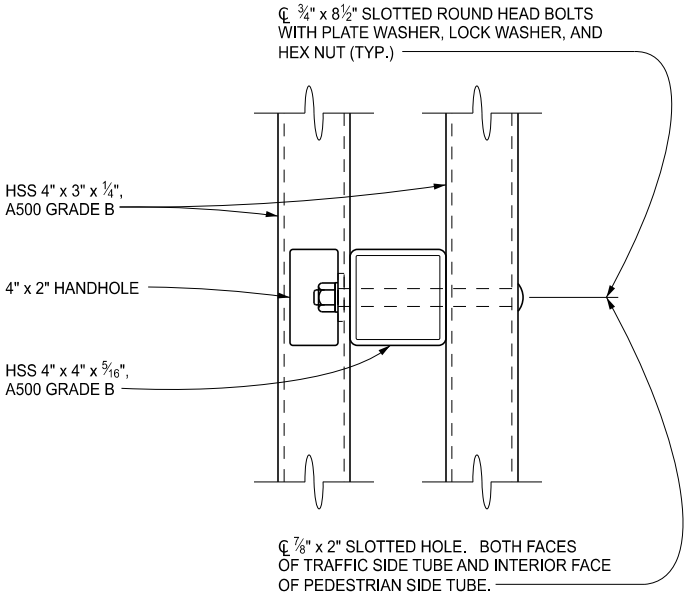
SECTION WITH PEDESTRIAN / MULTI USE PATH

MDOT
Michigan Department of Transportation

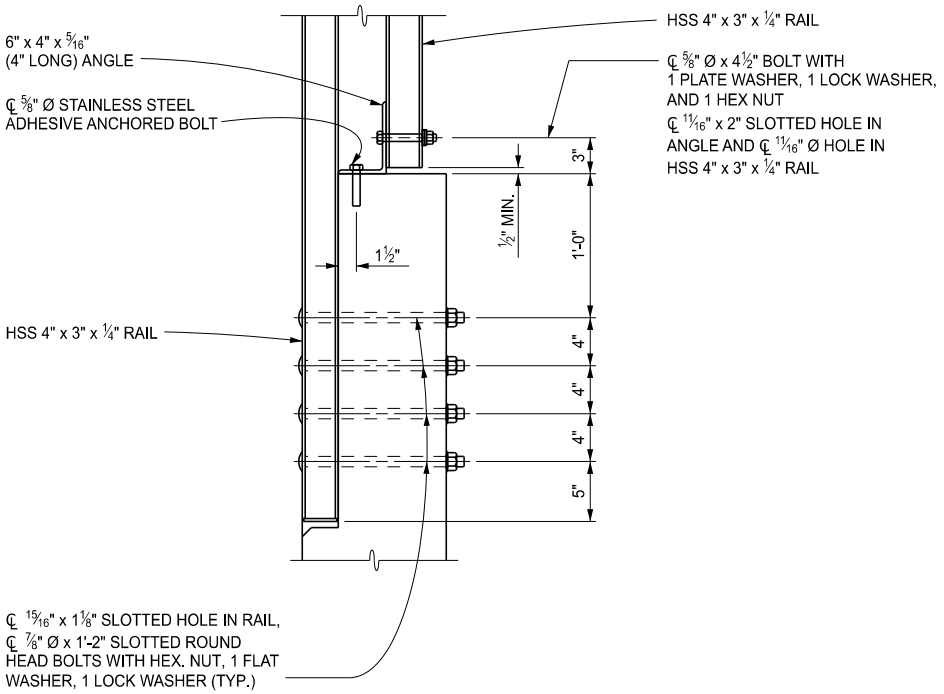
DEPARTMENT DIRECTOR
BRADLEY C. WIEFERICH, PE

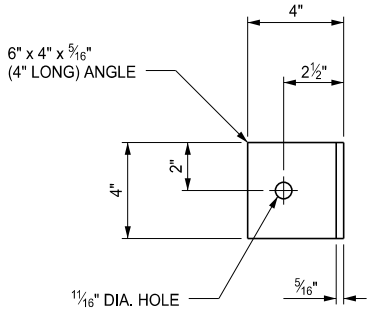
STANDARD PLAN FOR
BRIDGE RAILING, AESTHETIC PARAPET TUBE

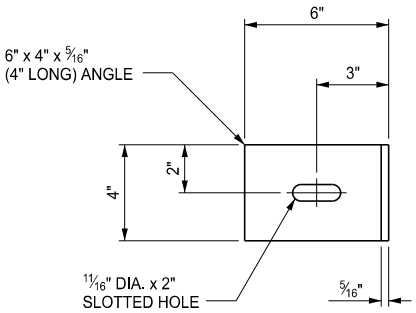
(SPECIAL DETAIL)	11/15/2023	B-25-L	SHEET
FHWA APPROVAL	PLAN DATE		7 OF 8



SECTION L-L







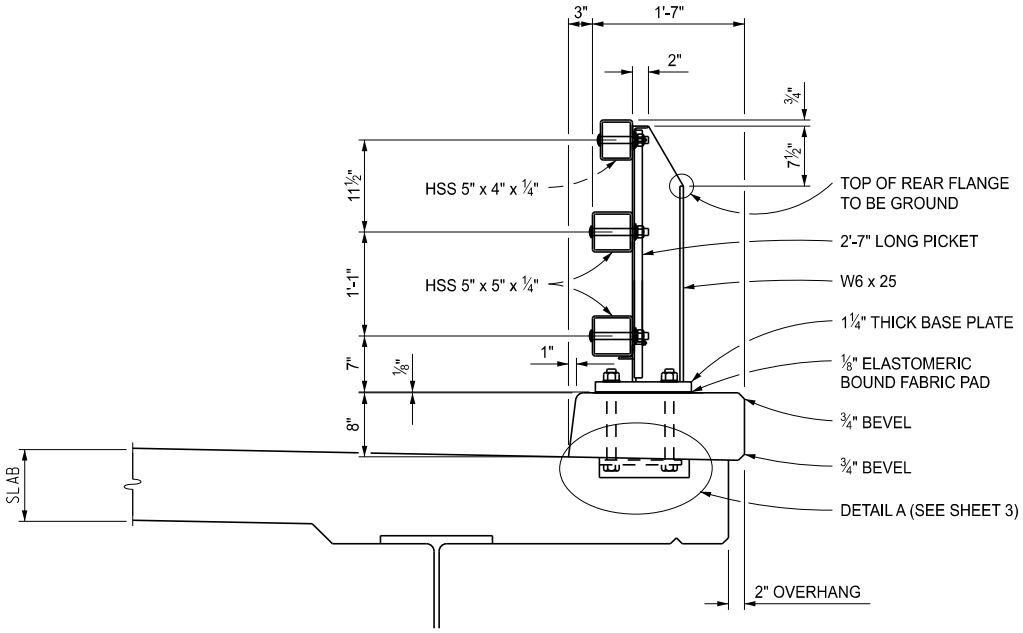
SECTION M-M

MDOT Michigan Department of Transportation

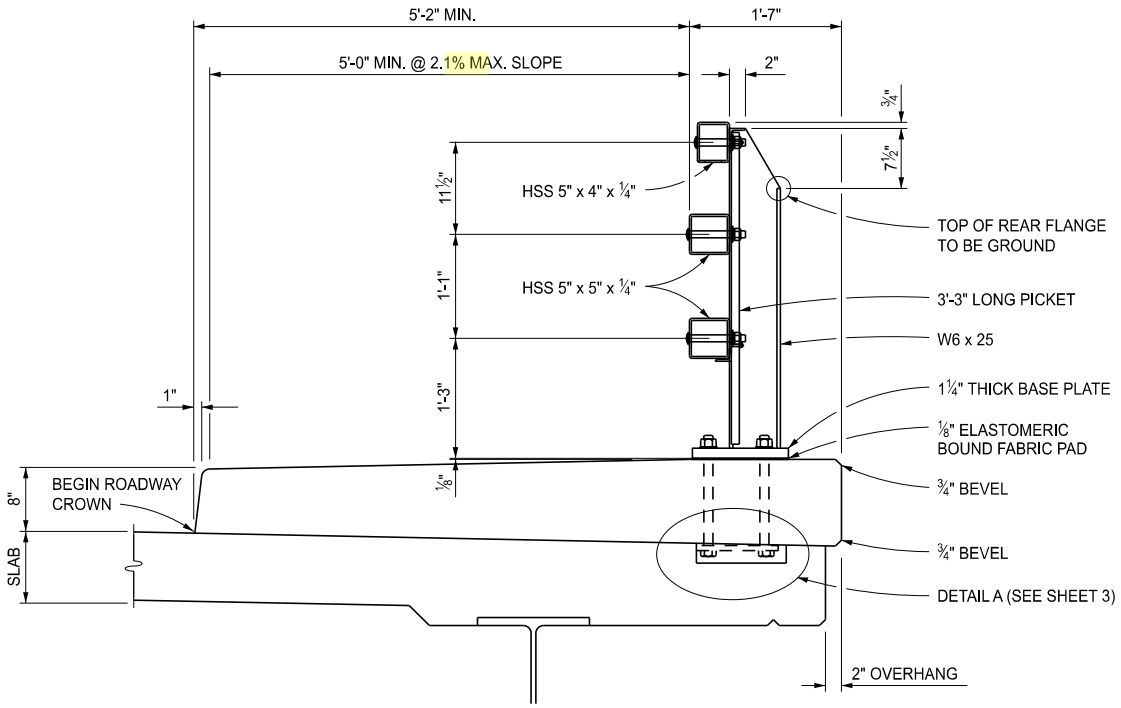
DEPARTMENT DIRECTOR
BRADLEY C. WIEFERICH, PE

STANDARD PLAN FOR
BRIDGE RAILING, AESTHETIC PARAPET TUBE

(SPECIAL DETAIL) FHWA APPROVAL	11/15/2023 PLAN DATE	B-25-L	SHEET 8 OF 8



SECTION THROUGH RAILING WITH BRUSH BLOCK



SECTION THROUGH RAILING WITH SIDEWALK

APPROVED BY: _____
DIRECTOR, BUREAU OF FIELD SERVICES

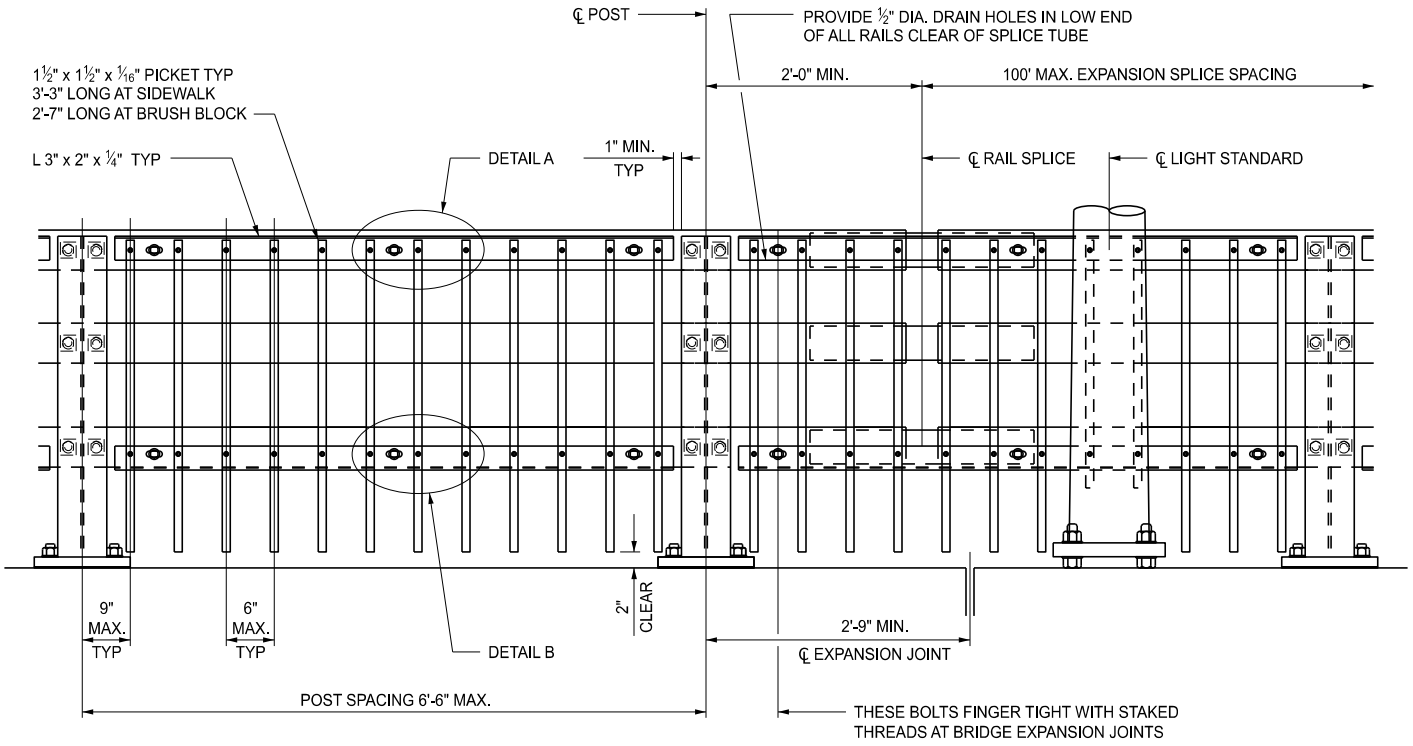
APPROVED BY: _____
DIRECTOR, BUREAU OF DEVELOPMENT

MDOT
Michigan Department of Transportation

DEPARTMENT DIRECTOR
BRADLEY C. WIEFERICH, PE

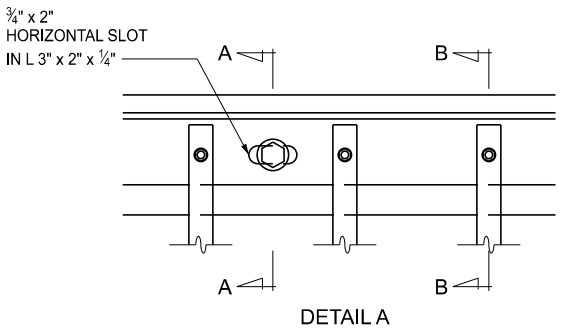
STANDARD PLAN FOR
BRIDGE RAILING,
3 TUBE WITH PICKETS

(SPECIAL DETAIL) FHWA APPROVAL	11/17/2023 PLAN DATE	B-27-B	SHEET 1 OF 7

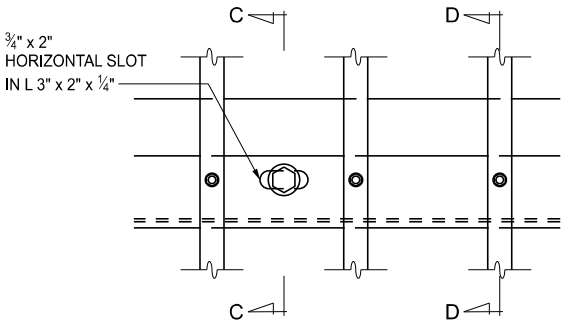


RAILING ELEVATION

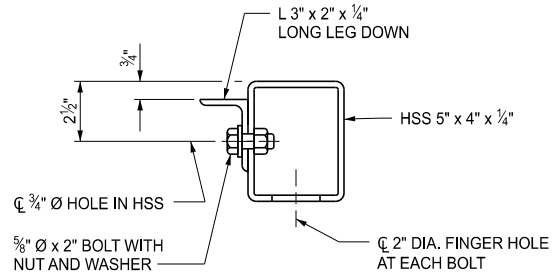
(AT SIDEWALK SHOWN)



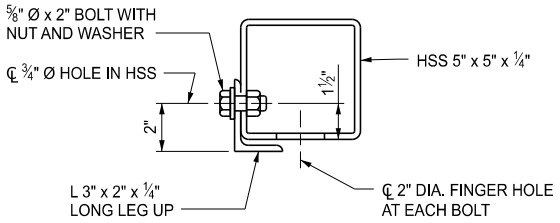
DETAIL A



DETAIL B



SECTION A - A



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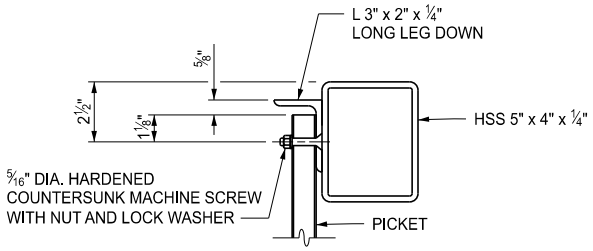
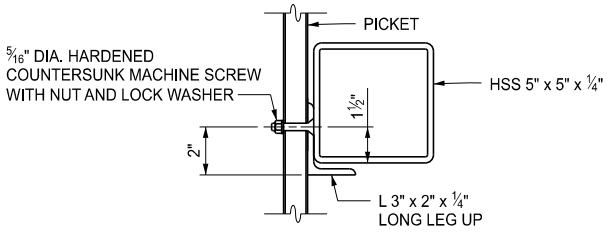


SECTION B - B



SECTION D - D

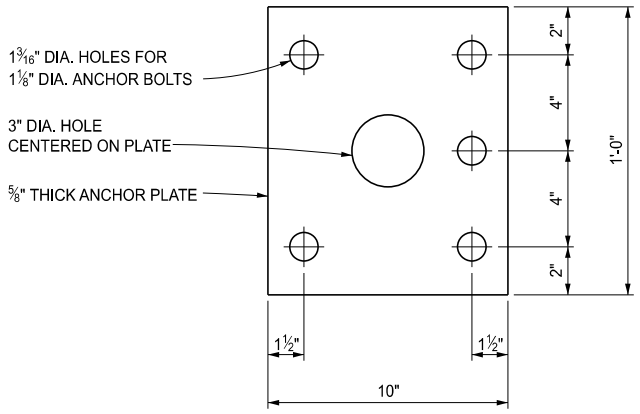
PICKET TO RAIL DETAILS

MDOT Michigan Department of Transportation

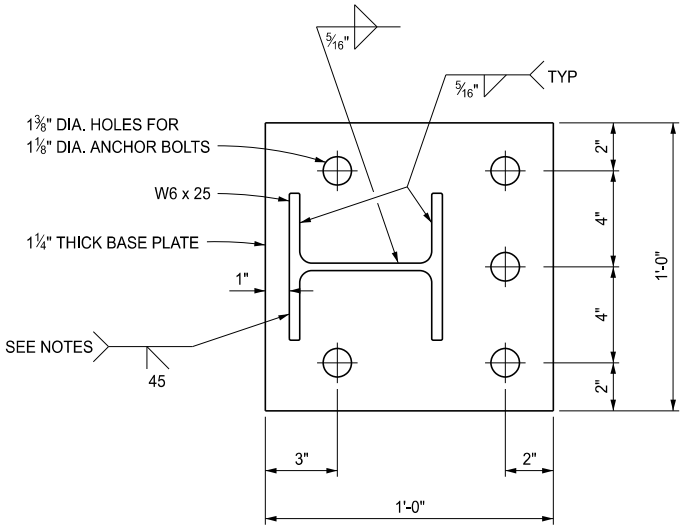
DEPARTMENT DIRECTOR
BRADLEY C. WIEFERICH, PE

STANDARD PLAN FOR
BRIDGE RAILING,
3 TUBE WITH PICKETS

(SPECIAL DETAIL) FHWA APPROVAL	11/17/2023 PLAN DATE	B-27-B	SHEET 2 OF 7

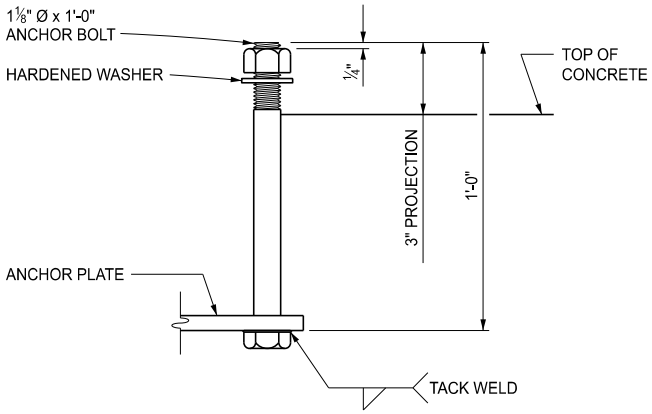


ANCHOR PLATE

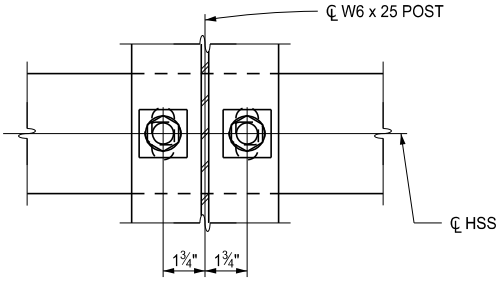


BASE PLATE

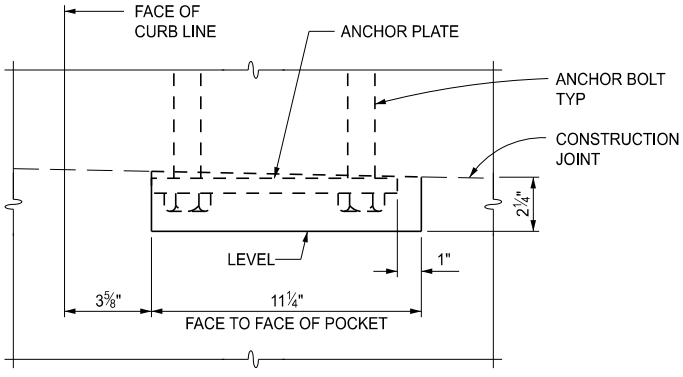
NOTE:
POST FLANGE WELD DOES NOT REQUIRE MAGNETIC PARTICLE TESTING. WELD SHALL BE BACK-GOUGED ON BACK SIDE EXCEPT AT WEB. WELD IS THE SAME ON BOTH FLANGES.



ANCHOR BOLT

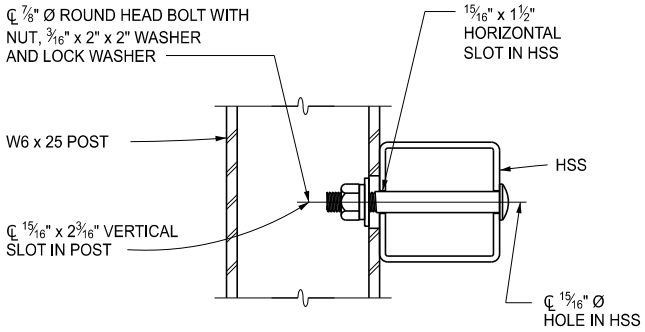


SECTION THROUGH POST WEB



DETAIL A

NOTE:
PROVIDE 15¾" LONG x 11¼" WIDE x 2¼" DEEP POCKET IN THE DECK SLAB AT THE LOCATION OF EACH RAIL POST. USE AT BRUSH BLOCK SECTION AND AT SIDEWALK FASCIA LESS THAN 10".



SECTION THROUGH RAIL

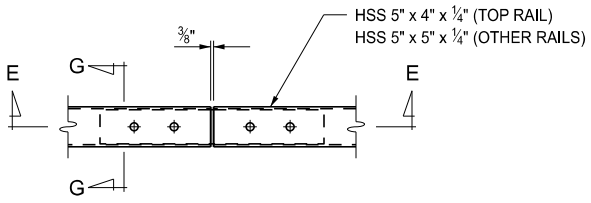
RAIL TO POST CONNECTIONS

MDOT
Michigan Department of Transportation

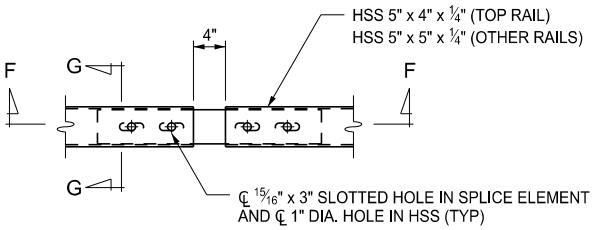
DEPARTMENT DIRECTOR
BRADLEY C. WIEFERICH, PE

STANDARD PLAN FOR
BRIDGE RAILING,
3 TUBE WITH PICKETS

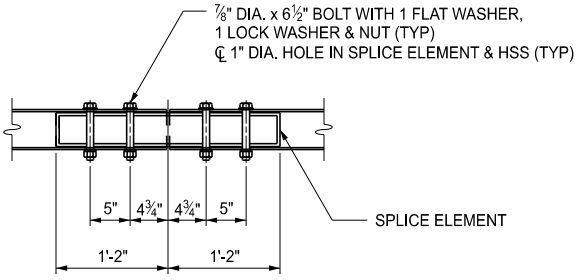
(SPECIAL DETAIL) FHWA APPROVAL	11/17/2023 PLAN DATE	B-27-B	SHEET 3 OF 7



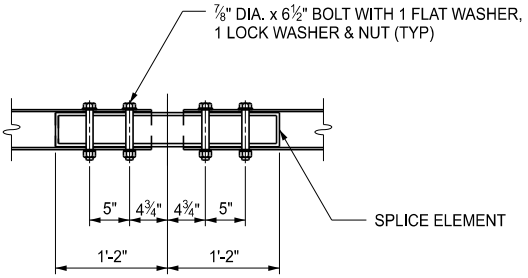
FIXED SPLICE PLAN



EXPANSION SPLICE PLAN



SECTION E - E



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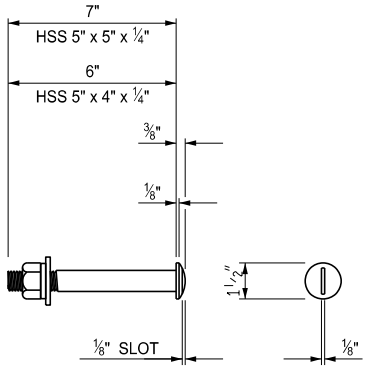
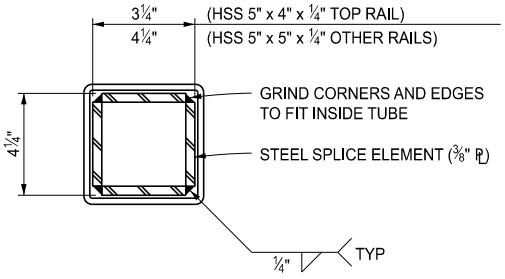
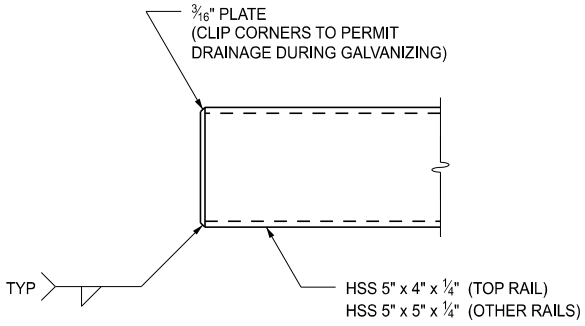


⅞" Ø ROUND HEAD BOLT



SECTION G - G



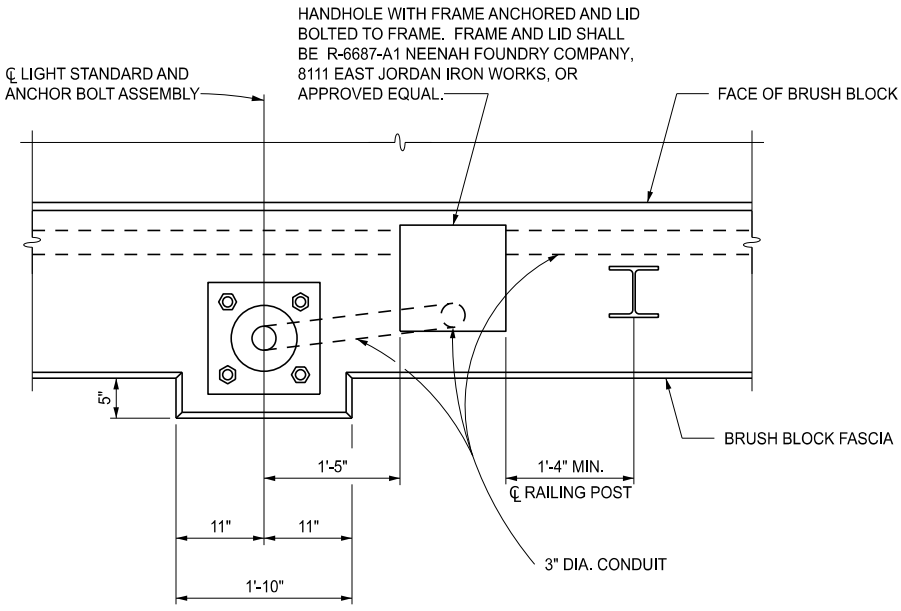
END OF RAIL DETAIL

MDOT
Michigan Department of Transportation

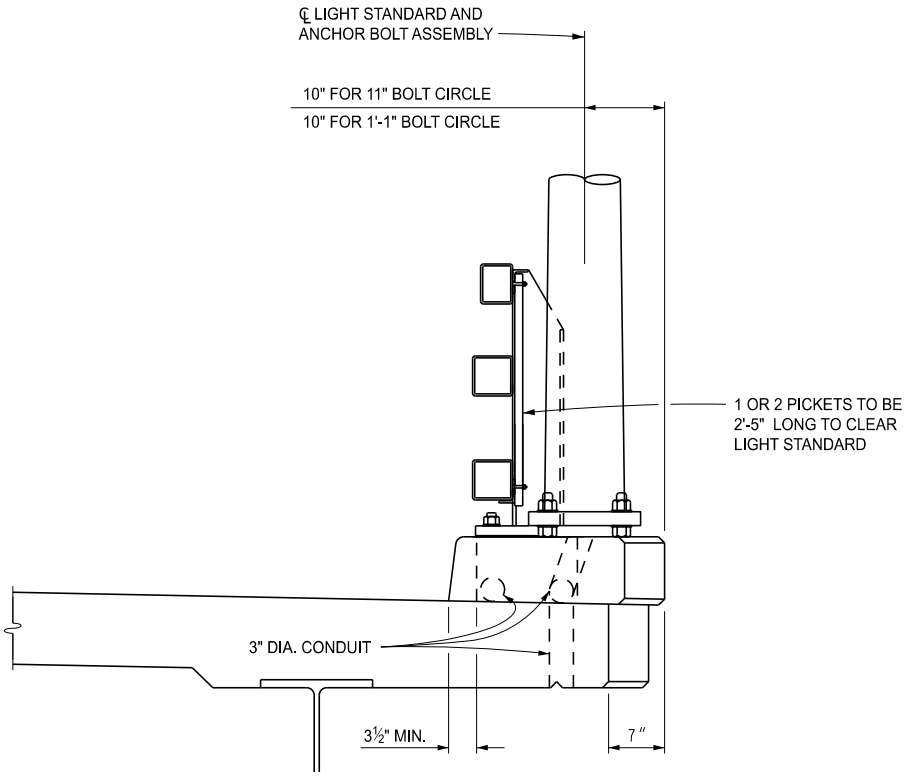
DEPARTMENT DIRECTOR
BRADLEY C. WIEFERICH, PE

STANDARD PLAN FOR
BRIDGE RAILING,
3 TUBE WITH PICKETS

(SPECIAL DETAIL)	11/17/2023	B-27-B	SHEET
FHWA APPROVAL	PLAN DATE		4 OF 7



PLAN VIEW AT LIGHT STANDARD WITH BRUSH BLOCK



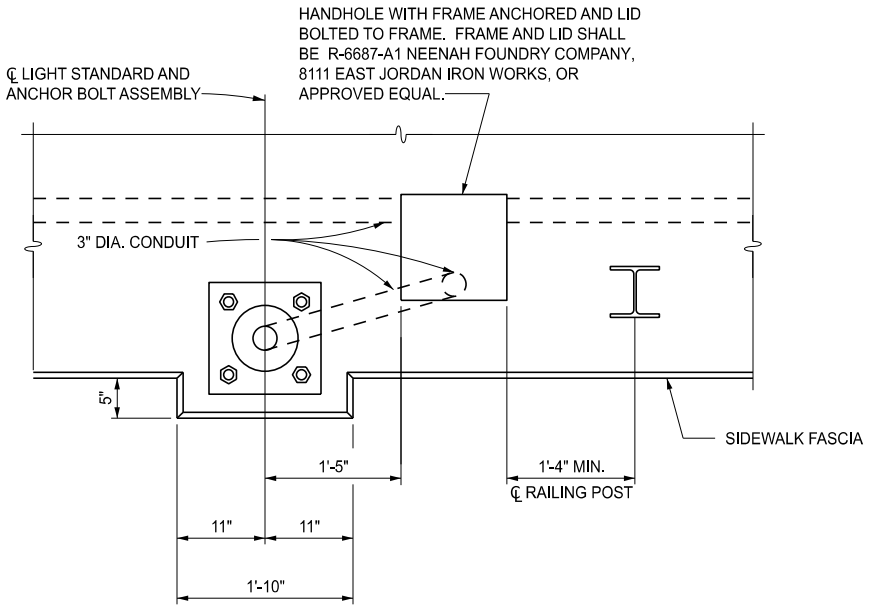
SECTION AT LIGHT STANDARD WITH BRUSH BLOCK

MDOT Michigan Department of Transportation

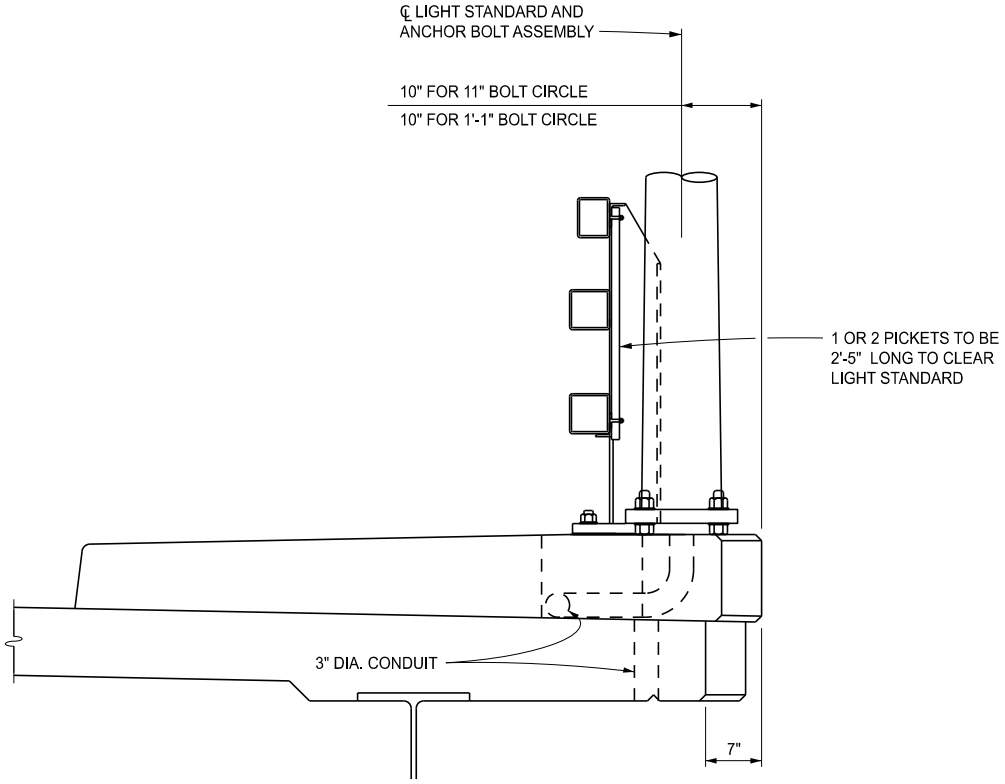
DEPARTMENT DIRECTOR
BRADLEY C. WIEFERICH, PE

STANDARD PLAN FOR
BRIDGE RAILING,
3 TUBE WITH PICKETS

(SPECIAL DETAIL) FHWA APPROVAL	11/17/2023 PLAN DATE	B-27-B	SHEET 5 OF 7

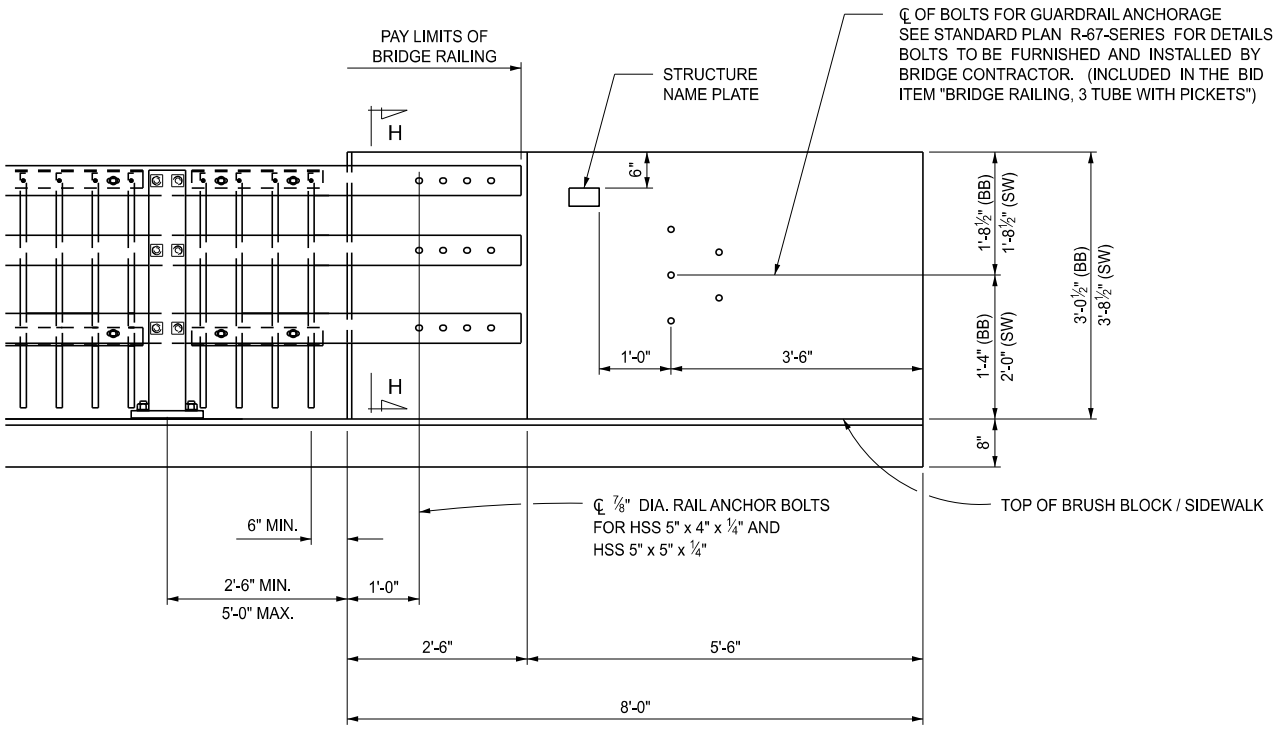


PLAN VIEW AT LIGHT STANDARD WITH SIDEWALK



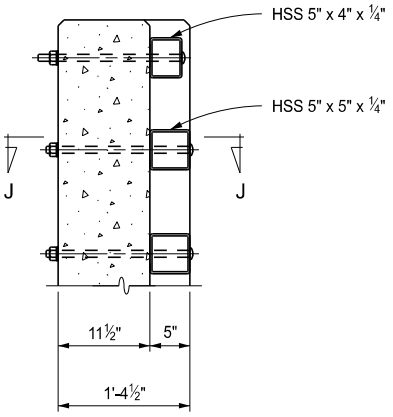
SECTION THROUGH RAILING WITH SIDEWALK

MDOT Michigan Department of Transportation DEPARTMENT DIRECTOR BRADLEY C. WIEFERICH, PE	STANDARD PLAN FOR BRIDGE RAILING, 3 TUBE WITH PICKETS		
(SPECIAL DETAIL) FHWA APPROVAL	11/17/2023 PLAN DATE	B-27-B	SHEET 6 OF 7

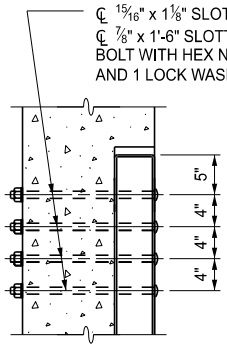


END WALL ELEVATION

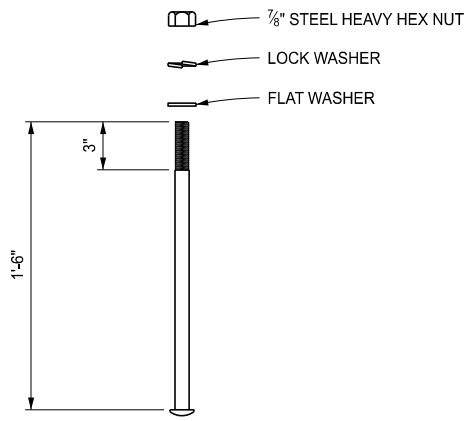
BB = BRUSH BLOCK
SW = SI DEWALK



SECTION H - H



SECTION J - J



⅞" Ø ROUND HEAD BOLT

NOTES:

RAILS SHALL BE CONTINUOUS OVER A MINIMUM OF FOUR (4) POSTS WITHOUT SPLICES WHERE POSSIBLE. RAILS SHALL BE SPLICED IN A PANEL OVER EXPANSION JOINTS.

DETAILS SHOWN ARE ACCORDING TO THE AASHTO SPECIFICATIONS.

ALL WORK AND MATERIAL SHALL BE ACCORDING TO THE STANDARD SPECIFICATIONS FOR CONSTRUCTION UNLESS OTHERWISE NOTED ON THIS PLAN.

MDOT
Michigan Department of Transportation

DEPARTMENT DIRECTOR
BRADLEY C. WIEFERICH, PE

STANDARD PLAN FOR
BRIDGE RAILING,
3 TUBE WITH PICKETS

(SPECIAL DETAIL)	11/17/2023	B-27-B	SHEET
FHWA APPROVAL	PLAN DATE		7 OF 7

6.03.04B (continued)

Surface Preparation

15. Wedging

Wedging is used to build up insufficient areas in the existing surfacing, such as to increase insufficient crown, to increase superelevation, or to level out sags that distort the profile. While the regular HMA surfacing can be thickened to take out up to 1" of sag, wedging, as a separate operation, must be used for thicker modifications.

Wedging shall be 3" or less using the same HMA mix as the top course of the mainline pavement. Additional wedging can be accomplished with variable thickness in the leveling and/or base course.

16. Scratch Coat

An 80 lbs/syd (about ¾" thick) scratch coat is usually required whenever a pavement is cracked and seated, or the existing HMA cap is removed from a composite pavement and the exposed concrete surface has joint and surface deterioration. This is to prevent ravelling of the old concrete under traffic, and possibly a rolling ride when the finished pavement is in place. The material is similar to an HMA leveling course, perhaps modified to use a different size aggregate, computed in addition to the regular rate of resurfacing proposed for the project. If, for some reason, the scratch coat needs to be thicker (as recommended at the Plan Review Meeting) then consideration should be given to reducing the regular leveling course by the additional application rate in excess of the nominal 80 lbs. A scratch coat should be provided on all such applicable projects unless it is specifically deleted at the Plan Review Meeting.

6.03.04B16 (continued)

A scratch coat can also be used to fill longitudinal irregularities such as rutting or faulting between lanes. Scratch coat quantities should be shown separately from the regular resurfacing quantities, and designated as "scratch coat", e.g. HMA, LVSP (Scratch Coat).

6.03.05 (revised 11-27-2023)

Adjusting Drainage Structures and Utilities

It is the practice of the Department to adjust the elevation of manhole and catch basin covers to fit the finished elevation of proposed resurfacing. Designers should therefore provide quantities for this adjustment, but with the knowledge that site by site decisions will be made on construction relative to tapering the surfacing down (or up) to meet the cover at its existing elevation. Depressed covers, e.g., possibly as much as 1" low, can sometimes be tolerated in the gutter, and a manhole cover in the center of a lane that is ½" low may not pose a problem. On the other hand, a cover in the lane wheeltrack that is ½" low will be a constant annoyance to the motorist. Some local agencies, for reasons of economy, will shape the new HMA to fit the existing elevation of the cover even if it is 1½" to 2" low. This practice may be acceptable on low volume, low speed residential streets, but it is not acceptable on a street designated as trunkline.

A. Adjusting Drainage Structure Covers

The item of "adjusting" applies where the elevation of the cover is changed 6" or less. It applies to manhole covers, whether drainage or utility, inlets, and to catch basin covers. While adjustment is usually upward, it can apply where the cover is lowered as well, as might occur in a widening situation.

If the existing structure is in poor condition, it should be reconstructed.

6.03.05A (continued)

Adjusting Drainage Structures and Utilities

Normally, adjustment is by means of raising the casting with a masonry lift. From time to time, various manufacturers introduce adjusting rings that raise the lid or grate without necessitating adjustment of the frame.

Designers should take the maintaining traffic scheme into account when setting up drainage structure adjustment quantities. If it is determined that traffic will be carried on the leveling course for a period of time, it may be necessary to adjust the covers twice. In this case it might be prudent to contact the Region/TSC for confirmation of the need for double adjustment.

There have been occasional problems with settlement of the HMA surfacing in the area for 10" to 12" around manhole covers, the area usually disturbed during adjusting. There are several theories as to the cause of this settlement: allowing traffic over the cover before normal strength mortar has attained strength, inadequate compaction around the cover, and deterioration of the manhole itself. The problem has been particularly prevalent in the urban areas.

One method that has proven successful in overcoming this problem is cutting out approximately a 6' square around the cover, after the leveling course is laid, and recasting it with concrete base course about 2" below the finished grade of the top course. This method of adjustment was approved by the Engineering Operations Committee on January 19, 1983.

6.03.05 (continued)

B. Drainage Structure Cover, Adjust, Additional Depth

The item of "adjust additional depth" applies where the elevation for the cover is changed more than 6” (unless reconstruction to top of footing is necessary, in which case the work is paid for as a new structure). Additional depth adjusting also applies where the corbel (cone) of an existing structure must be rebuilt to adjust the lateral location of the cover.

Frequently, drainage structures set up on plans to be adjusted are found on construction to be in such poor condition that they require additional depth adjusting, resulting in a cost overrun. To compensate for this, designers should set up a lump sum quantity of "entire project" additional depth adjusting of drainage structures equal to 25% of the total of structures set up on the plans to be adjusted. (This figure of 25% will be in addition to the number of structures known to require additional depth adjusting and so set up on the plans.) On projects where the drainage structures are unusually old, or where there is a large volume of heavy trucks, the 25% estimate should be increased to 40%.

C. Measurement and Payment

The pay item “Dr Structure Cover, Adj, Case 1”, measured as each, applies to structures located in pavement (including curb and gutter). Removal and replacement of pavement is included in this pay item if not already covered elsewhere. Replacement of curb and gutter is paid for separately.

The pay item “Dr Structure Cover, Adj, Case 2”, measured as each, applies only to structures located outside the pavement area.

6.08.02 (revised 5-27-2020)

Thickness

Concrete sidewalks are normally 4” thick. When part of a driveway, it should be constructed to the same thickness as the driveway approach, as detailed on Standard Plan R-29-Series. See Section 12.08.03D.

When it is determined at the Plan Review Meeting that there is evidence of trucks encroaching on curb returns at short-radius intersections or where the potential for encroachment will exist after project completion, the designer should call for 6” thick concrete for sidewalk and curb ramps within the return. This thickness can be increased if there is potential for very heavy trucks to encroach on the return.

6.08.03

Reinforcement

Sidewalks are usually not reinforced. Occasionally, a municipality will request the Department to reinforce sidewalk within its limits. If such reinforcing of sidewalk is standard municipal policy elsewhere, the sidewalk may be reinforced at project cost.

The plans should note that 6” x 6” mesh should be used, with either No. 10 wire weighing 21 pounds per 100 sft or No. 6 wire weighing, 42 pounds per 100 sft, whichever is the municipal standard.

6.08.04

Earth Excavation for Sidewalk

Any earth excavation and backfilling required for construction of sidewalk is included in the pay item for sidewalk.

6.08.05 (revised 11-27-2023)

Curb Ramps

Curb ramps are mandated by Act 8, P.A. of 1973 (amended by Act 35 in 1998), as was the issuance of Standard Plan R-28-Series, “Curb Ramp and Detectable Warning Details". FHWA guidance indicates that ramps be constructed whenever construction involves curb or sidewalk. On May 8, 1973, the Department extended this requirement, by policy to include resurfacing projects that did not ordinarily require the replacement of existing curb or sidewalk.

Federal mandates followed this State law in conjunction with the Americans with Disabilities Act of 1990. The United States Access Board published the Americans with Disabilities Act Accessibility Guidelines (ADAAG) in 1991 and subsequently extended its application to Public Rights of Way in 1994. The Access Board later published the Public Rights of Way Accessibility Guideline (PROWAG) to address accessibility issues specific to public rights of way.

It should be emphasized that there is little permitted reason for failure to place or upgrade a curb ramp on a road construction project if a sidewalk meets a curb in an obvious crosswalk situation. An "obvious crosswalk situation" would be where a sidewalk intersects with the roadway, whether or not there are painted crosswalk lines or a traffic signal present.

6.08.05 (continued)

Curb Ramps

A. Warrants for Curb Ramps and Curb Ramp Upgrade

Based on FHWA guidance, curb ramp construction and/or curb ramp upgrade be incorporated with new construction, and roadway alterations.

New Construction refers to the initial construction of a new roadway facility on a new alignment for which new right of way is acquired. Curb ramp installation is required and new construction standards are fully enforced.

Alteration refers to changes that affect or could affect the usability of an existing roadway facility. Curb ramp installation and upgrading is required prior to or at the time of a roadway alteration. New construction standards are applicable to the maximum extent feasible.

Maintenance refers to maintenance activities that do not affect the usability of an existing road. Curb ramp accessibility upgrades are not required to be performed in conjunction with maintenance treatments.

The U.S. Department of Justice and the FHWA issued a joint Technical Assistance memo in 2013 to clarify which roadway treatments fall within the definition of an alteration and which are considered maintenance.

6.08.05A (continued)

Alterations include**:**

- Reconstruction
- Rehabilitation – including cold milling & resurfacing, slab replacement, slab jacking, widening, adding pavement structural capacity.
- Open-Graded Surface Course (open graded friction course)
- Micro-surfacing (includes rut filling)
- Double Chip Seal
- HMA Overlay (regardless of thickness)
- Cape Seal - (Chip seal capped with a slurry seal, micro-surface or other treatment to fill voids in a chip seal).
- In-Place Asphalt Recycling

Other condition requiring accessibility upgrading includes:

- Altered crossings through driveways. See Section 6.08.05F for driveway applications.
- Independent shared use path crossing are treated the same as sidewalks with regard to accessible roadway crossings.
- Installation of pedestrian signals. See Section 6.08.05G.
- Existing curb ramps without detectable warnings but otherwise compliant must be retrofitted with detectable warnings in conjunction with alterations to an existing roadway.

6.08.05A (continued)

Curb Ramps

Maintenance includes**:**

- Crack Filling and Sealing
- Surface Sealing (liquid sealant)
- Chip Seals
- Slurry Seals
- Fog Seals
- Scrub Sealing
- Joint Crack Seals
- Joint Repairs
- Dowel Retrofit
- Spot High Friction Treatments
- Diamond Grinding
- Pavement Patching

Other routine operations where curb ramp upgrades are not required include:

- Signing, pavement marking projects.

- Guardrail/Safety upgrade projects.

- Landscape/Streetscape projects (except where an existing sidewalk or curb ramp is altered)

- Independent Utility Work/Maintenance (except where an existing sidewalk or curb ramp is altered or when work is extensive such that an entire crosswalk is reconstructed)

Two or more maintenance treatments may be combined and still be considered a maintenance treatment. However, if more than one of those treatments contains aggregate and/or filler, the combination will be considered an alteration.

For example a cape seal is an integrated system comprised of two maintenance treatments, a chip seal and a slurry seal. The slurry seal includes aggregate and filler to fill the voids of the aggregate in the chip seal. They combine as an alteration."

6.08.05 (continued)

B. Scoping Considerations

If the projects limits include only a portion of an intersection, all ramps within the intersection shall be evaluated for compliance and the project limits extended to include all ramps.

Smaller scale projects such as CPM may still require a right of way phase to accommodate consent to tie into existing sidewalk outside the right of way. See Section 5.05.02 for more information on right of way requirements.

Alteration projects will likely require accurate contour and elevation information prior to designing compliant curb ramps.

C. Design Standards

Standard Plan R-28-Series details the requirements for ramp width, cross slope, running slope, landings, curb transition, and detectable warning surfaces. Designers should investigate site conditions in order to determine and design the appropriate treatment for each curb ramp location. Where fully compliant curb ramps are infeasible, compliance is required to the maximum extent feasible. See Section 6.08.05E "Accessibility Constraints". This will require preliminary field work in order to design for maximum feasible compliance.

The curb ramp types detailed on Standard Plan R-28-Series represent some of the more conventional applications. Existing conditions may require variations not shown on the standard. The designer may need to combine the features of two or more ramp types to provide a compliant design.

6.08.05C (continued)

Curb Ramps

There are several basic elements that should be incorporated into the design. These are:

1. **Minimum width** (5 ft.). The minimum width of 5 ft. allows side by side wheelchair passing and is consistent with most sidewalk widths. Sidewalks less than 5 ft. wide require a 5 ft. x 5 ft. wide passing space every 200 ft. or less. In order to accommodate unavoidable existing width restrictions the PROWAG allows a reduction to not less than 4 ft.

2. **Maximum running slope** (8.3%). The maximum running slope is absolute and therefore a target maximum of 5% to 7% is used to allow for construction inconsistencies. However, the running slope shall not require the ramp length to exceed 15 ft. (See Section 6.08.05D "Meeting Existing Sidewalk Grades and Elevations").

3. **Maximum cross slope** (2.1%). The maximum cross slope is absolute for ramps at intersections except as stated below. Designers should use a target cross slope less than the maximum to account for inconsistencies in concrete finishing.

   When resurfacing or reconstructing existing roadways, the ramp cross slope may be blended to meet existing steeper roadway grades. Significant redesign of an existing cross road to accommodate a ramp cross slope commonly exceeds the scope of a roadway alteration. The curb ramp cross slope should be transitioned through the full length of the ramp to minimize abrupt changes. If opportunities within the roadway construction scope of work are available to achieve even partial compliance, they should be pursued.

6.08.05C (continued)

   For new roadways, the cross slope of the cross walk must not exceed 2.1% at stop controlled (stop sign) crossings and 5% at signalized and uncontrolled crossings. The cross slope at mid-block crossings may follow the roadway grade.

4. **Landing -** 5' x 5' minimum, 2.1% max slope in the direction(s) of pedestrian travel. A landing is required at the top of perpendicular ramps. However, if the ramp running slope is less than 5%, it is considered a "blended transition" and does not require a landing. In order to accommodate unavoidable existing width restrictions the PROWAG allows a reduction to no less than 4' x 4'.

5. **Maximum Bottom Counter Slope -** (5% and flush with no vertical lip to the ramp). The maximum counter slope is provided to minimize wheelchair front caster snagging at the bottom of the ramp.

6.08.05 (continued)

Curb Ramps

D. Meeting Existing Sidewalk Grades and Elevations

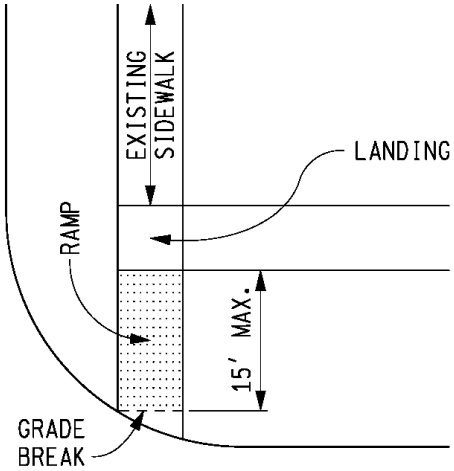
Sidewalk grades generally tend to follow the grade of the bordering street. When the existing sidewalk grade is steep, it becomes more difficult to comply with the maximum curb ramp running slope of 8.3% without "chasing grade" to meet the existing sidewalk. In some cases it results in an infinite run. Excessive ramp runs might also result when the existing sidewalk is at a significantly higher elevation than the adjacent road.

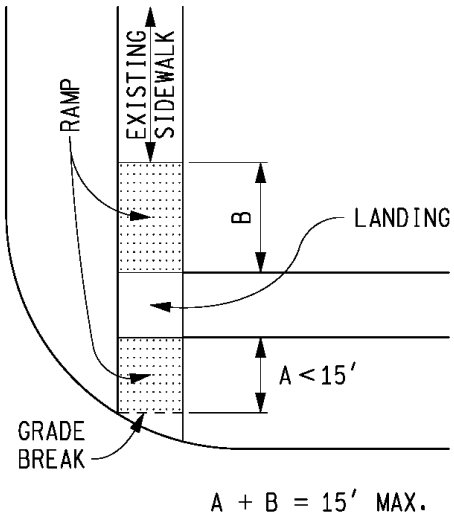
When this occurs, the maximum running slope may be exceeded in order to limit the ramp length(s) to not more than 15 ft. measured from the ramp grade break. The need to exceed the maximum slope must be documented (See Section 6.08.05E). The 15 ft. limit on ramp length does not include the landing or transition slabs to tie into the existing sidewalk. Three examples are illustrated:

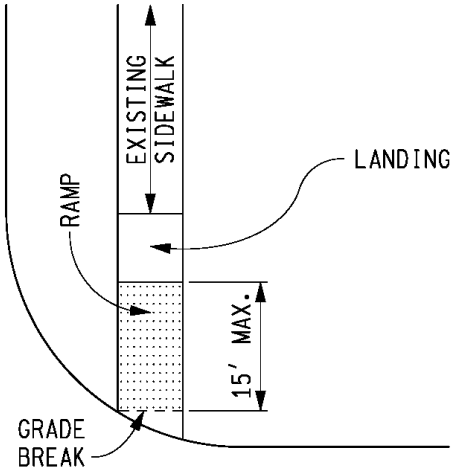
Unlike other maximum dimensions, the 15 ft. limit is not absolute. If compliance with the maximum running slope (8.3%) can be achieved by extending the ramp by one or two flags of sidewalk beyond the 15 ft. limit, it should be considered within feasible limits.

A landing is required at the top of perpendicular ramps. However, if the ramp running slope is less than 5%, it is considered a "blended transition" and does not require a landing.

6.08.05D (continued)







6.08.05 (continued)

Curb Ramps

E. Accessibility Constraints

When it is infeasible to meet all standard compliance elements, the standards must be met to the maximum extent feasible. Infeasibility does not apply for new roadway construction.

A strict definition of "feasible" is not provided since the potential circumstances for each installation is limitless. Some circumstances of infeasibility are clear such as impacts on structural integrity of surrounding features, or an inability to adapt to existing immovable or unalterable conditions. Other circumstances such as real estate limitations and historic preservation can also represent infeasibilities.

The curb ramp elements are not listed in any order of preference or importance. Order of importance may vary for each application. When it is infeasible to provide compliant elements, they should be provided to the maximum extent feasible.

While cost is not itself an acceptable argument for noncompliance, scope can be a prevailing factor. If certain significant efforts required to meet the standard are not otherwise called for in a project, it may be a infeasibility. Examples would be utility relocation or the acquisition of right of way for a roadway alteration project. If utility relocation or right of way acquisition is not required in the project for any other reasons, then it is preferred but not required that the same efforts be made solely for ADA compliance. See Section 5.05.02 for more information on fee, easement and consent requirements for sidewalks.

6.08.05E (continued)

When full compliance is infeasible and compromises are necessary, consideration should be given to safe refuge for the pedestrian. Flush transitions and flatter bottom entrances or a marked refuge area in the pavement allows persons in wheelchairs to leave the vehicular way prior to negotiating possible steeper ramp grades or cross slopes that result from infeasibility.

When determining the correct balance to provide maximum extent feasible, it is best to follow good engineering judgment. Compromises may be needed for more than one standard element. If full compliance is infeasible, strive for maximum overall improved accessibility. Do not over compensate to favor one element. Over emphasis on a single element may cause a reduction in overall accessibility in comparison to the original condition.

Accessibility constraints should always be documented in the project files using MDOT Form 0370. This is retained as justification to address possible future claims. The documentation should include location, non-compliant element(s), reason for infeasibility and maximum extent feasible.

6.08.06 (revised 11-27-2023)

Building Entrances

When constructing or reconstructing a public sidewalk, access to adjacent buildings might be impacted. Adjusting grade or cross slope on the sidewalk can change or compromise connectivity to adjacent buildings.

Accessibility requirements and responsibilities differ between public and private entities. In general, access to buildings that abut or encroach on the public right–of-way is the responsibility of the building owner. The building owner is accountable for accessibility under Title III of the ADA if the building provides services or accommodations to the public. When constructing sidewalks, the Department's responsibility is to construct sidewalks and street crossings compliant with the ADA under Title II. Private residences that do not serve the public are not regulated by the ADA.

While the building owner is responsible for ADA compliance, the building owner may be entitled to restitution or compensation under the Uniform Relocation Act (URA) of 1970. When obtaining the Consent to Construct Sidewalk, Region Real Estate should discuss both temporary and permanent access with the property owners. See Section 5.05.02.

6.08.06 (continued)

A. Building Access Alterations

When steps or ramps are removed or altered by sidewalk construction, The Department will offer to reconstruct or restore them. To promote accessibility, the proposed replacement will be one that is compliant with ADA Title III to the extent feasible. The designer should consult the Roadside Development Unit for ADA building access requirements and accessibility options. The work necessary to make the facility accessible is eligible for federal participation.

The Department is not a Title III enforcement agency. If a property owner refuses a compliant replacement, the Department will honor the owner's preference and document the refusal. When an owner's preference of steps over ramps is accommodated, ADA guidelines for steps will be followed to the extent feasible.

The feasibility of accommodating private access will be based largely on structural and spatial limitations. If the installation of an ADA-compliant private access compromises the accessibility of the sidewalk, this may be a basis for a determination of infeasibility for full compliance of the building access.

In all cases, replaced access to a building entrance must not be made less accessible than the previous existing condition. If restoration to the existing level of accessibility is infeasible, the building owner may be entitled to compensation for the loss of the entrance. The compensation would be a Real Estate action and ADA compliance remains the owner's responsibility.

Existing building access can also be replaced by the property owner, under the provisions of existing permits, without action by MDOT. New installation of stairs/ramps undertaken by the property owner in public rights-of-way would require a permit. In all cases, stairs/ramps once constructed become the responsibility (ownership and maintenance) of the private property owner.

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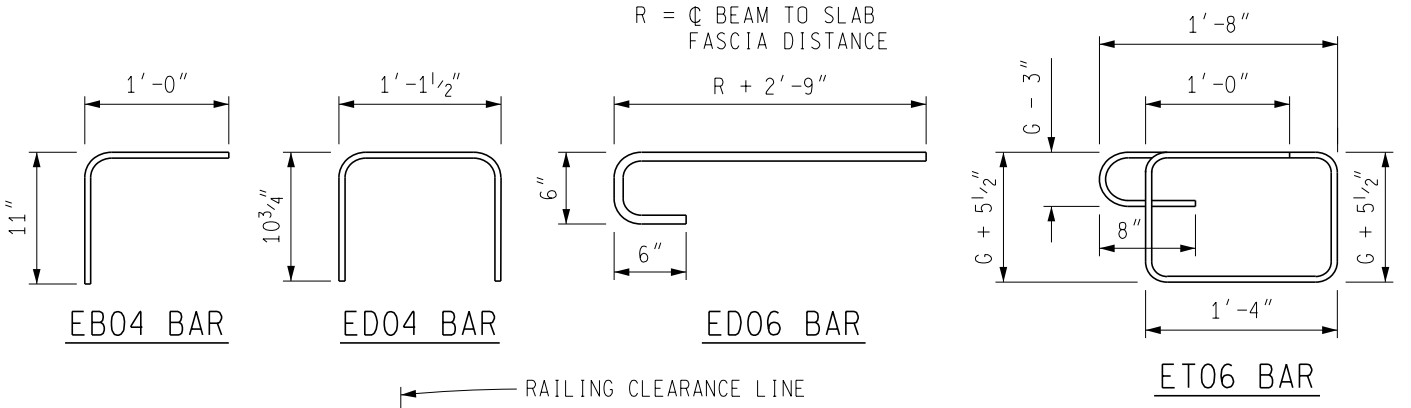
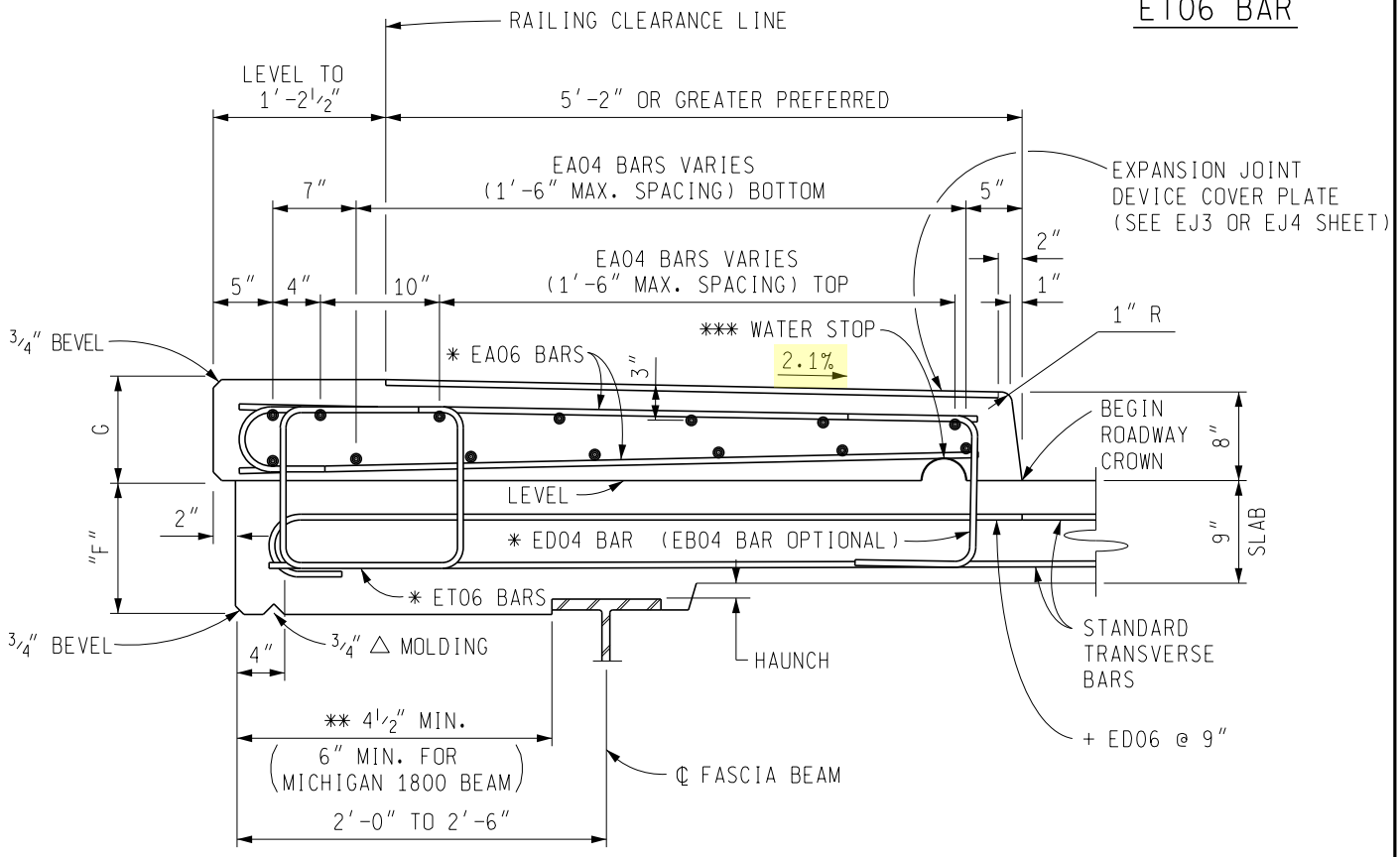




NOTES:

"F" CONSTANT EQUALS SLAB THICKNESS PLUS HAUNCH PLUS THICKEST FASCIA BEAM FLANGE PLUS ½" PLUS AMOUNT OF FASCIA BEAM DROP REQUIRED TO MAINTAIN SLAB THICKNESS AT CURB LINE.

IF "F" BECOMES GREATER THAN 12" USE A HAUNCH DETAIL ON THE FASCIA SIDE OF THE BEAM SIMILAR TO THE HAUNCH DETAIL ON THE INTERIOR SIDE. ADDITIONAL REINFORCEMENT MAY BE REQUIRED IN THE AREA OVER THE BEAM FLANGE IF THE HAUNCH BECOMES EXCESSIVE.

\+ THE DETAILED REINFORCEMENT IN THE SLAB (ED06 BARS) IS THE MINIMUM FOR THE RAILING. THE DESIGN OF THE SLAB OVERHANG MAY REQUIRE ADDITIONAL REINFORCEMENT (OR INCREASING THE REINFORCEMENT AREA (DIAMETER) SHOWN). ALL TOP TRANSVERSE BRIDGE SLAB REINFORCEMENT IS HOOKED SIMILAR TO THE ED06 BAR DETAILED ON THIS SHEET. BARS WITH PREFIX "E" ARE TO BE EPOXY COATED.

* SPACE WITH ALTERNATE TRANSVERSE SLAB BARS (1′-6″ MAX.). EB04 BAR MAY BE ADHESIVE ANCHORED INTO 6" DEEP HOLE INSTEAD OF ED04 BAR. PLACE ADDITIONAL ET06 BAR 6" EACH SIDE OF ℄ RAILING POST.

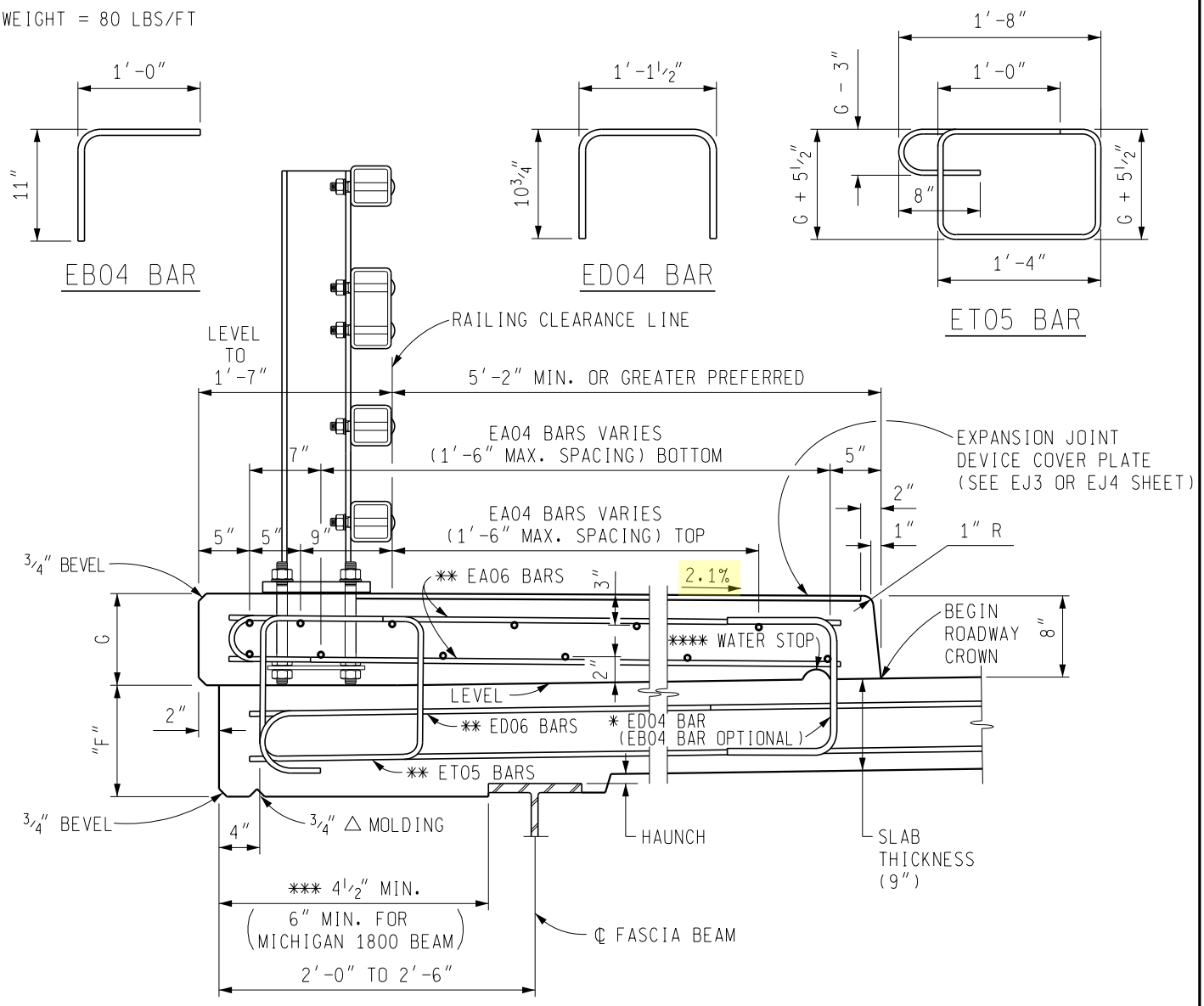
** APPLIES TO CURVED BRIDGES ONLY.

*** 2" HIGH x 4" LONG (±). FORMING NOT REQUIRED.

PREPARED BY DESIGN DIVISION	6.29.10C

DRAWN BY: BLT CHECKED BY: VZ APPROVED BY: KCK	MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF DEVELOPMENT BRIDGE RAILING, 4 TUBE - SIDEWALK SECTION PEDESTRIAN RAILING OPTION	ISSUED: 11/27/23 SUPERSEDES: 03/27/23

WEIGHT = 80 LBS/FT



NOTES:

"F" CONSTANT EQUALS SLAB THICKNESS PLUS HAUNCH PLUS THICKEST FASCIA BEAM FLANGE PLUS ½" PLUS AMOUNT OF FASCIA BEAM DROP REQUIRED TO MAINTAIN SLAB THICKNESS AT CURB LINE.

IF "F" BECOMES GREATER THAN 12" USE A HAUNCH DETAIL ON THE FASCIA SIDE OF THE BEAM SIMILAR TO THE HAUNCH DETAIL ON THE INTERIOR SIDE. ADDITIONAL REINFORCEMENT MAY BE REQUIRED IN THE AREA OVER THE BEAM FLANGE IF THE HAUNCH BECOMES EXCESSIVE.

THE DETAILED REINFORCEMENT IN THE SLAB (ED06 BARS) IS THE MINIMUM FOR THE RAILING. THE DESIGN OF THE SLAB OVERHANG MAY REQUIRE ADDITIONAL REINFORCEMENT (OR INCREASING THE REINFORCEMENT AREA (DIAMETER) SHOWN). BARS WITH PREFIX "E" ARE TO BE EPOXY COATED.

* EB04 BAR MAY BE ADHESIVE ANCHORED INTO 6" DEEP HOLE INSTEAD OF ED04 BAR. SPACE WITH ALTERNATE TRANSVERSE SLAB BARS (1′-6" MAX.).

** AT EACH POST PLACE 7 - ET05 BARS SPACED AT 6", ED06 BARS (SEE GUIDE 6.29.17) AND EA06 BARS WITH ALTERNATE ET05 BARS. PLACE ET05 BARS, ED06 BARS AND EA06 BARS AT 12" MAXIMUM IN REMAINING AREAS.

*** APPLIES TO CURVED BRIDGES ONLY.

**** 2" HIGH x 4" LONG (±). FORMING NOT REQUIRED.

PREPARED BY DESIGN DIVISION	6.29.17E

7.01.04 (continued)

Design Loading

K. Vehicle Collision Force (7-24-2023)

Account for the AASHTO LRFD vehicle collision force in the design of all new bridges, bridge replacements, and pier replacements.

Locate the pier outside of the clear zone as defined in Section 7.01.11 of the MDOT Road Design Manual where possible. The clear zone used to determine the location of the pier must account for future roadway widening where applicable.

If a pier cannot be located outside of the clear zone design a multi-column pier with a base wall. Design the base wall with the minimum dimensions specified in MDOT Bridge Design Guide 5.22.01 and to meet the requirements outlined in Section 3.6.5.1 of the AASHTO LRFD Bridge Design Specifications.

Alternatively, a reinforced solid wall pier may be designed with the following minimum dimensions to meet the requirements outlined in Section 3.6.5.1 of the AASHTO LRFD Bridge Design Specifications:

1. The minimum width of the solid wall is 3'-0".

2. The minimum cross-sectional area of the wall is 30.0 square feet measured in the horizontal plan. Generally, a 10'-0" minimum length based on a width of 3'-0".

A pier base wall with the minimum dimensions specified in MDOT Bridge Design Guide 5.22.01 and a solid wall pier with the minimum dimensions specified above are components with adequate structural resistance and do not need to be designed to withstand the vehicle collision force required by the AASHTO LRFD Bridge Design Specifications. (11-27-2023)

For situations where the above criteria cannot be satisfied, design the pier to withstand the full vehicle collision force required by the AASHTO LRFD Bridge Design Specifications.

7.01.04 (continued)

Design the pier footing or the pile group or drilled shafts supporting the pier to withstand the vehicle collision force using the appropriate limit states and load combinations. (11-27-2023)

The vehicle collision force may be redirected or absorbed with Type C single face concrete barrier in accordance with MDOT Standard Plan R-54-Series if the pier cannot be located outside of the clear zone. Locate the Type C single face concrete barrier relative to the pier to meet the requirements outlined in Section 3.6.5.1 of the AASHTO LRFD Bridge Design Specifications. Provide appropriate barrier end treatments in accordance with the MDOT Road Design Manual. If the Type C single face concrete barrier encroaches on the required lane or shoulder widths for the roadway under the bridge shielding the pier shall not be considered. Design the pier with a base wall, as a reinforced solid wall pier, or to withstand the full vehicle collision force required by the AASHTO LRFD Bridge Design Specifications. If the pier is designed to withstand the full vehicle collision force design the pier footing or the pile group or drilled shafts supporting the pier to withstand the vehicle collision force using the appropriate limit states and load combinations. (11-27-2023)

Site and project specific conditions must be considered by the Bridge Engineer when determining the option for accounting for the vehicle collision force. This may include, but is not limited to foundation limitations, the estimated cost of each option, and the construction schedule for the project.

New bridges, bridge replacements, and pier replacements shall not be exempted from the application of the AASHTO LRFD vehicle collision force.

12.08.08

Protection of Existing Piers in the Clear Zone (7-24-2023)

The piers of existing bridges located within the clear zone as defined in Section 7.01.11 of the MDOT Road Design Manual shall be retrofitted to account for the vehicle collision force (see section 7.01.04 K.) as part of any project that includes the 3R or 4R work on the bridge or along the roadway under the bridge if one of the following conditions are true:

1. The pier has columns with a minimum width of less than 3'-0".

2. The pier does not have load path redundancy. This includes, but is not limited to:

   a. The pier has two columns or fewer.

   b. The superstructure beams are supported directly on the columns with no cap adjoining columns.

3. The pier has columns with a minimum width or diameter of 3'-0" or greater and the face of the pier is located 12' or less from the edge of the lane (traveled way) of the roadway.

If an existing pier is located within the clear zone and meets one of the conditions listed above design and detail a strut between the existing columns based on the guidelines included in the MDOT Bridge Design Guides. The guidance included in the MDOT Bridge Design Guides have been developed based on the requirements in Section 3.6.5.1 of the AASHTO LRFD Bridge Design Specifications. (**This is pending and will be available shortly.**)

12.08.08 (continued)

Check the existing pier foundation to verify the additional dead load from the pier strut can be supported without exceeding the allowable bearing capacity or pile capacity. Complete this check according to AASHTO LRFD where practicable. In cases where AASHTO LRFD cannot be used, the design method shall be approved by the MDOT Chief Structure Design Engineer. (11-27-2023)

Because of the short duration over which they would be applied, the forces used to design the pier strut do not need to be transferred to the pier footing or to the deep foundation supporting the existing pier. Neither the forces used to design the pier strut, nor the AASHTO LRFD vehicle collision force need to be applied to the existing pier columns. (11-27-2023)

Alternatively, the vehicle collision force can be redirected or absorbed with Type C single face concrete barrier in accordance with Standard Plan R-54-Series. Locate the barrier relative to the face of the pier in accordance with the requirements outlined in Section 3.6.5.1 of the AASHTO LRFD Bridge Design Specifications. Provide appropriate barrier end treatments in accordance with the MDOT Road Design Manual.

If the existing pier foundation is not capable of supporting the additional dead load from a pier strut or if the pile supports for a Type C single face concrete barrier conflict with the existing pier footing the existing pier can be protected with a Type B single face concrete barrier placed directly in front of the pier columns in accordance with R-54-Series. Use this option only if the barrier can be installed without the need for a design exception/design variance for shoulder width. Provide appropriate barrier end treatments (R-55, 67, etc.-Series) in accordance with the MDOT Road Design Manual.

7.01.15

Shoulder Widths for Work Zone Safety and Mobility (8-20-2009) (6-16-2014)

For 2 lane freeway and interstate new bridge construction and superstructure replacements the standard bridge shoulder widths shall be 14'-10". This will provide increased safety and mobility for future maintenance of traffic. The cross section will provide part width bridge construction with traffic being maintained on two 11 ft. lanes with 1 ft. shy distance on each side. For cross section see Bridge Design Guide 6.05.01A. A design exception will be required when the shoulder width is not met. The Region shall determine the required shoulder width at the scoping of the projects. (9-25-2023)

For shoulder widths for deck replacements, see section 7.02.31. A design exception will be required when the shoulder widths provided on deck replacement projects do not meet those required in section 7.02.31. Shoulders wider than those specified in section 7.02.31 may be required to accommodate corridor mobility needs and to accommodate the future maintenance of traffic needs for projects affecting infrastructure adjacent to the bridge. The Region shall determine the required maintenance of traffic needs for the corridor at the scoping of the projects and will document how the corridor mobility needs have been considered in the Scoping Report for the structure. The corridor mobility needs and the proposed clear roadway width for the deck replacement project will be confirmed during the Scope Verification Meeting for the project and the discussion must be documented in the minutes for the meeting. (9-25-2023)

Designers should layout beam spacing to accommodate future part width reconstruction. Beams may be located under the crown of the bridge deck provided there is no construction joint in the bridge deck at the crown. (11-27-2023)

Bridge approach guardrail and bridge approach curb and gutter will be affected as a result of the widened shoulders and must be addressed in the design of the approaches. If the increased shoulder width is deemed necessary on reconstruction projects substructure widening may become necessary.

7.01.16

Redundancy
(8-20-2009) (9-17-2012) (3-23-2020)

Any proposed elements, or systems that do not meet AASHTO and FHWA redundancy requirements are prohibited. Bridge superstructures (beam/slab type) must have a minimum of 3 longitudinal beams or girders.

7.01.17

Part Width Construction (11-28-2011)

For existing bridges used to maintain traffic, the structural performance of the in-service portion of the structure shall be evaluated with respect to stage demolition and adjacent construction.

To the extent possible, plans shall show location of existing spread footings with respect to proposed construction.

Unbraced excavations for new substructures shall not extend below the bearing elevation of adjacent spread footing foundations.

Drilled excavations adjacent to in-service spread footing foundations shall be cased to prevent undermining.

For part-width construction of bridges, provide a minimum of 6' between the centerline of temporary sheeting (along the stage line) and the existing substructure sawcut line. This will allow for the width of sheeting and any required whalers and/or tiebacks. (2-26-2018)

7.02.25

Pavement Seats

Pavement seats are to be provided on all bridges except integral and semi-integral structures with continuous pour over reference lines (also see Section 7.03.01 C). (5-6-99)

7.02.26

Drain Castings

A. Location

Drain castings in bridge decks should be avoided where practicable. Where drain castings are necessary, they are to be spaced as required but located so as not to allow water to fall on slopes and/or roadways below. Design is to be based on Hydraulic Engineering Circular No. 21 (HEC 21), "Design of Bridge Deck Drainage", or an equal. (5-6-99)

B. Special Reinforcement Steel

Where drain castings are called for in bridge decks, plans are to show that two epoxy coated reinforcing bars are to be placed diagonally at each corner of the drain casting (one top, one bottom). (5-6-99)

7.02.27

Sidewalks (9-2-2003) (11-25-2019)

In general, on a bridge where pedestrians must be accommodated and where maximum posted speed is 40 mph or less, a raised sidewalk should be provided if there is a raised sidewalk on the approach. Where posted speed is greater than 40 mph or there is no raised sidewalk on the approach, a walkway at roadway level should be provided and protected from traffic by an MDOT approved bridge railing.

Where sidewalks are required, they should be 5'-2" or greater in width. However, in circumstances where a 5'-2" width is not achievable a 4'-2" minimum width is permissible if crash tests allow. (8-20-2009)

7.02.27 (continued)

When the bridge railing length is greater than 200 feet, to adhere to Americans with Disabilities Act (ADA), the sidewalk must be 5'-0" wide (@ 2.1% maximum slope) or a 5' square passing space shall be located at intervals not exceeding 200 feet. The requirement is valid with a raised sidewalk as on Standard Plan B-25-Series, B-26-Series or B-27-Series and anywhere where the sidewalk is located behind a railing that separates pedestrians from traffic. For railing lengths less than 200 feet the sidewalk width may be 4'-2" if crash tests allow and does not require passing spaces. (11-27-2023)

Expansion joints located on sidewalks shall be fitted with cover plates to eliminate vertical depressions caused by the joint. See Expansion Joint sheets (EJ3 or EJ4). Detail cover plates that require a length greater than 11' to be fabricated from two equal length pieces with a joint located at the centerline of the sidewalk or path. Provide a ¼" wide gap at the joint that is parallel to the centerline of the sidewalk or path. (1-23-2023)

For additional information refer to Bridge Design Guides 6.05.02, 6.29.10C, 6.29.17E and Road Design Manual Section 6.08.

Where a shared (multi) – use path or other mode of transportation is anticipated or proposed for the bridge, verify that all users have been accommodated and refer to appropriate specifications for design criteria. (12-16-2019)

A. Sidewalk Joints

Space sidewalk joints to match any joints in the slab. (9-25-2017)

B. Independent Sidewalk

If the sidewalk is independent of the roadway slab, the sidewalk is to be designed for maximum wheel loading for the bridge with overstressing as allowed by the current AASHTO Standard Specifications for Highway Bridges.