



Road & Bridge Design Publications

Monthly Update – October 2014

Revisions for the month of **October** are listed and displayed below. New special details will be included in projects submitted for the **January** letting as is stated on the special detail index sheets. E-mail questions related to the road changes to MDOT-Road-Design-Standards@michigan.gov. E-mail bridge related questions to MDOT-Bridge-Design-Standards@michigan.gov.

Standard Plan Distribution

The special detail index was updated to account for recent standard plan approvals. The distribution letter explaining the changes and the inserts used to keep a hard copy of the standard plan booklet up to date can be found at:

http://mdotcf.state.mi.us/public/design/files/englishstandardplans/files/standard_plan_distribution.pdf

The new standard plans have been placed on the website.

Special Details

R-112-H: Shoulder & Center Line Corrugations: Two notes on the note sheet were revised to clarify exclusion of corrugations on exit/entrance ramps and to add the use of corrugations on freeway to freeway ramps (excluding loop ramps). On sheet five, the width of the non-freeway concrete corrugation was revised from 16” (one corrugation covering both directions of traffic, 8” out from each side of centerline) to a 6” corrugation on each side of the centerline with a 3” gap separating it from the centerline. The depth of the concrete centerline corrugation (nearest the center line on a crowned pavement) was revised from ½” to 7/16”.

Road Design Manual

6.05.11: Corrugations in Shoulders and Pavement: Corrugations are excluded on the shoulders of typical exit/entrance ramps but included on the shoulders of freeway to freeway ramps (excluding loop ramps). Also, text was added regarding gapping out any existing formed corrugations on the plans which may conflict with new ground in corrugations.



Road & Bridge Design Publications

Monthly Update – October 2014

7.05.02: Delineators: The revisions clarify that delineator pay items are to be included in all 3R/4R divided highway and freeway projects regardless of whether surfacing is included. Inclusion with CPM projects is conditional. Additional sizes and colors were added to the pay item descriptions for delineator reflectors and delineator reflective sheeting.

Bridge Design Guides

6.65.02, 6.65.02 A, & 6.65.02 B: Updated box beam properties and added more (deeper) beams.

Updates to MDOT Cell Library, Bridge Auto Draw Program, etc., may be required in tandem with some of this month's updates. Until such updates to automated tools 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

10-20-2014

⑥

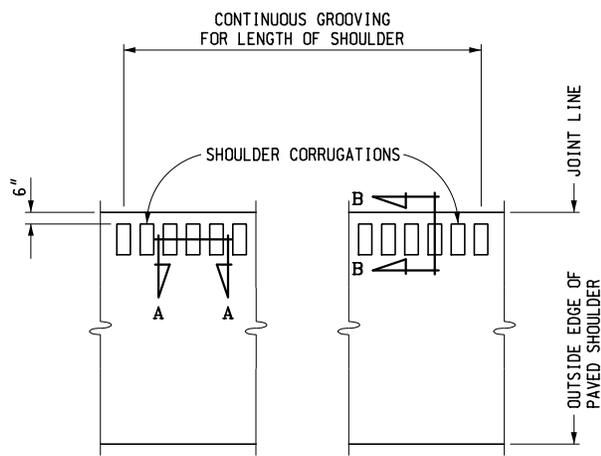
SPECIAL DETAIL NUMBER	NUMBER OF SHEETS	TITLE	CURRENT DATE
21	2	GUARDRAIL AT INTERSECTIONS	5-24-01
24	5	GUARDRAIL ANCHORED IN BACK SLOPE TYPES 4B & 4T	7-22-02
99	2	CHAIN LINK FENCE WITH WIRE ROPE	9-22-14
R-110-A	3	PAVEMENT SAFETY EDGE	3-17-14
* R-112-H	8	SHOULDER AND CENTER LINE CORRUGATIONS	10-7-14
R-126-I	5	PLACEMENT OF TEMPORARY BARRIER	3-26-12
<p>* Denotes New or Revised Special Detail to be included in projects for (beginning with) the January letting.</p> <p>Note: 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 Municipal Utilities Unit will provide these full sized special details for inclusion in construction plans for MDOT jobs. To assure prompt delivery, requests must be made in advance.</p> <p>Former Standard Plans IV-93 and IV-94 series have been replaced with precast concrete box & three-sided culverts as per the 2012 Standard Specifications for Construction.</p>			

Index to Bridge Detail Sheets

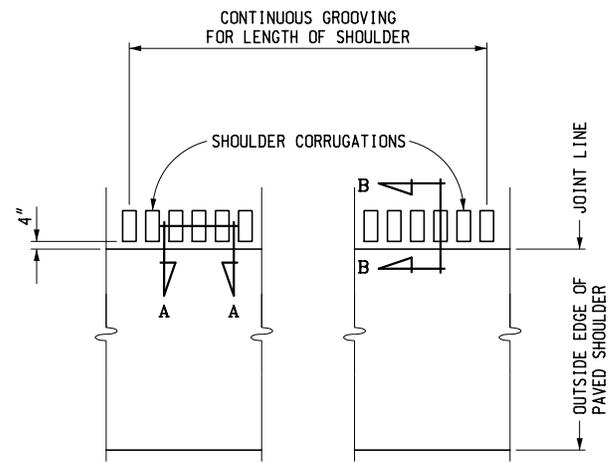
10-20-2014

⑦

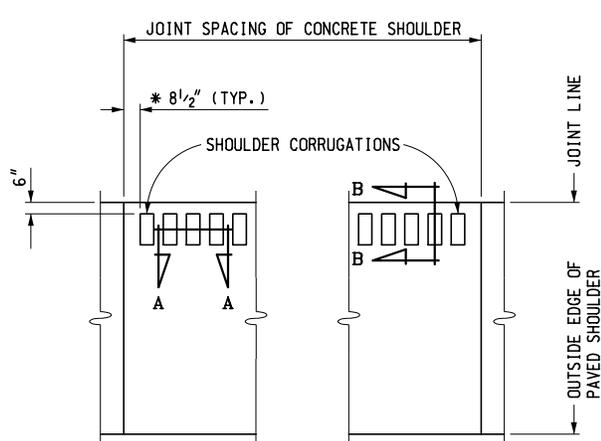
DETAIL NUMBER	NUMBER OF SHEETS	TITLE	CURRENT DATE
EJ3AA	1 or 2	EXPANSION JOINT DETAILS	6-16-14
EJ4N	1 or 2	EXPANSION JOINT DETAILS	6-16-14
PC-2G	1	70" PRESTRESSED CONCRETE I-BEAM DETAILS	3-31-06
PC-4E	1	PRESTRESSED CONCRETE 1800 BEAM DETAILS	3-31-06
PC-1L	1	PRESTRESSED CONCRETE I-BEAM DETAILS	7-12-06
<p>* Denotes New or Revised Special Detail to be included in projects for (beginning with) the January letting.</p>			
Note:	<p>Details EJ3AA & EJ4N are interactive, i.e. designers and detailers choose details based upon railing type and angle of crossing. Place all details appropriate for the project, structure specific information, and the Expansion Joint Device quantity on the sheet. The sheet shall then be added to the plans as a normal plan sheet.</p> <p>Detail PC-1L, PC-2G and PC-4E 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.</p>		



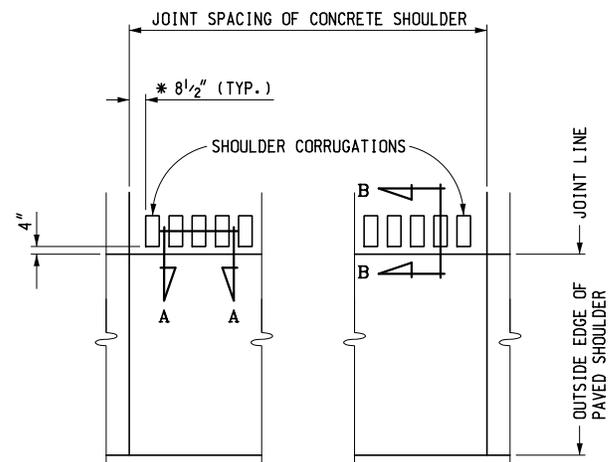
HMA SHOULDER PLAN
ADJACENT TO 12' LANE



HMA SHOULDER PLAN
ADJACENT TO 14' LANE



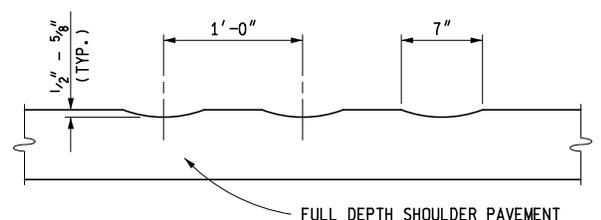
CONCRETE SHOULDER PLAN
ADJACENT TO 12' LANE



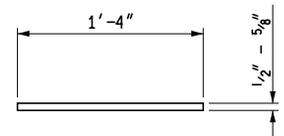
CONCRETE SHOULDER PLAN
ADJACENT TO 14' LANE

* THE DISTANCE FROM THE CORRUGATION TO THE TRANSVERSE JOINT SHALL BE AT LEAST 6" BUT LESS THAN 12".

* THE DISTANCE FROM THE CORRUGATION TO THE TRANSVERSE JOINT SHALL BE AT LEAST 6" BUT LESS THAN 12".



SECTION A - A



SECTION B - B

FREEWAY SHOULDER CORRUGATIONS
(FOR FREEWAY SHOULDERS PAVED 4 FEET OR GREATER)



DEPARTMENT DIRECTOR
Kirk T. Stuedle

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

PREPARED BY
DESIGN DIVISION

APPROVED BY: _____
DIRECTOR, BUREAU OF FIELD SERVICES

**SHOULDER AND CENTER LINE
CORRUGATIONS**

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

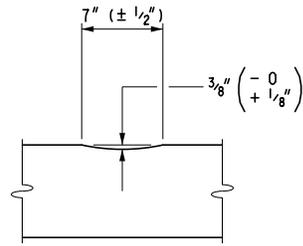
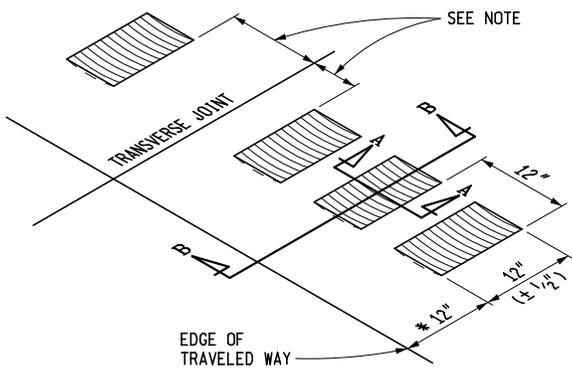
APPROVED BY: _____
DIRECTOR, BUREAU OF HIGHWAY DEVELOPMENT

F.H.W.A. APPROVAL

10-7-2014
PLAN DATE

R-112-H

SHEET
1 OF 8



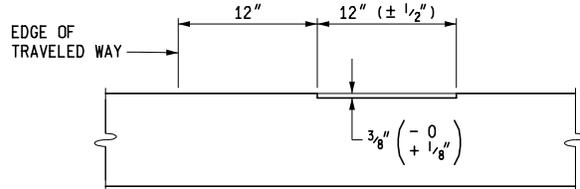
SECTION A-A

TYPICAL NON-FREEWAY SHOULDER CORRUGATION INSTALLATION

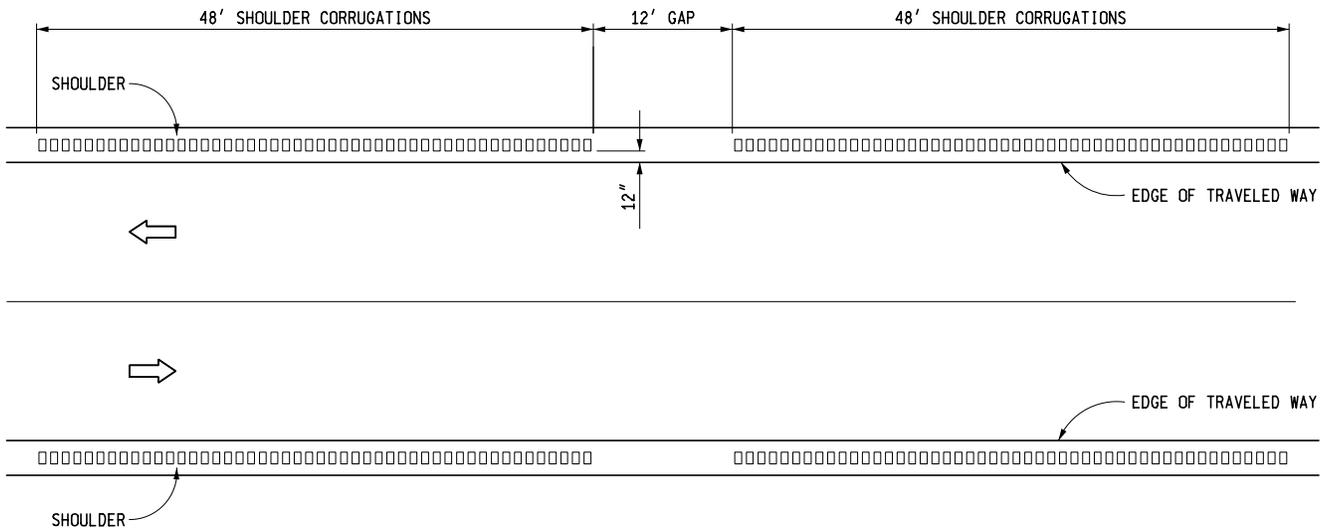
* LATERAL DEVIATION SHALL NOT EXCEED 1" IN 100'.

NOTE:

ON CONCRETE PAVEMENTS, THE DISTANCE FROM A SHOULDER CORRUGATION TO A TRANSVERSE JOINT SHALL BE AT LEAST 6" BUT LESS THAN 12".

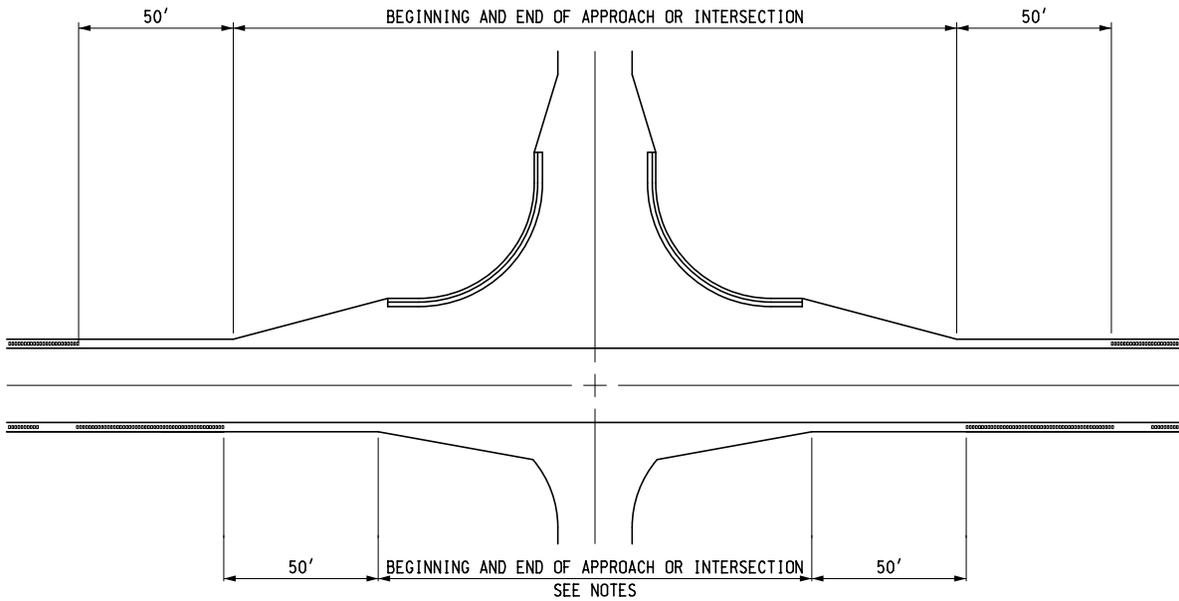


SECTION B-B



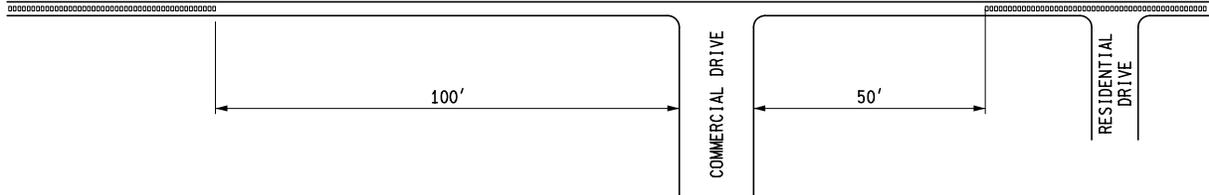
SHOULDER CORRUGATIONS ON TWO-WAY ROADWAYS
NON-FREEWAY SHOULDER CORRUGATIONS
 (FOR NON-FREEWAY SHOULDERS PAVED 6 FEET OR GREATER)

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR		
SHOULDER AND CENTER LINE CORRUGATIONS		
F.H.W.A. APPROVAL	10-7-2014 PLAN DATE	R-112-H
		SHEET 2 OF 8

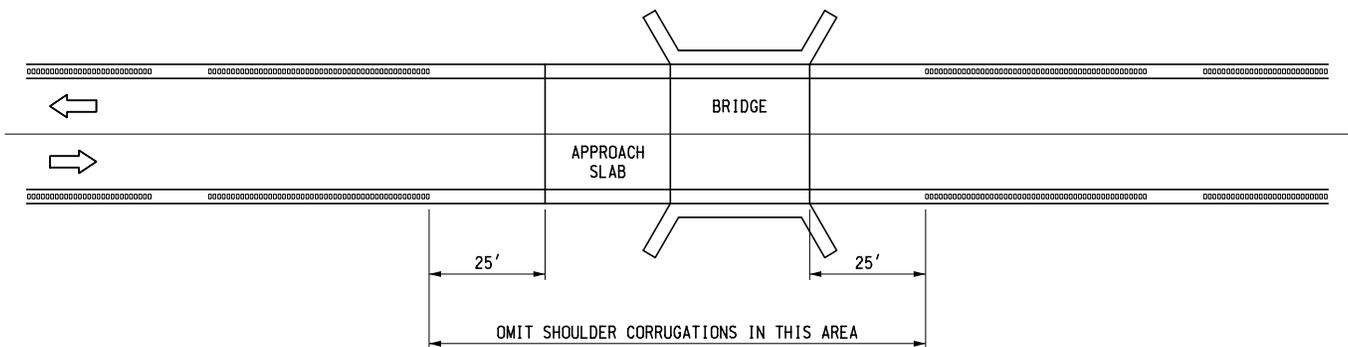


NOTE:

SHOULDER CORRUGATIONS MAY BE OMITTED IN AREAS WITH HIGH CONCENTRATIONS OF DRIVES, WHEN DIRECTED BY THE ENGINEER.



SHOULDER CORRUGATIONS AT INTERSECTIONS



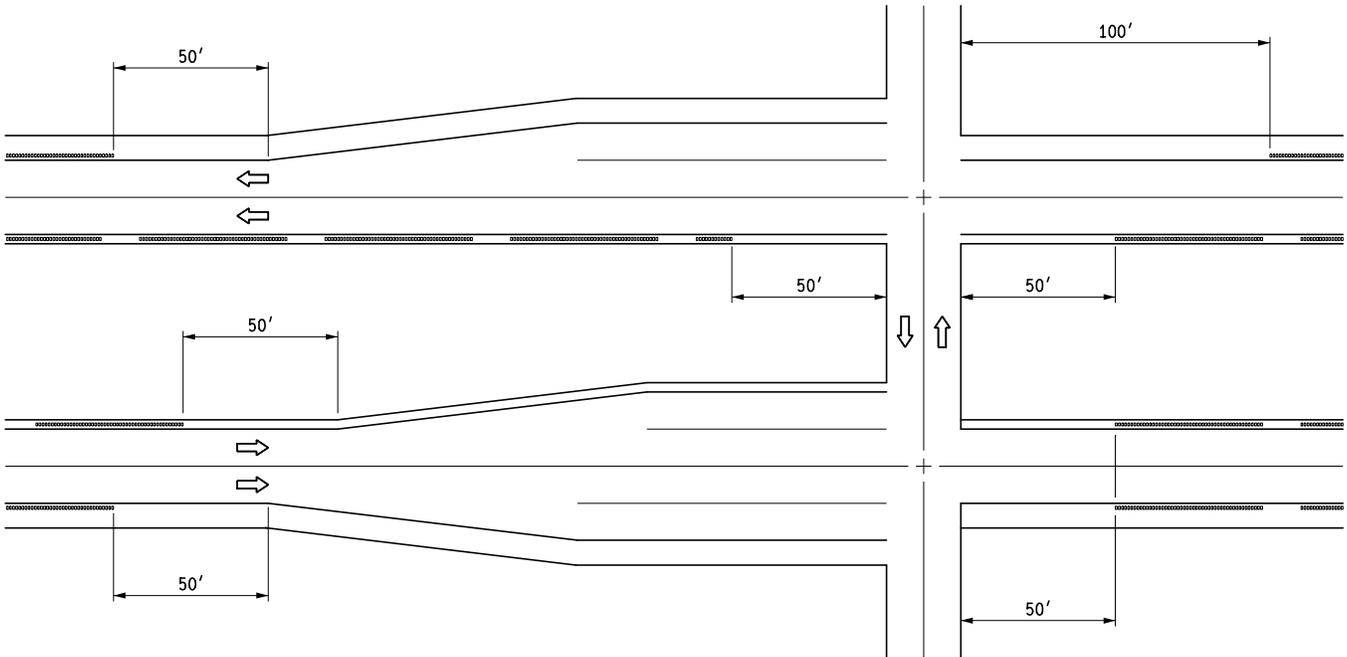
SHOULDER CORRUGATIONS AT BRIDGES

**NON-FREEWAY SHOULDER CORRUGATIONS
(FOR NON-FREEWAY SHOULDERS PAVED 6 FEET OR GREATER)**

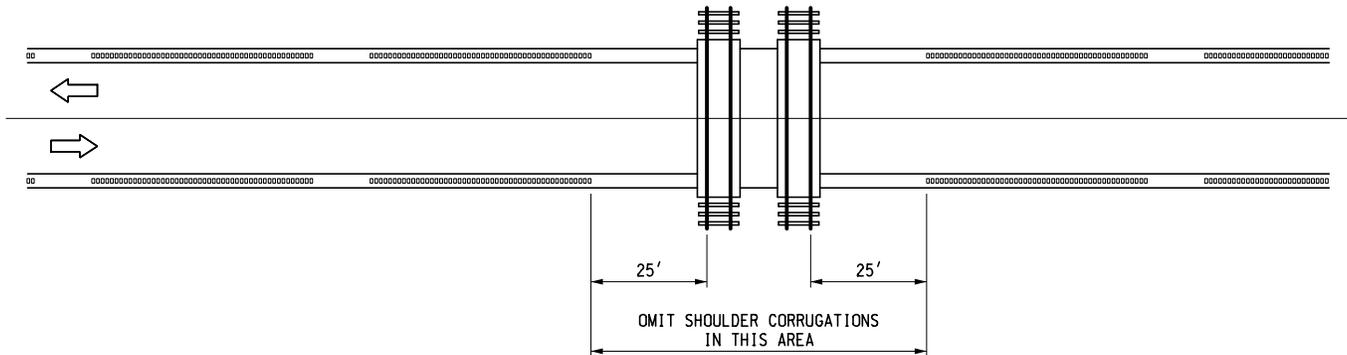
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

**SHOULDER AND CENTER LINE
CORRUGATIONS**

F.H.W.A. APPROVAL	10-7-2014 PLAN DATE	R-112-H
		SHEET 3 OF 8



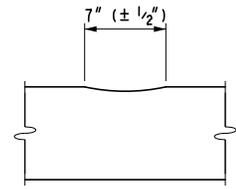
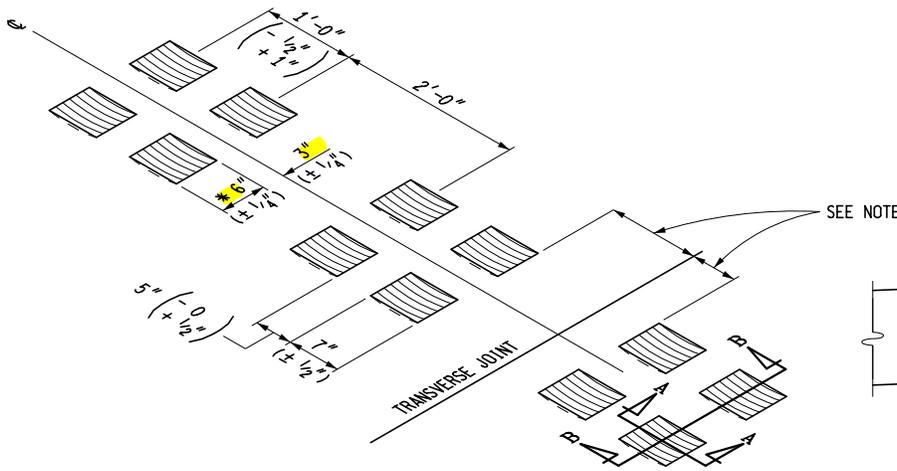
SHOULDER CORRUGATIONS AT INTERSECTIONS



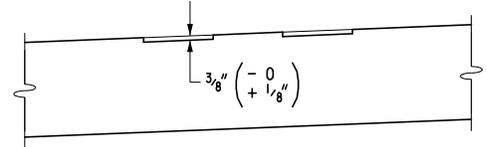
SHOULDER CORRUGATIONS AT RAILROADS

NON-FREEWAY SHOULDER CORRUGATIONS
 (FOR NON-FREEWAY SHOULDERS PAVED 6 FEET OR GREATER)

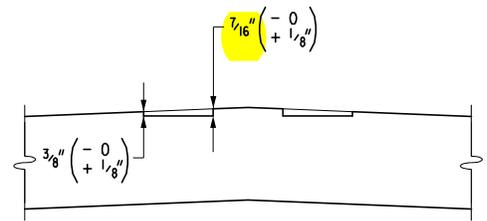
MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR		
SHOULDER AND CENTER LINE CORRUGATIONS		
F.H.W.A. APPROVAL	10-7-2014 PLAN DATE	R-112-H
		SHEET 4 OF 8



SECTION A-A



SECTION B-B
SUPERELEVATED ROADWAY



SECTION B-B
CROWNED ROADWAY

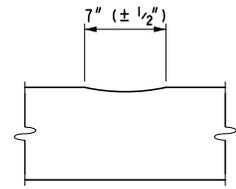
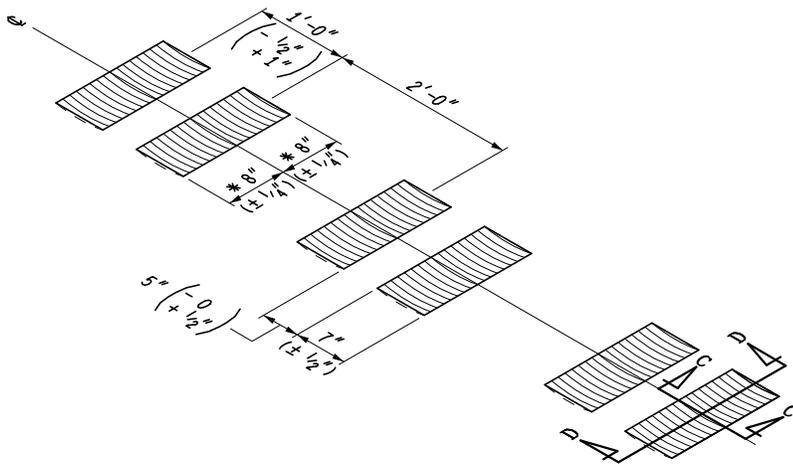
TYPICAL NON-FREEWAY CENTER LINE CORRUGATION INSTALLATION FOR CONCRETE PAVEMENT

* LATERAL DEVIATION SHALL NOT EXCEED 1" IN 100'.

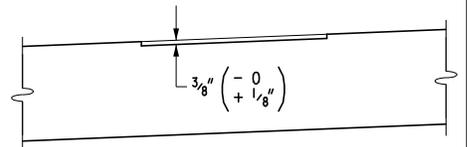
NOTES:

ON CONCRETE PAVEMENTS, THE DISTANCE FROM A CENTER LINE CORRUGATION TO A TRANSVERSE JOINT SHALL BE AT LEAST 6" BUT LESS THAN 12".

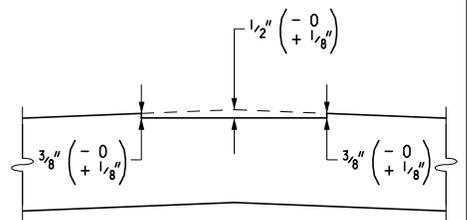
ON CONCRETE PAVEMENTS, CORRUGATIONS MAY BE CONSTRUCTED IN TWO PASSES AND THEREFORE NOT BE SYMMETRICAL ACROSS THE CENTER LINE.



SECTION C-C



SECTION D-D
SUPERELEVATED ROADWAY



SECTION D-D
CROWNED ROADWAY

TYPICAL NON-FREEWAY CENTER LINE CORRUGATION INSTALLATION FOR HMA PAVEMENT

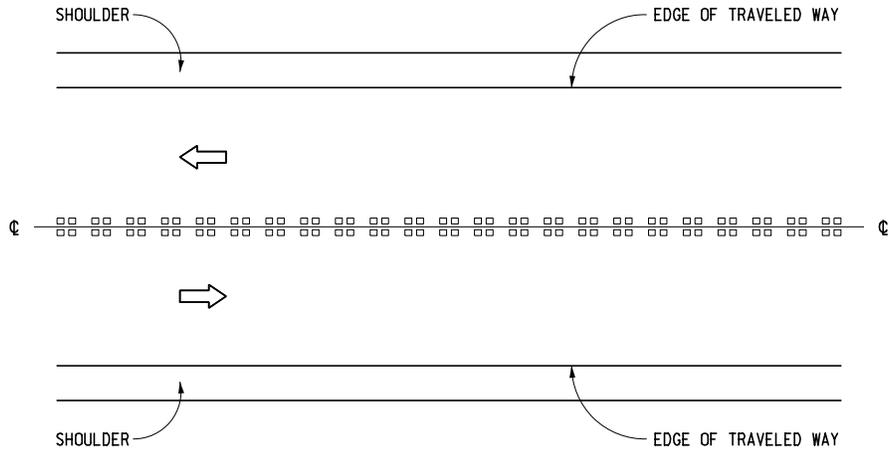
* LATERAL DEVIATION SHALL NOT EXCEED 1" IN 100'.

NON-FREEWAY CENTER LINE CORRUGATIONS

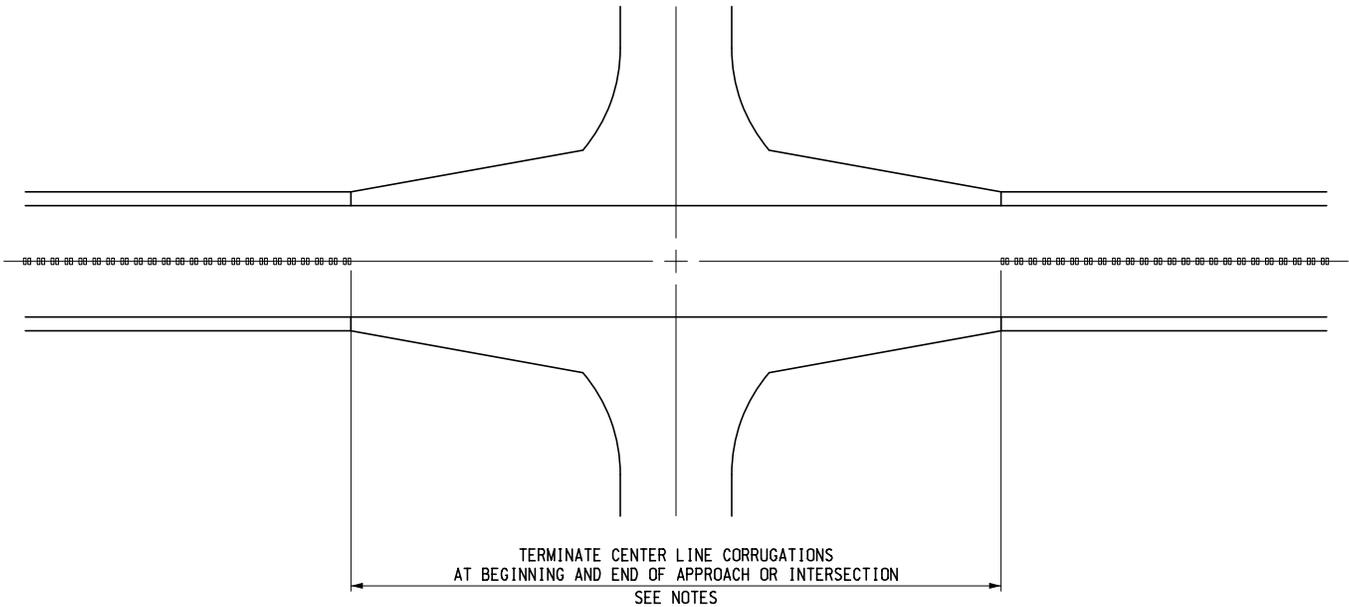
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

SHOULDER AND CENTER LINE CORRUGATIONS

F.H.W.A. APPROVAL	10-7-2014 PLAN DATE	R-112-H	SHEET 5 OF 8
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CENTER LINE CORRUGATIONS ON TWO-WAY ROADWAYS

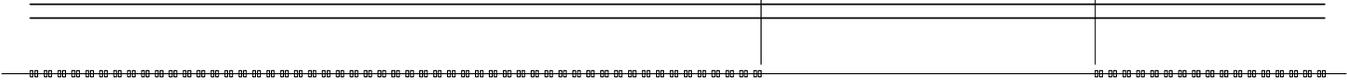


CENTER LINE CORRUGATIONS AT INTERSECTIONS

NON-FREEWAY CENTER LINE CORRUGATIONS

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR		
SHOULDER AND CENTER LINE CORRUGATIONS		
_____ F.H.W.A. APPROVAL	10-7-2014 PLAN DATE	R-112-H
		SHEET 6 OF 8

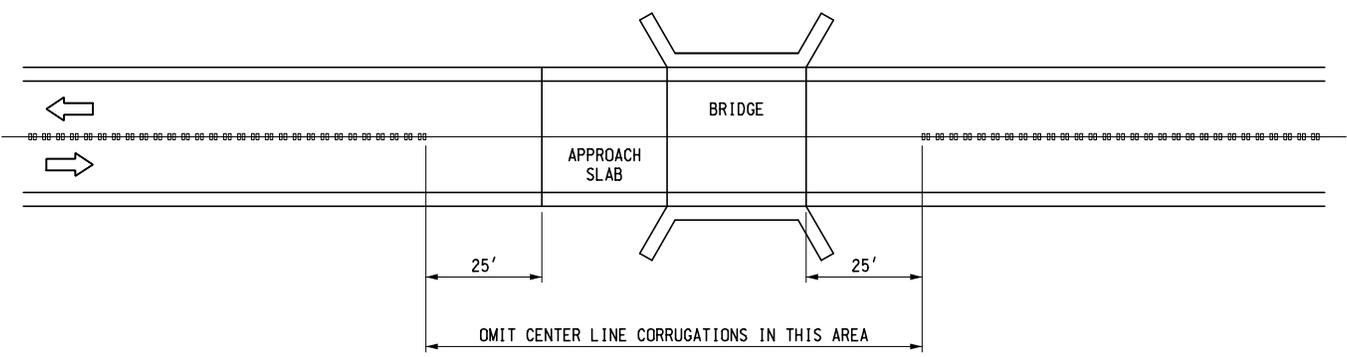
TERMINATE CENTER LINE CORRUGATIONS
 3 TIMES WIDTH OF COMMERCIAL DRIVE
 OR AS DIRECTED BY THE ENGINEER
 SEE NOTES



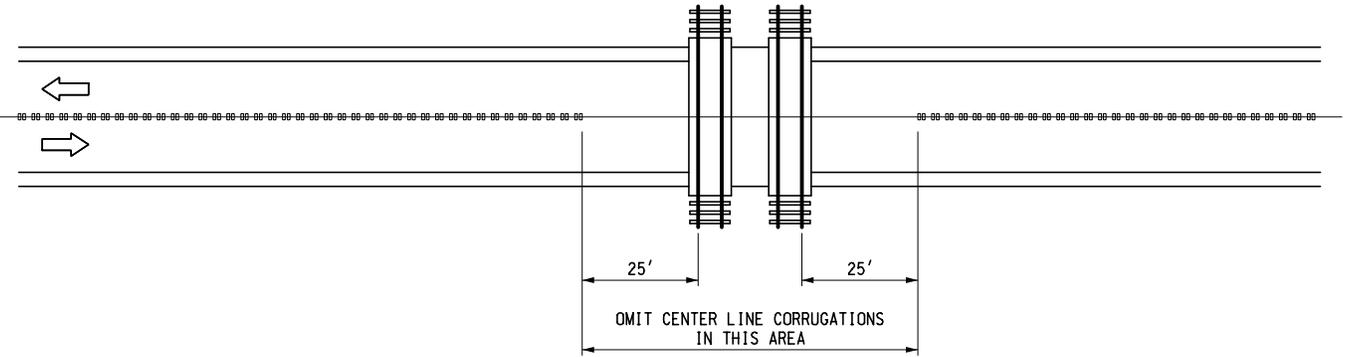
RESIDENTIAL
 DRIVE

COMMERCIAL
 DRIVE

CENTER LINE CORRUGATIONS AT DRIVEWAYS



CENTER LINE CORRUGATIONS AT BRIDGES



CENTER LINE CORRUGATIONS AT RAILROADS

NON-FREEWAY CENTER LINE CORRUGATIONS

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR		
SHOULDER AND CENTER LINE CORRUGATIONS		
_____ F.H.W.A. APPROVAL	10-7-2014 PLAN DATE	R-112-H
		SHEET 7 OF 8

NOTES: (NON-FREEWAY)

SHOULDER CORRUGATION CROSS-SECTIONS AND LOCATIONS SHALL BE AS DETAILED ON THIS STANDARD. CORRUGATIONS ON NON-FREEWAYS SHALL BE IN CONCRETE AND HMA SHOULDERS PAVED AT LEAST 6'-0" WIDE WITH A POSTED SPEED OF 55 MPH. CORRUGATIONS CAN BE USED IN OTHER SITUATIONS WHERE THEY HAVE BEEN PREVIOUSLY APPROVED USING CURRENT GUIDELINES.

CORRUGATIONS SHALL NOT BE PLACED OVER A TRANSVERSE SHOULDER JOINT.

DO NOT MILL SHOULDER OR CENTER LINE CORRUGATIONS THROUGH ANY INTERSECTION, MARKED CROSSWALK, NON-MOTORIZED PATH CROSSING, OR SNOWMOBILE CROSSING.

NOTES: (FREEWAY)

SHOULDER CORRUGATION CROSS-SECTIONS AND LOCATIONS SHALL BE AS DETAILED ON THIS STANDARD. CORRUGATIONS ON FREEWAYS SHALL BE IN CONCRETE AND HMA SHOULDERS PAVED 4'-0" OR WIDER OR WHERE THE SHOULDER LIES BETWEEN THE PAVEMENT AND VALLEY GUTTER OR CURB AND GUTTER. **CORRUGATIONS WILL NOT BE USED IN FREEWAY EXIT/ENTRANCE RAMP SHOULDERS OR WHERE SHOULDERS ARE SEPARATED FROM THE PAVEMENT BY VALLEY GUTTER OR CURB AND GUTTER. EXCEPT FOR LOOP RAMP, CORRUGATIONS WILL BE USED ON FREEWAY TO FREEWAY RAMP.**

CORRUGATIONS SHALL NOT BE PLACED OVER A TRANSVERSE SHOULDER JOINT.

CORRUGATION LOCATION IN THE AREA OF FREEWAY RAMP WILL BE AS FOLLOWS: THE TYPICAL OFFSET WILL BE INCREASED TO 24" AND BE LOCATED ON THE SHOULDER SIDE OF THE JOINT BEGINNING 300' IN ADVANCE OF THE EXIT RAMP TAPER. THIS OFFSET WILL CONTINUE UNTIL THE 2' POINT OF THE GORE. **FOR EXIT/ENTRANCE RAMP AND LOOP RAMP, THE CORRUGATIONS WILL END ALONG THE RAMP AT THIS POINT AND SIMULTANEOUSLY RESUME ON THE MAINLINE SHOULDER WITH THE NORMAL OFFSET. THE CONFIGURATION FOR ENTRANCE RAMP WILL BE IN THE REVERSE ORDER OF THE EXIT RAMP. FOR FREEWAY TO FREEWAY RAMP, IN ADDITION TO RESUMING THE MAINLINE SHOULDER CORRUGATION AT THIS POINT, RETURN TO THE NORMAL MAINLINE OFFSET ALONG THE LENGTH OF THE RAMP SHOULDER.**

WITHIN AN URBAN FREEWAY AREA OR OTHER LIMITED FREEWAY AREA, SHOULDER CORRUGATIONS MAY BE OFFSET UP TO 12" FROM THE EDGE OF THE TRAVEL LANE, AS SHOWN IN THE PLANS, OR AS DIRECTED BY THE ENGINEER. IF NEEDED, THE CORRUGATION MAY BE LOCATED ON THE OPPOSITE SIDE OF THE JOINT FOR 14' LANES TO MAINTAIN THE MINIMUM OFFSET TO THE JOINT LINE.

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

SHOULDER AND CENTER LINE CORRUGATIONS

F.H.W.A. APPROVAL

10-7-2014
PLAN DATE

R-112-H

SHEET
8 OF 8

MICHIGAN DESIGN MANUAL ROAD DESIGN

6.05.11 (revised 10-22-2014)

Corrugations in Shoulders and Pavement

Corrugations (also known as rumble strips) provide a visual and audible warning to a driver that their vehicle is either straying off the road or is encroaching an oncoming lane of traffic. Shoulder corrugations also discourage the unauthorized use of the shoulder as a driving lane.

Corrugations are ground or cut into both concrete and HMA pavements. They cannot be formed in. Corrugation cross sections and locations shall be as detailed on standard plan R-112-Series.

Freeway shoulder corrugations should be used in both median and outside shoulders having paved widths of at least 4'. Corrugations are to be included on freeway-to-freeway ramps with the exception of loop ramps, but are otherwise not to be used on freeway exit/entrance ramp shoulders. Corrugations are also omitted where the shoulder is separated from the traveled lanes by a curb and gutter or valley gutter.

Existing concrete shoulders might contain intermittent (formed) corrugations that conflict with the proposed placement of retrofit ground or cut corrugations. It should be noted and detailed in the plans that the existing intermittent corrugations should be gapped out rather than milled through.

Non-freeway shoulder corrugations should be used on all rural, 2-lane, 4-lane, and divided trunk line roadways where the posted speed is 55 mph and the paved shoulder is at least 6' wide. The Region or TSC should contact the MDOT non-motorized coordinator and non-motorized program staff when considering placing corrugations on shoulders paved less than 6' wide.

6.05.11 (continued)

Centerline corrugations should be used on all rural 2-lane and 4-lane trunk line roadways (in both passing and non-passing zones) where the posted speed is 55 mph and the lane plus paved shoulder width beyond the centerline corrugation is greater than 13' in width.

If safety concerns outweigh other issues such as noise and bicycle use, non-freeway shoulder and centerline corrugations can be considered for use on roadways that do not meet the criteria given above.

In locations where horse-drawn buggies utilize the roadway, do not use shoulder corrugations unless a crash history exists. Document this as a context sensitive design decision. When a correctable crash history does exist, consider using corrugations and widening the shoulder 2' to accommodate both. Document the decision.

In developed rural areas where driveway density exceeds 30 access points within ½ mile, non-freeway shoulder and centerline corrugations may be omitted unless a crash history exists. Document the decision.

ROAD DESIGN MANUAL

ROAD DESIGN

7.05

TRAFFIC SIGNS AND ROADWAY DELINEATORS

7.05.01 (revised 12-22-2011)

Traffic Signs

The Department has jurisdiction over traffic operational signs (As opposed to local street name signs which are the property and responsibility of the local jurisdiction, and occupy the R.O.W. by permission). The responsibility for preparing any required freeway signing plans will be that of the Design Division – Traffic Sign Unit and/or its traffic signing consultant. The preparation of signing plans for non-freeway is the responsibility of the Region/TSC or a per-qualified signing consult. Design's responsibility will usually be limited to coordinating the signing plans with the project plans.

When a project involves completely new construction or reconstruction, the signing plans should be included as part of the project plans. If the project will be built under one contract, e.g., a two-lane, free access roadway, then the signing will be included with the road plans either as plan sheets or computerized log sheets. If a contiguous section of freeway is being built under several contracts, it is possible that the signing work will be done with a separate contract. Even if this happens, some foundation and sign base work may be included in the road and bridge contracts. The Design Unit should contact the Region/TSC Operations Engineer early in the project development stage to determine if signing will be a part of the project. Also a copy of the correspondence should be given to Design Division – Traffic Sign Unit. If the signing contract is being done with a separate contract, the Design Unit should also contact the Traffic Sign Unit to confirm that all items are included in their respective contracts.

7.05.01 (continued)

As mentioned above, signing plans will generally be prepared by the Design Division – Traffic Sign Unit or Region/TSC Traffic & Safety. There may be occasions, however, where time constraints will necessitate Design completing the final drafting of signing plans from preliminary layouts furnished by the Region/TSC. Design should contact the Reflective Systems Unit, if the Region/TSC has not submitted special provisions and support standards with plans. The role that the Traffic Sign Unit, plays is one of review and coordination between the Region/TSC and Design.

Salvaged signs remain the property of the Department and components will be re-used, whenever possible, by Maintenance and the sign shops.

For signing on detours see [Section 12.05](#).

7.05.02 (revised 10-22-2014)

Delineators

See Standard Plan R-127-Series, "Delineator Installations" for information on both rigid-post and flexible-post delineators.

The contract items of "Delineator Reflector", "Post, Delineator", and/or "Delineator, Reflective Sheeting", and "Post, Flexible Delineator" shall be used on all 3R/4R road construction projects for divided highways and freeways. Inclusion of these items should also be considered on divided highway and freeway CPM projects depending on the condition of existing devices and the pavement remaining service life.

The rigid delineator measurements and payments are for Delineator Reflector, measured as "each" (Delineator Reflector-Double is counted as two each) and Post, Delineator, also measured as "each".

ROAD DESIGN MANUAL ROAD DESIGN

7.05.02 (continued)

Delineators

The designer should make an estimate of each type of Delineator reflector, based on the patterns specified on the standard plan. These quantities are shown in the Miscellaneous Estimate on the plans, as follows:

Delineator Reflector - Single Crystal	()	Each
Delineator Reflector - Single Yellow	()	Each
Delineator Reflector - Single Green	()	Each
Delineator Reflector - Double Crystal	() Double	() Each
Delineator Reflector - Double Yellow	() Double	() Each
Delineator Reflector - Single Crystal with Red	() Double	() Each
Delineator Reflector - Single Yellow with Red	() Double	() Each
DELINEATOR REFLECTOR TOTAL	()	Each

The flexible delineator measurements and payments are for Delineator, Reflective Sheeting of the size and color specified, measured as "each", and for Post, Flexible, Delineator, also measured as "each".

The designer should make an estimate of each type of Delineator, Reflective Sheeting, based on the patterns shown on the standard plan. These quantities are shown in the Miscellaneous Estimate on the plans, as follows:

Delineator, Reflective Sheeting, 3 inch by 6 inch, White	()	Each
Delineator, Reflective Sheeting, 3 inch by 12 inch, White	()	Each
Delineator, Reflective Sheeting, 4 inch by 8 inch, White	()	Each
Delineator, Reflective Sheeting, 3 inch by 6 inch, Yellow	()	Each
Delineator, Reflective Sheeting, 3 inch by 12 inch, Yellow	()	Each
Delineator, Reflective Sheeting, 3 inch by 6 inch, Green	()	Each
Delineator, Reflective Sheeting, 3 inch by 12 inch, Green	()	Each
Delineator, Reflective Sheeting, 4 inch by 8 inch, Green	()	Each
Delineator, Reflective Sheeting, 3 inch by 6 inch, Red	()	Each

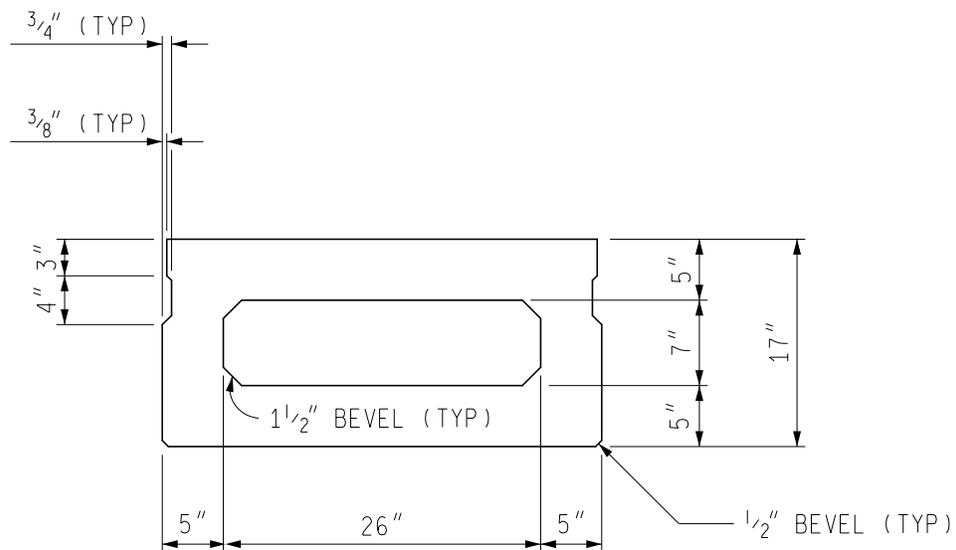
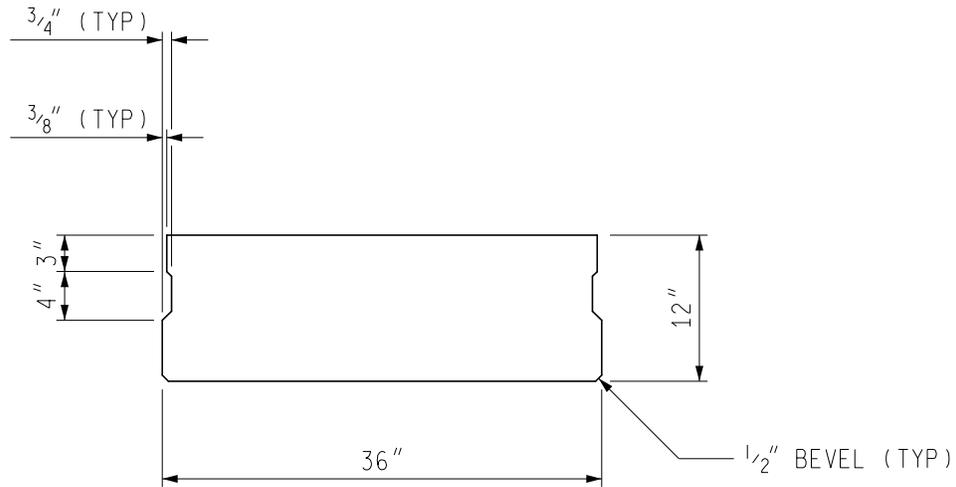
Delineators with Red are to be used where red delineators are attached to the back of delineators on ramps to face possible wrong-way traffic movements.

DRAWN BY: BLT
 CHECKED BY: VZ
 APPROVED BY: DAJ

MICHIGAN DEPARTMENT OF TRANSPORTATION
 BUREAU OF HIGHWAY DEVELOPMENT

PRESTRESSED CONCRETE
 12" & 17" BOX BEAM PROPERTIES

ISSUED: 10/21/14
 SUPERSEDES: 09/22/14



BEAM PROPERTIES								
DEPTH	WIDTH	WEIGHT	AREA	Y_T	Y_B	S_T	S_B	I
in	in	lbs/ft	in ²	in ³	in ³	in ³	in ³	in ⁴
12	36	442	424	6.04	5.96	848	860	5,120
17	36	445	427	8.58	8.42	1610	1640	13,800

NOTE: SHEAR KEYS ARE OPTIONAL FOR SPREAD BOX BEAMS.

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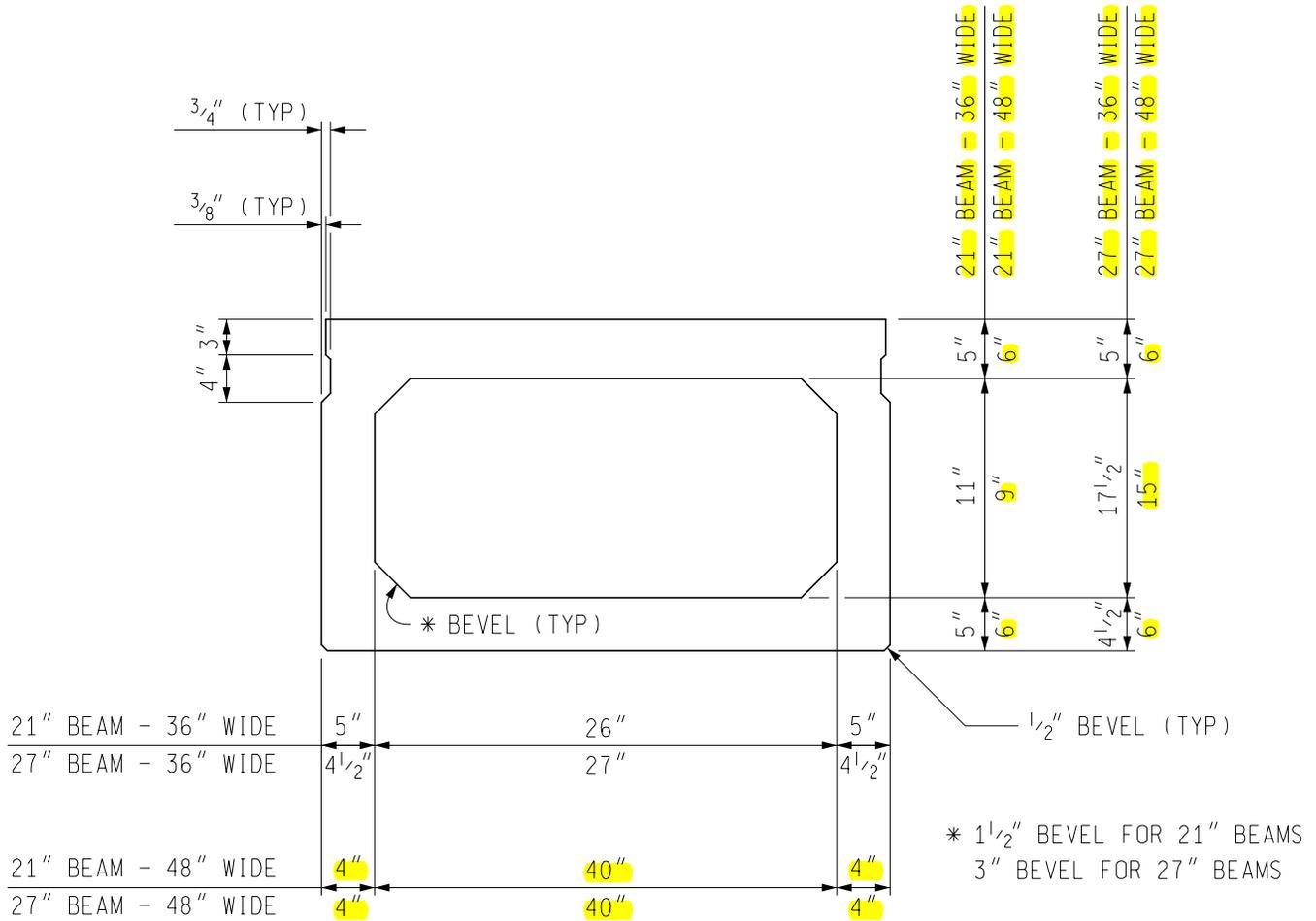
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 CHECKED BY: VZ
 APPROVED BY: DAJ

MICHIGAN DEPARTMENT OF TRANSPORTATION
 BUREAU OF HIGHWAY DEVELOPMENT

PRESTRESSED CONCRETE
 21" & 27" BOX BEAM PROPERTIES

ISSUED: 10/21/14
 SUPERSEDES: 09/22/14



BEAM PROPERTIES								
DEPTH	WIDTH	WEIGHT	AREA	Y _T	Y _B	S _T	S _B	I
in	in	lbs/ft	in ²	in ³	in ³	in ³	in ³	in ⁴
21	36	486	467	10.60	10.40	2320	2360	24,600
21	48	686	659	10.58	10.42	3260	3310	34,500
27	36	530	509	13.43	13.57	3520	3480	47,300
27	48	736	707	13.59	13.41	4970	5030	67,500

NOTE: SHEAR KEYS ARE OPTIONAL FOR SPREAD BOX BEAMS.

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6.65.02A

