Road & Bridge Design Publications

Monthly Update – November 2013

Revisions for the month of **November** are listed and displayed below. The special detail index from the "July Special Update" will remain in effect. Contact Wayne Pikka (pikkaw@michigan.gov) for questions related to the road changes. Contact Vladimir Zokvic (zokvicv@michigan.gov) for questions related to the bridge changes.

Road Design Manual

1.03.02: Plan Preparation Conventions: This section was revised to include the file naming conventions from DDEP Phase II.

3.09.02A & 3.09.02B: 3R Minimum Guidelines: In the shoulder width section, the text was revised (to match the 4R guidelines) such that minimum shoulder widths are not required in urban areas where the posted speed is greater than 45 mph if sufficient right-of-way does not exist to include shoulders.

Appendix 3A: Geometric Design Elements for New Construction/Reconstruction: Minor wording changes were made to clarify existing policy.

6.08.05: Sidewalk Ramps: Revisions to this section incorporate recent changes made by FHWA/DOJ in their Technical Assistance Memo. The most prominent change is the defining of "alterations" requiring curb ramp upgrading as certain work types rather than by depth of resurfacing**. Note: these changes are to be included in projects beginning with the March letting.**

14.36.02: Plan Review Procedure & 14.54.02: OEC Package Material: File naming conventions were revised to reference section 1.03.02 of this manual.

14.41.03: Act 51 Participation: A link was added for guidelines for determining the work types which should or should not be included in Act 51 categories in Trns•Port for participating Cities and Villages.

14.65: Reference Information Documents (RID): This section was updated to include RID guidance per DDEP Phase II.

Bridge Design Manual

7.01.08 (LFD & LRFD): Updated link for Traffic Signing Standards in last paragraph.

Road & Bridge Design Publications

Monthly Update – November 2013

Bridge Design Guides

6.06.05: Clear Zone Chart: For design speeds of 40 mph or less and cut slopes 1:4 or flatter, the clear zone distances for ADTs of 750 or greater were revised to meet the 2011 Roadside Design Guide.

6.06.05 A: Curve Correction Factors Table: The table was revised to meet the 2011 Roadside Design Guide. (Most Radii values were revised with minor changes to the values in the 65 mph and 70 mph Design Speeds.)

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.

CHAPTER 1 PLAN PREPARATION INDEX (continued)

1.02.12 Removal, Construction Plan, and Profile Sheets
- A. Removal
- B. General
- C. Guidelines
  1. Plan and Profile Scale
  2. Sheet Breaks
  3. Information
  4. Sheet Orientation and Stationing
- D. Quantities

1.02.13 Interchange Ramp Plan and Profile

1.02.14 Crossroad Plan and Profile

1.02.15 Detail Grades
- A. General
- B. Guidelines

1.02.16 Maintaining Traffic/Stage Construction

1.02.17 Signing Plans

1.02.18 Pavement Marking Plans

1.02.19 Miscellaneous Plans

1.02.20 Log of Borings

1.02.21 Special Details

1.03 MISCELLANEOUS

1.03.01 Order of Plan Sheets

1.03.02 Plan Preparation Conventions
- A. Drafting
- B. File Naming Conventions

1.03.03 Critical Path Method (CPM)

1.03.04 Roadway Cross Section

1.04 LOG PROJECTS

1.04.01 Preparing a Log Project

1.04.02 Earth Disturbances

1.03.02 (revised 11-21-2013)

Plan Preparation Conventions

A. Drafting

See the Sample Plans for examples of drafting conventions, symbols, line weights, etc. to use in preparing plans.

B. File Naming Conventions

1. Plan and Proposal Milestones

For the given job number XXXXXX:

Base Plans:
XXXXXX _Road_Base.pdf
XXXXXX _Bridge_Base.pdf
XXXXXX _Proposal_Base.pdf (if applicable)

Preliminary Plans:
XXXXXX _Road_Prelim.pdf
XXXXXX _Bridge_Prelim.pdf
XXXXXX _Proposal_Prelim.pdf (if applicable)

Marked Final ROW:
XXXXXX _Road_MFROW.pdf

OEC Plans:
XXXXXX _Road_OEC.pdf
XXXXXX _Bridge_OEC.pdf
XXXXXX _Proposal_OEC.pdf

Final Plan Turn In:
XXXXXX _Road.pdf
XXXXXX _Bridge.pdf
XXXXXX _Proposal.pdf

1.03.02B (continued)

The maximum pdf file size for any given plan set submittal is 30 MB. If more than one set is needed per package due to size, number sets sequentially. For example:

XXXXXX _Road_OEC1.pdf
XXXXXX _Road_OEC2.pdf

2. Reference Information Documents (RID)

See Section 14.65.

3.08.01E (continued)

General

When a bridge falls within a road project and no work is planned for the bridge, AASHTO "bridges to remain in place" criteria apply to the bridges. See AASHTO publication, ***A Policy on Design Standards-Interstate System,*** or ***A Policy on Geometric Design of Highways and Streets.*** If the bridge does not meet the criteria to "remain in place" the Road Designer shall be responsible for submitting any necessary design exceptions for the bridge.

F. Safety Review / Crash Analysis

A safety review is required for all 3R and 4R projects. The Project Manager should contact the TSC Traffic Engineer during scoping, so that a safety review can be performed throughout the project limits. On corridor projects only one analysis that includes roadways and bridges is required. This review should consist of an analysis of available crash data to determine where safety enhancements are warranted. Safety reviews more than 3 years old shall be updated to verify the original safety review.

A site specific crash analysis is required as justification for any design exception. It is also required in determining appropriate 3R design criteria according to Section 3.09.02A and 3.09.02B. Site specific crash analyses more than 3 years old shall be updated to verify the original crash analysis.

3.09

NON-FREEWAY RESURFACING, RESTORATION AND REHABILITATION (3R) MINIMUM DESIGN GUIDELINES

3.09.01 (revised 1-6-99)

General

The intent of the 3R guidelines is to extend the useful life of existing roadways and enhance safety while incurring minimal aesthetic and environmental disturbance and economic burden. Often, design guidelines used for new and major reconstruction are not cost effective on 3R projects. Where economically and physically practical, design guidelines should be according to AASHTO requirements to insure the greatest traffic service. The ultimate goal is to improve operating conditions and provide highways that are reasonably safe and fit for travel.

3R guidelines are divided into three categories that are addressed in subsequent sections of this chapter. These are NHS, Non-NHS and 3R Safety Considerations. They apply strictly to non-freeway applications. Guidelines for freeway 3R and 4R type work are addressed separately in Section 3.11.

3.09.02 (revised 11-21-2013)

3R Minimum Guidelines

Minimum guidelines for controlling design elements shall be according to the following:

3.09.02 (continued)

A. Non-Freeway, NHS

Geometric Elements	Non-Freeway, NHS 3R Minimum Guidelines			
Design Speed (see Section 3.06)	Posted Speed + 5 mph			
Shoulder Width *Minimum shoulder widths apply for:* ***Rural:*** *Posted speeds greater than 45 mph.* ***Urban:*** *Posted speeds greater than 45 mph where sufficient right-of-way exists to include shoulders.* *At lower speeds, minimum shoulders are desirable.*	Current ADT Two-Way		Inside Shoulder	Outside Shoulder
	Two Lane (and three lane when the center lane is a left turn lane)	<750		3'-0" Gravel
		750 - 5000		6'-0" (3'-0" Paved)
		>5000 - 10,000		8'-0" (3'-0" Paved)
		>10,000		8'-0" (7'-0" Paved)
	Multi-Lane Undivided	≤ 10,000 > 10,000		6'-0" (3'-0" Paved) 8'-0" (3'-0" Paved)
	Multi-Lane Divided	≤ 10,000 > 10,000	3'-0" Paved 3'-0" Paved	6'-0" (3'-0" Paved) 8'-0" (3'-0" Paved)
Lane Width	ADT	Lane Width		
	≤750	10'-0"		
	>750	11'-0"		
		10'-0" lanes may be considered in urban areas for multi-lane un-divided (regardless of ADT) and multi-lane divided (ADT < 10,000). 12'-0" lanes are desirable on the Priority Commercial Network (PCN). 12'-0" lanes are required on the National Network (also known as the National Truck Network). Design exceptions to maintain existing narrower lanes generally receive favorable consideration but a high burden of justification is placed on requests to reduce lane widths to less than 12'-0".		
Bridge Width, Structural Capacity & Horizontal Clearances	Rural		Urban	
	Traveled way width plus 2'-0" each side. Minimum Design Loading HS20.		Curb to curb approach width. Minimum Design Loading HS20.	
	(See Bridge Design Manual Appendix 12.02 for other trunkline classifications)			
Horizontal / Vertical Alignment and Stopping Sight Distance	Existing alignment and stopping sight distance may be retained if the design speed of the existing curve is not more than 15 mph below the project design speed and there is no crash concentration. Otherwise standards for new construction apply. See current AASHTO Green Book or MDOT Sight Distance Guidelines.			
Grade	Review crash data. Existing grade may be retained without crash concentration.			
Cross Slopes	Traveled way 1.5% - 2%, Shoulder see Section 6.05.05			
Superelevation	Standard Plan R-107-Series or reduced maximum (6%) Straight Line Superelevation Chart using the project design speed.			
Vertical Clearance	See Section 3.12.			

3.09.02 (continued)

B. Non-Freeway, Non-NHS

Geometric Elements	Non-Freeway, Non-NHS 3R Minimum Guidelines		
Design Speed	Posted Speed Minimum		
Shoulder Width *Minimum shoulder widths apply for:* ***Rural:*** *Posted speeds greater than 45 mph.* ***Urban:*** *Posted speeds greater than 45 mph where sufficient right-of-way exists to include shoulders.* *At lower speeds, minimum shoulders are desirable.*	Current ADT Two-Way	Inside and Outside Shoulder Width	
	≤750	2'-0" (Gravel)	
	750 - 2000	3'-0" (Paved)	
	> 2000	6'-0" (3'-0" Paved)	
	Multi-Lane (Divided & Undivided)	Inside (Divided)	Outside (Both sides for un-divided)
		3'-0" Paved	6'-0" (3'-0" Paved)
Lane Width	ADT	Lane Width	
	≤750	10'-0"	
	>750	11'-0"	
		10'-0" lanes may be considered in urban areas for multi-lane un-divided (regardless of ADT) and multi-lane divided (ADT < 10,000). 12'-0" lanes are desirable on the Priority Commercial Network (PCN) and the National Network (also known as the National Truck Network). Existing narrower lanes may be retained without design exceptions. Reduction of existing lane widths on the National Network to less than 12-0" require a design exception request having a high burden of justification.	
Bridge Width, Structural Capacity & Horizontal Clearances **(Existing Bridges to remain in place)**	ADT (Design Year)	Minimum Design Loading	Usable Width
	0 - 750	H15	Width of traveled way.
	751 - 1500	HS15	Width of traveled way.
	1501 - 2000	HS15	Width of traveled way plus 1' each side.
	2001 - 4000	HS15	Width of traveled way plus 2' each side.
	> 4000	HS15	Width of traveled way plus 3' each side.
Horizontal / Vertical Alignment and Stopping Sight Distance	Existing alignment and stopping sight distance may be retained if the design speed of the existing curve is not more than 15 mph (horizontal alignment) or 20 mph (vertical alignment) below the project design speed and there is no crash concentration. Otherwise standards for new construction apply. . See current AASHTO Green Book or MDOT Sight Distance Guidelines.		
Grade	Review crash data. Existing grade may be retained without crash concentration.		
Cross Slopes	Traveled way 1.5% - 2%, Shoulder see Section 6.05.05		
Superelevation	Standard Plan R-107-Series or reduced maximum (6%) Straight Line Superelevation Chart using the project design speed.		
Vertical Clearance	See Section 3.12.		

Appendix 3A
GEOMETRIC DESIGN ELEMENTS
New Construction / Reconstruction

Element		Urban & Rural			
Shoulder Width	Freeway	**Mainline**		**Ramp** (one lane and two lanes)	
		Median	Outside	Left	Right
		8 ft. (4ft. paved) (8 ft. paved at bridge and barrier sections) For 6 or more lane sections (3 or more lanes directional) use 11ft. min (10 ft. paved) and consider 12 ft. paved where truck traffic exceeds 250 DDHV.	10 ft. min (paved) For non-interstate freeways, use 12 ft. paved where truck traffic exceeds 250 DDHV. For interstate freeways consider using 12 ft. paved where truck traffic exceeds 250 DDHV.	6 ft. (4 ft. paved)	8 ft. (7ft. paved)
		For new construction and reconstruction, the mainline outside paved shoulder is extended with 1 ft. of aggregate to the shoulder hinge for stabilization. When widening existing paved shoulders to meet current standard widths, it is desirable to provide the additional foot of aggregate when feasible.			
	Non Freeway (Arterial)	**Urban**	**Rural**		
		In those instances where sufficient right-of-way exists to include shoulders, refer to the guidance for non freeway rural shoulders.* ☞	**Min paved shoulder, ft. for specified ADT, veh/day** **Undivided Roadways***		
			Under 400	400 to 1500	1500 to 2000	Over 2000
			4	6	6	8
			Use 8ft. right and 4 ft. left for divided arterials. Use full width (8 ft.) on both sides of divided arterials with 3 lanes in each direction. For new construction and reconstruction and when feasible on shoulder widening, the paved shoulder is extended with 1 ft. of aggregate to the shoulder hinge for stabilization.			
		A minimum 4 ft. (3 ft. paved) shoulder is acceptable adjacent to right turn lanes. * Minimum shoulder widths apply for posted speeds greater than 45 mph. At lower speeds, minimum shoulders are desirable.			
	Collector Roads	Where shoulders are used, refer to requirements for rural arterials. ☞	**Min shoulder, ft. for specified ADT, veh/day**		
			Under 400	400 to 1500	1500 to 2000	Over 2000
			2	5	6	8
			The above ranges apply on uncurbed roads and when shoulders are feasible on curbed roads. A minimum paved width of 1 ft. is desirable.			

CHAPTER 6 SURFACING AND SHOULDERS INDEX (continued)

6.06.15 Minimum Curb and Gutter Grades

6.06.16 Curb and Gutter for Erosion Control

6.06.17 Concrete Curb Cap

6.06.18 Deleted

6.06.19 Driveway Openings

6.06.20 Curb and Gutter Adjacent to HMA Base Course

6.07 CONCRETE DIVIDER

6.08 SIDEWALK

6.08.01 Department Position on Sidewalk Construction

6.08.02 Thickness

6.08.03 Reinforcement

6.08.04 Earth Excavation for Sidewalk

6.08.05 Sidewalk Ramps
- A. Warrants for Sidewalk Ramps and Sidewalk Ramp Upgrade
- B. Scoping Considerations
- C. Design Standards
- D. Meeting Existing Sidewalk Grades and Elevations
- E. Technical Infeasibility
- F. Driveways
- G. Sidewalk Ramp Location
- H. Traffic and Pedestrian Signals

6.08.06 Building Entrances
- A. Building Access Alterations
- B. Historic Buildings and Districts

6.08.02 (revised 4-8-2010)

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 sidewalk 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 11-21-2013)

Sidewalk Ramps

Sidewalk 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, "Sidewalk Ramp and Detectable Warning Details". In essence, the law requires that a ramp 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 sidewalk 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)

Sidewalk Ramps

A. Warrants for Sidewalk Ramps and Sidewalk Ramp Upgrade

The FHWA requires that sidewalk ramp construction and/or sidewalk 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. Sidewalk 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. Sidewalk 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. Sidewalk 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 sidewalk 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)

Sidewalk 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 sidewalk ramp upgrades are not required include:

- Signing, pavement marking projects.

- Guardrail/Safety upgrade projects.

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

- Independent Utility Work/Maintenance (except where an existing sidewalk or sidewalk 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 sidewalk ramps.

C. Design Standards

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

The sidewalk 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)

Sidewalk 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%). 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% 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. **Level Turning Space -** 5' x 5' minimum, 2% max slope in the direction(s) of pedestrian travel. Level turning spaces are required where a change in direction is provided or planned in the pedestrian path. These dimensions allow for optimal turning movement for wheel chairs. 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.

6.08.05C (continued)

Sidewalk Ramps

6. **Detectable Warning** - Detectable warnings are truncated domes that serve as surface tactile cues to alert persons with sight disabilities of an upcoming change from pedestrian to vehicular way. The dimensions and location are detailed on Standard Plan R-28-Series.

   They are not intended as a way finding device. Square dome alignment within the boundaries of the detectable warning is detailed on the standard plan. However, orientation of the detectable warning surface is relative to placement location. Although preferable, it is not always relative to the direction of travel. Radial alignment is acceptable to match a radial curb alignment.

   Detectable warnings are required at the intersection of sidewalks at streets regardless of whether the sidewalk is ramped or flush to the street or shoulder.

   In addition to roadway intersections, detectable warnings are also required at mid-block crossings, sidewalk/railroad crossings, and the intersection of sidewalks with controlled commercial driveways (see Section 6.08.05F).

6.08.05C (continued)

7. **Grade Break Orientation** – The grade break at the sidewalk ramp terminals (top or bottom) should be flush and perpendicular to the direction of travel on the ramp. The objective is to provide a square approach to and from the ramp. The bottom grade break is generally located at the back of curb line for perpendicular ramps. However, it can be located up to 5 ft. from one end of a radial curb line in order to maintain a perpendicular orientation (see Standard Plan R-28-Series).

8. **Flared Sidewalk Ramps** - When a sidewalk or pedestrian circulation path laterally crosses the sidewalk ramp, the sides of the curb ramp must be flared with a 10% maximum slope as shown in Standard Plan R-28-Series for Flared Sidewalk Ramps.

9. **Rolled Curb** - When the side of the ramp borders a non-walking surface such as grass or landscaping or a permanent obstruction, a rolled curb is permitted on the side of the ramp. Rolled curb is not defined as vertical faced or by a specified radius but rather curb not limited by the 10% maximum defined for flared curb. It can be as flat or steep as needed.

These elements are not listed in any order of preference or importance. Order of importance may vary for each application. When it is technically infeasible to provide compliant elements, they should be provided to the maximum extent feasible. See Section 6.08.05E “Technical Infeasibility”.

6.08.05 (continued)

Sidewalk Ramps

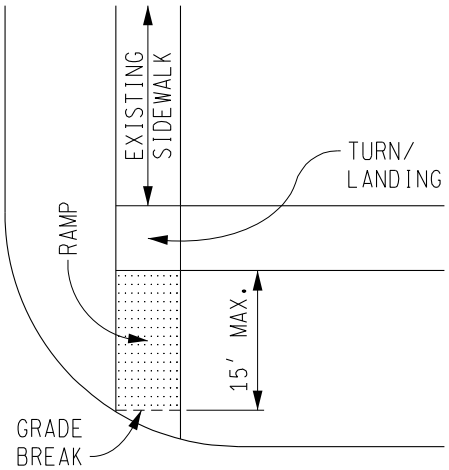
D. Meeting Existing Sidewalk Grades and Elevations

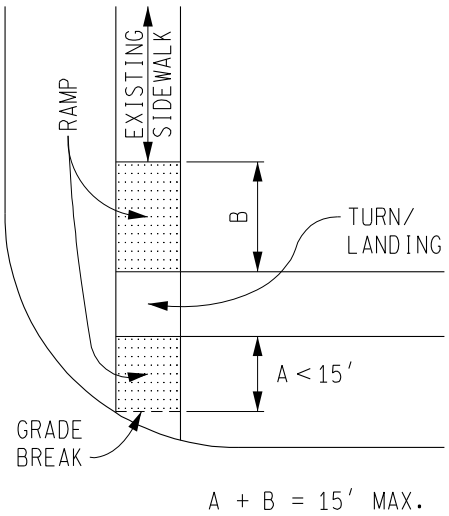
Sidewalk grades generally tend to follow the grade of the bordering street. When the existing sidewalk grade is steep, it becomes more difficult to comply with the maximum sidewalk ramp running slope of 8.3% without "chasing grade" to meet the existing sidewalk. In some cases it results in an infinite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

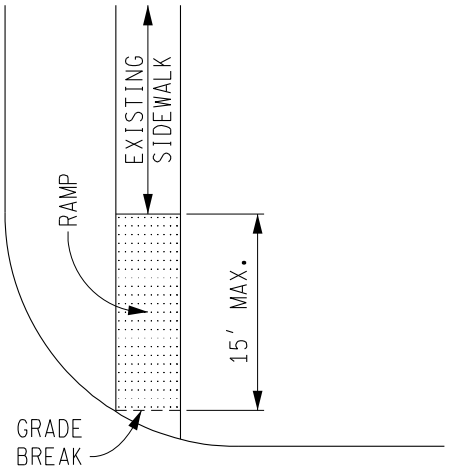
When this occurs, the maximum running slope may be exceeded in order to limit the ramp length(s) to not more than 15 ft. measured from the ramp grade break. The need to exceed the maximum slope must be documented (See Section 6.08.05E). The 15 ft. limit on ramp length does not include the level turning space. If there is no turning movement or other accessible feature requiring a level surface, the turning space may be omitted. This will further minimize the increased slope needed to meet existing grade. 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.

6.08.05D (continued)







6.08.05 (continued)

Sidewalk Ramps

E. Technical Infeasibility

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

A strict definition of "feasibility" 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.

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 technical 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.

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 technical infeasibilities.

6.08.05E (continued)

When determining the correct balance to provide maximum obtainable compliance, 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.

Technical infeasibility should always be documented in the project files using MDOT Form 0370. This is retained as justification to address possible future claims. It also serves as information for annual updating of the region's sidewalk ramp inventory and the Department's ADA transition plan. The documentation should include location, non-compliant element(s), reason for infeasibility and maximum obtainable compliance.

6.08.05 (continued)

Sidewalk Ramps

F. Driveways

When project work alters a driveway that crosses a sidewalk or alters the sidewalk abutting a driveway, the crossing through that driveway must be ADA compliant. Sidewalks are normally continuous through residential driveways and don't require either sidewalk ramps or detectable warnings. However, commercial driveways with curbed returns may present a barrier that requires a sidewalk ramp.

Detectable warnings at commercial driveways are only used when the crossing is signalized or stop controlled with a regulatory stop sign. When this level of traffic control is needed, the driveway presents more of a street-like encounter for persons with sight disabilities and therefore warrants detectable warnings. Otherwise only the sidewalk ramp is required. Overuse of detectable warnings cause misinformation for persons with sight disabilities.

The path crossing through the driveway must meet the standards for sidewalks including width, slope and cross slope. If continuous sidewalk construction or reconstruction is not in the scope of work, a short transition may be required to meet the existing sidewalk cross section at either end of the driveway crossing.

6.08.05 (continued)

G. Sidewalk Ramp Location

Federal Code 28 CFR, Part 36 states;

"4.7.1 Location. Curb Ramps complying with 4.7 shall be provided wherever an accessible route crosses a curb."

As stated earlier in this section, there are few permitted reasons not to provide sidewalk ramps where a sidewalk crosses a curb. The absence of signals or marked crossings is not sufficient justification to exclude a sidewalk ramp.

However, there are some circumstances, both obvious and obscure, that may affect the determination of sidewalk ramp need and location.

Absence of Sidewalk
In most cases the absence of sidewalk, (existing or planned) coincides with exemption from the requirement to provide sidewalk ramps. The ADA does not require the installation of ramps or curb ramps in the absence of a pedestrian walkway with a prepared surface for pedestrian use. The ADA also does not require the provision of sidewalk where none currently exists. However, certain circumstances may require some minimum treatment for a quadrant without sidewalk.

The installation or presence of a pedestrian signal (whether pedestrian activated or not) suggests implicit intent of pedestrian travel. Accessibility from the road to a pedestrian activated signal would be required despite the absence of sidewalk. This may include curb ramps and an accessible path to a level surface at the push button. Where signals are not pedestrian activated and sidewalks are not present, the vertical portion of any curb should be gapped to provide a minimum 5 ft. wide clear opening to the implied path. See Section 6.08.05H for information on Traffic and Pedestrian Signals.

6.08.05G (continued)

Sidewalk Ramps

Evidence of Pedestrian Travel
Where sidewalk is not provided or planned at either side of a street crossing but there is evidence of pedestrian travel (worn path), a curb ramp is not required. However, the vertical portion of any curb should be gapped to provide a minimum 5 ft. wide clear opening to the path.

Prohibited Crossings
Where a sidewalk meets a road and pedestrian crossing is prohibited, a sidewalk ramp is not required at either side of the road. The end of the sidewalk should be delineated by both visible and tactile cues. A sign should be provided prohibiting crossing for all pedestrians. The tactile cue must be either detectable by cane or foot. A barrier approximately six inches in height can be detected by cane. Since a barrier is not always practical or context sensitive, a planted or gravel strip between the end of the sidewalk and the curb can serve as a tactile indication of the end of the pedestrian path. The strip should have a minimum dimension of two feet in the direction of travel.

Detrimental Crossings
As previously stated, the absence of cross walk markings or signals does not imply an exemption for the provision of sidewalk ramps. However, even where crossing is not expressly prohibited but is clearly not intended, circumstances may make it prudent to exclude ramps leading to undesirable crossing points. As with prohibited crossings, it may be desirable to end the sidewalk by separating it from the curb with a planted or gravel strip to provide underfoot detection of the path's end.

6.08.05G (continued)

Examples of undesirable crossing situations are at mid-block locations or three legged intersections where crossings may lead to or near driveways. Turning traffic from driveways may not expect pedestrians where a crossing is not clearly marked. The same may also be true where cross roads are slightly jogged across the mainline roadway. An unmarked crossing that is offset too far from an intersection may cause a hidden vehicle/pedestrian conflict.

Logical crossing opportunities should be selected at reasonable intervals that provide safer direct corner-to-corner crossing. It may be acceptable at times to direct pedestrians to a safer alternate quadrant or nearby intersection.

When evaluating crossing intent, high consideration should be given to providing ramped crossings to public service destinations such as public transit stops, schools, hospitals, libraries, post offices, etc.

6.08.05 (continued)

Sidewalk Ramps

H. Traffic and Pedestrian Signals

While signal maintenance does not warrant a sidewalk ramp upgrade, new signal installation might. Circumstances requiring sidewalk ramp installation or upgrade in conjunction with signal installation include:

- Alteration to existing sidewalk/sidewalk ramp.
- Absence of a curb ramp where a sidewalk is curbed at the street intersection.
- Absence of a curb ramp where a crossing is served by a pedestrian signal (with or without sidewalk).

See Section 6.08.05G for signal accessibility in the absence of sidewalk.

Existing ramps may remain in place without upgrade if they are not otherwise altered by the signal work.

For roadway alteration projects without signal work, consideration should be made to improve accessibility to push button signals. If the sidewalk ramp is to be upgraded, designers are encouraged to extend paving to provide access to pedestrian activated signals where access is not currently provided.

Sidewalk ramp construction should not reduce the existing level of accessibility of the existing pedestrian signal.

ADA requirements for pedestrian push button signals are addressed separately in Traffic and Safety standards and guidelines. ADA requirements for signal upgrading apply in conjunction with alterations to external components of the signal. Sidewalk or Sidewalk ramp construction alone does not activate a requirement to upgrade the signal.

14.36.02 (revised 11-21-2013)

Procedure

1. When the Project Manager or Consultant determines the plans meet the requirements for THE Plan Review, a Plan Review Material Submittal (Form 2913) is completed to verify that supporting documents, proposal materials and plans are ready to submit. The materials are entered into ProjectWise using the file naming conventions outlined in Section 1.03.02.

2. The Project Manager fills out a Plan Review Meeting (Form 0200). Include E-mail addresses for invitees outside of MDOT, Include dates that key personnel and conference rooms are available. They should be at least 3 weeks (preferably 4-5 weeks) from the submittal date.

3. The Project Manager will verify that ProjectWise (folder 3) is current with the following format;

   - 3 – Plan Review
     - Meeting Request and Minutes
     - Review Comments

   If the format is not correct contact the ProjectWise administrator to apply the proper template.

4. When the project is ready for final review, form 0200 is placed in the ProjectWise subfolder "Meeting Requests and Minutes" using the file name *Job Number-form 200* and the state is advanced to "Request for Meeting" to initiate submittal to Quality Assurance for review. The ProjectWise state on the three files containing plans, proposal material and supporting documents in the "Plan Review" folder are also advanced once to "Submitted for Review".

14.36.02 (continued)

5. The plans will be reviewed by Quality Assurance for completeness and a meeting date scheduled 4-5 weeks from the time of submittal. Instances where projects require a compressed schedule or scheduling without plans should be kept to a minimum. The 4-5 week period is needed to assure all participants are given ample time to review the plans prior to the meeting. This is essential to making THE Plan Review as useful and productive as possible.

6. Plans and other material are made accessible in ProjectWise by the Project Manager. Quality Assurance distributes the same to non-ProjectWise users in an alternate deliverable and usable format. The reviewers include the following:
   Operations Field Services Division
   Region System Manager
   TSC Manager
   Region/TSC Resident/Delivery Engineer
   TSC Development Engineer
   Region/TSC Operations Engineer
   Region/TSC Soils/Materials Engineer
   Region/TSC Traffic and Safety Engineer
   Region/TSC Maintenance Engineer
   Region/TSC Utilities/Permits Engineer
   Region/TSC Real Estate Agent
   Region Resource Specialist
   Region Bridge Engineer
   (Bridge Jobs Only)
   Region Bridge Inspection Engineer
   (Bridge Jobs Only)
   Environmental Section-BTP
   FHWA Oversight
   Design Utilities Section
   Railroad Coordination Unit – Office of Rail
   (if applicable)
   Geometrics Section- Design
   Utilities/Permits Development Services Division
   City or Village (if applicable)
   County Drain Commissioner
   (if applicable)
   County Road Commission
   Department of Management and Budget (MIR Program)
   Others identified by the Project Manager

14.41.02 (revised 9-17-2012)

Estimates

The estimate provided to the Governmental Coordination Unit - Development Services Division for agreement purposes should NOT include contingencies since a contingency factor will be added to the construction cost for agreement purposes. The estimate should be refined to such a degree that it will be within 25% of the final engineer's estimate. Anything in excess of 25% should be called to the attention of the Governmental Coordination Unit - Development Services Division. The estimate must be split along corporate limits for projects with city participation. Any modifications to the scope should be incorporated in a revised or amended agreement.

Upon receipt of the request for involvement, the Governmental Coordination Unit - Development Services Division will contact the Design Unit to request any additional information required and will coordinate the agreement processing procedure.

14.41.03 (revised 11-21-2013)

Act 51 Participation

Act 51 Public Acts of 1951, as amended (1982), provides that cities having a population of 25,000 or more will participate with the Department in the cost of opening, widening and improving, including construction and reconstruction, of State trunkline highways within said cities. Cities required to participate, based on the 2010 census, are:

14.41.03 (continued)

OVER 50,000 12.5 % Participation	
Ann Arbor	Pontiac
Battle Creek	Rochester Hills
Dearborn	Royal Oak
Dearborn Heights	Saginaw
Detroit	St. Clair Shores
Farmington Hills	Southfield
Flint	Sterling Heights
Grand Rapids	Taylor
Kalamazoo	Troy
Lansing	Warren
Livonia	Westland
Novi *	Wyoming
40,000 to 50,000 11.25 % Participation	
East Lansing	Portage
Kentwood	Roseville
Midland	
25,000 to 40,000 8.75 % Participation	
Allen Park	Lincoln Park *
Bay City	Madison Heights
Burton	Mount Pleasant
Eastpointe	Muskegon *
Garden City	Oak Park
Holland	Port Huron
Inkster	Southgate
Jackson	Wyandotte

* City has changed participation range.

Guidelines for determining types of work which should or should not be included in Act 51 categories in Trns•Port for participating Cities and Villages are posted at Act 51 Participation Items.

14.54.01 (continued)

Attendees

Attendance at the OEC Meeting should be kept to a minimum. The object of the meeting is to identify missing, incorrect or conflicting information in the package prior to advertising and letting. Utilities, Right-of-Way, Soils, Project Development, etc. must be resolved prior to scheduling an OEC Meeting. Additional people should only be invited if the discipline requires clarification (i.e. significant utility relocation during construction or conditions/dates of right of entry regarding ROW not yet in MDOT possession). Work Centers that have contributed to the plan/proposal package should access the plan/proposal package in ProjectWise to verify that all their material is included and up to date, but do not need to attend the meeting. This reduces the number of meetings for staff and allows those attending to focus on the primary goal - errors and omissions.

Others (if applicable):

Consultant Coordinator/Consultant
Electrical Unit
Municipal Utilities Unit
Hydraulics/Hydrology Unit
Roadside Development Unit
Signals (Operation Field Services Division)
Signs
Pavement Marking
Region/TSC Real Estate
Region/TSC Utilities/Permits

14.54.02 (revised 11-21-2013)

OEC Package Material

The OEC Package material must include the items indicated in Form 0330. If the submitted material is missing enough of the listed essential items, Quality Assurance may direct the Project Manager to cancel the meeting and reschedule when all the material is complete and/or available. The materials are entered into ProjectWise using the file naming conventions outlined in Section 1.03.02. The Project Manager should always allow 10 business days for review of the plan/proposal material prior to the OEC Meeting. On large, complex, or unique projects the Project Manager should extend the review time to 3 or even 4 weeks to insure adequate review time. Additional time after the OEC Meeting (beyond the standard 1 week) for corrections to the package should also be considered. It is essential that the Project Manager recognize these additional time requirements and include these in the PPMS network so as to avoid delaying the project letting.

The Construction Engineer will be responsible for providing a completed Progress Schedule at the OEC meeting.

At the same time the above material is distributed, the Project Manager should send the project link to the Specifications and Estimates Unit to initiate federal programming of funds and estimate review.

The estimator will review the estimate, adjust any unit costs and return it to the Project Manager prior to the OEC Meeting so that any funding problems can be discussed at the OEC Meeting.

14.65 (revised 11-21-2013)

REFERENCE INFORMATION DOCUMENTS

The Reference Information Document (RID) process provides availability of electronic data files through the e-Proposal website. RID files are non-contractual items for contractor use prior to bidding on construction projects. They include design files, survey deliverable files, miscellaneous files and a RID Index Sheet.

RID files will be submitted to the Specifications and Estimates Unit for review prior to final turn in. The files are subsequently published at the same time as the Proposal and Plans. Any changes made to the RID files after this time, due to an addendum, will be the responsibility of the Project Manager. Each published 'set' released after the original publication shall include a revised Index Sheet that includes a brief explanation of the changes made to the files.

The following is a guide as to which project documents shall be released as reference information documents (RID) for bidding purposes, and what format and file naming convention shall apply. To apply to projects for any given job number (XXXXXX):

14.65 (continued)

Design Files:
(The files listed under Design Files are applicable for plan set projects containing road work. They may not apply to bridge or ITS projects at this time.)

- XXXXXX_Align_*date*.dgn
  - DGN file from design that contains all project horizontal roadway alignments. (If using models or multiple alignment scales, include only one set of the project alignments, preferably the alignments at the scale used for the Alignment/ROW Sheets.)
  - Refer to alignment levels within the Alignments Level Library (mdot_01 workspace) for standard levels that would be used within this reference file.

- XXXXXX_Const_*date*.dgn
  - DGN file from design that contains proposed construction elements.

- XXXXXX_Drain_*date*.dgn
  - DGN file from design that contains **proposed** project drainage. Depending on the size of the project, and the design preferences of the project team, the information in this file may be included in the XXXXXX_Const_date.dgn.
  - Refer to the proposed drainage levels within the Drainage Level Library (mdot_01 workspace) for standard levels that would be used within this reference file.

14.65 (continued)

REFERENCE INFORMATION DOCUMENTS

- XXXXXX_Parcel_*date*.dgn
  - This file is a new reference file for the ROW PI pilot projects. It is not a reference file that all projects may currently have. More information on the implementation of this reference file will be forthcoming.
  - DGN file from real estate/design that contains project parcel information. This file should be provided by Real Estate or the Real Estate consultant.
  - Refer to parcel levels within the Boundary Level Library (mdot_01 workspace) for standard levels that would be used within this reference file.

- XXXXXX_Prof_*date*.dgn *or* XXXXXX_Prof_*roadway*_*date*.dgn
  - DGN file(s) from design that contains profile information.
  - Refer to profile levels within the Profile Level Library (mdot_01 workspace) for standard levels that would be used within this reference file.

- XXXXXX_ROW_*date*.dgn
  - DGN file from design that contains existing and proposed ROW information.
  - Refer to boundary levels within the Boundary Level Library (mdot_01 workspace) for standard levels that would be used within this reference file.

- XXXXXX_Topo_*date*.dgn
  - DGN file from design that contains existing topographic project data.
  - This file includes topographic project data from surveys, and any existing items moved to a removal, adjust, or relocate level.

14.65 (continued)

- XXXXXX_Utility_*date*.dgn
  - DGN file from design that contains underground and overhead utility lines. Typically this information is provided by the utility companies during the life of the project and may be in approximate locations.
  - Refer to underground and overhead utility line levels within the Utilities Level Library (mdot_01 workspace) for standard levels that would be used within this reference file.

- XXXXXX_PrModel_*date*.dgn (if applicable)
  - Copy of the proposed final surface model from design, generated with Roadway Designer, that includes the 3D line strings for critical proposed final surface features (i.e. proposed edge of pavement, proposed back of curb, etc.).
  - For directions on creating this GEOPAK file, please see the GEOPAK Road Design Training Manual.

- XXXXXX_PrTriangle_*date*.dgn (if applicable)
  - File from design that contains the proposed surface triangle file for the project.
  - For directions on creating this GEOPAK file, please see the GEOPAK Road Design Training Manual.

- XXXXXX_LandXML_Geometry_*date*.xml (if applicable)
  - File from design that shall include all alignments (horizontal and vertical).
  - For directions on creating this GEOPAK output file, please see the GEOPAK Road Design Training Manual.

14.65 (continued)

REFERENCE INFORMATION DOCUMENTS

Survey Files:

- XXXXXX_Survey_2D_*date*.dgn *and* XXXXXX_Survey_3D_*date*.dgn (if applicable)
  - Copies of the original survey topo files delivered for the project design.
  - These files should be in their original state and should not contain any changes from design.

- XXXXXX_ExTriangle_*date*.dgn
  - Copy of the original survey existing surface triangle file delivered for the project design.
  - This file should be in its original state and should not contain any changes from design.

- XXXXXX_ExDTM_*date*.tin *or* XXXXXX_ExDTM_*date*.dat (if applicable)
  - Copy of the original survey existing tin (current standard survey deliverable) or dat (previous standard survey deliverable) GEOPAK file delivered for the project design.
  - This file should be in its original state and should not contain any changes from design.

- XXXXXX_ControlPts_*date*.txt
  - Copy of the original survey control points file delivered for the project.
  - This file should be in its original state and should not contain any changes from design.

14.65 (continued)

Miscellaneous Files:

- XXXXXX_Xsec_*roadway_date*.pdf
  - Cross-section files from design placed on cross-section grids.
  - Add station range to the file name if necessary. (XXXXXX_XSEC_roadway_310-320.pdf)
  - Refer to cross-section levels within the XS Level Library (mdot_01 workspace) for standard levels that would be used within this reference file.

Note:

1. For *date*, label with the date of original project turn in to the Specifications & Estimates Unit. Or, in the case of file updates, please use the date of the addendum. The date will be important for tracking changes that have been made during advertisement. The process for adding updated files to e-Proposal after advertisement will be the same process as the MDOT Notice to Bidder Inquiry process. Add updated files with the appropriate date to the RID area in ProjectWise, include an updated Index, and change the state on the additional files. (MDOT Project Managers - See RID Process directions or contact MDOT's Design Services Section for more information.)

14.65 (continued)

REFERENCE INFORMATION DOCUMENTS

2. If design files were created with an older MDOT workspace than MDOT's current workspace (mdot_01), provide the design files with the appropriate levels from the workspace used to design the project.

3. Files labeled to deliver "**(if applicable)**" are not currently a requirement for plan turn in but the inclusion of them is encouraged if the files were created. Whether or not the files exists may be dependent on which MDOT workspace the project is completed in, the survey deliverables for the project, and/or whether GEOPAK Roadway Designer (mdot_01 MicroStation workspace) was employed for the design. Further deliverable requirements will be forthcoming. If the project has the listed file available, or the listed file has been created as part of the design process, it shall be included as part of the RID. For any questions regarding this matter, contact MDOT's Design Services Section.

14.66 (revised 5-28-2013)

TABULATIONS OF BIDS

Approximately one week after the letting, bid tabulations with the Engineer's Estimate, the low bid Contractor and the other prime Contractor's bids are posted to the MDOT website. Some projects require an additional review and may take longer. The Tabulation of Bids can also be accessed through the Bid Letting System on the Plan Development website by selecting the appropriate letting date and letting item number.

7.01.08

Vertical Clearance

A. Requirements

The desired vertical bridge underclearances should be provided as indicated below. If the desired underclearances cannot be provided, then the minimum underclearances shall be met. Where it is considered not feasible to meet these minimums, a design exception shall be requested from the Engineer of Design Programs and subsequently to the FHWA Area Engineer on "FHWA Oversight" (non exempt) projects and from MDOT Engineer of Design Operations - Structures Section on "MDOT Oversight" (exempt) projects (see Section 12.03 also). See the vertical clearance design exception matrix in Appendix 12.02.01. Requests to further reduce the underclearance of structures with existing vertical clearance less than indicated in the chart below should be made only in exceptional cases. (12-5-2005)(1-14-2013)

VERTICAL CLEARANCE REQUIREMENT TABLE (11-28-2011)

Route Classification Under the Structure	All Construction	New Construction	Road 4R Construction	Bridge 4R Construction	3R Construction
	Desired	Min	Min	Min	Min
Freeways	16'-3"	16'-0" *	16'-0" *	16'-0" *	16'-0" *
NHS Arterials (Local & Trunkline)	16'-3"	16'-0" *	Maintain Existing 14'-6" Min*	16'-0" *	14'-0" *
Non NHS Arterials (Local & Trunkline)	16'-3"	14'-6" *	Maintain Existing 14'-6" Min*	Maintain Existing 14'-6" Min*	14'-0" *
Collectors, Local Roads & Special Routes(1)	14'-9"	14'-6" *	Maintain Existing 14'-6" Min*	Maintain Existing 14'-6" Min*	14'-0" *

3R = Rehabilitation, Restoration, Resurfacing **4R = Reconstruction**

* Minimum Vertical Clearance must be maintained over complete usable shoulder width.

Information on the NHS systems can be obtained by contacting the Statewide Planning Section, Bureau of Transportation Planning or found on the MDOT website at: http://www.michigan.gov/mdot-nfc (11-28-2011)

1) Special Routes are in Highly Urbanized Areas (where little if any undeveloped land exists adjacent to the roadway) where an alternate route of 16'-0" is available or has been designated. Bridges located over Special Routes in Highly Urbanized Areas can be found on the MDOT website at: http://mdotcf.state.mi.us/public/design/files/englishbridgemanual/Exempt_Structures.pdf (5-28-2013)

Ramps and roadways connecting a Special Route and a 16'-0" route require a vertical clearance minimum of 14'-6" (14'-9" desired). Ramps and roadways connecting two 16'-0" routes require a vertical clearance minimum of 16'-0" (16'-3" desired). (11-28-2011)

Pedestrian bridges are to provide 1'-0" more underclearance than that required for a vehicular bridge. For Freeways (Interstate and non Interstate), including Special Route Freeways, the desired underclearance shall be 17'-3" (minimum 17'-0"). (11-28-2011)

A vertical underclearance of 23'-0" is required for highway grade separations over railroads when constructing a new bridge or removing the existing superstructure. For preventative maintenance, rehabilitation and deck replacement projects the existing railroad vertical underclearance does not need to be increased unless requested by the Railroad. (11-28-2011)

Clearance signs are to be present for structures with underclearance of 16'-0" or less (show dimensions 2" less than actual). See http://mdotcf.state.mi.us/public/tands/plans.cfm for additional information and guidelines. (11-28-2011) (11-21-2013)

7.01.08

Vertical Clearance

A. Requirements

The desired vertical bridge underclearances should be provided as indicated below. If the desired underclearances cannot be provided, then the minimum underclearances shall be met. Where it is considered not feasible to meet these minimums, a design exception shall be requested from the Engineer of Design Programs and subsequently to the FHWA Area Engineer on "FHWA Oversight" (non exempt) projects and from MDOT Engineer of Design Operations - Structures Section on "MDOT Oversight" (exempt) projects (see Section 12.03 also). See the vertical clearance design exception matrix in Appendix 12.02.01. Requests to further reduce the underclearance of structures with existing vertical clearance less than indicated in the chart below should be made only in exceptional cases. (12-5-2005)(1-14-2013)

VERTICAL CLEARANCE REQUIREMENT TABLE (8-20-2009)

Route Classification Under the Structure	All Construction	New Construction	Road 4R Construction	Bridge 4R Construction	3R Construction
	Desired	Min	Min	Min	Min
Freeways	16'-3"	16'-0" *	16'-0" *	16'-0" *	16'-0" *
NHS Arterials (Local & Trunkline)	16'-3"	16'-0" *	Maintain Existing 14'-6" Min*	16'-0" *	14'-0" *
Non NHS Arterials (Local & Trunkline)	16'-3"	14'-6" *	Maintain Existing 14'-6" Min*	Maintain Existing 14'-6" Min*	14'-0" *
Collectors, Local Roads & Special Routes(1)	14'-9"	14'-6" *	Maintain Existing 14'-6" Min*	Maintain Existing 14'-6" Min*	14'-0" *

3R = Rehabilitation, Restoration, Resurfacing **4R = Reconstruction**

* Minimum Vertical Clearance must be maintained over complete usable shoulder width.

Information on the NHS systems can be obtained by contacting the Statewide Planning Section, Bureau of Transportation Planning or found on the MDOT website at: http://www.michigan.gov/mdot-nfc (11-28-2011)

(1) Special Routes are in Highly Urbanized Areas (where little if any undeveloped land exists adjacent to the roadway) where an alternate route of 16'-0" is available or has been designated. Bridges located over Special Routes in Highly Urbanized Areas can be found on the MDOT website at: http://mdotcf.state.mi.us/public/design/files/englishbridgemanual/Exempt_Structures.pdf. (5-28-2013)

Ramps and roadways connecting a Special Route and a 16'-0" route require a vertical clearance minimum of 14'-6" (14'-9" desired). Ramps and roadways connecting two 16'-0" routes require a vertical clearance minimum of 16'-0" (16'-3" desired). (8-20-2009)

Pedestrian bridges are to provide 1'-0" more underclearance than that required for a vehicular bridge. For Freeways (Interstate and non Interstate), including Special Route Freeways, the desired underclearance shall be 17'-3" (minimum 17'-0"). (8-20-2009)

A vertical underclearance of 23'-0" is required for highway grade separations over railroads when constructing a new bridge or removing the existing superstructure. For preventative maintenance, rehabilitation and deck replacement projects the existing railroad vertical underclearance does not need to be increased unless requested by the Railroad. (11-28-2011)

Clearance signs are to be present for structures with underclearance of 16'-0" or less (show dimensions 2" less than actual). See http://mdotcf.state.mi.us/public/tands/plans.cfm for additional information and guidelines. (8-20-2009) (11-28-2011) (11-21-2013)

CLEAR ZONE DISTANCES (Lc)

DESIGN SPEED	DESIGN ADT	FILL SLOPES			CUT SLOPES		
		1:6 OR FLATTER	1:5 TO 1:4	1:3	1:3	1:4 TO 1:5	1:6 OR FLATTER
40 mph or less	under 750	7 - 10	7 - 10	**	7 - 10	7 - 10	7 - 10
	750 - 1500	10 - 12	12 - 14	**	10 - 12	12 - 14	12 - 14
	1500 - 6000	12 - 14	14 - 16	**	12 - 14	14 - 16	14 - 16
	over 6000	14 - 16	16 - 18	**	14 - 16	16 - 18	16 - 18
45-50 mph	under 750	10 - 12	12 - 14	**	8 - 10	8 - 10	10 - 12
	750 - 1500	12 - 14	16 - 20	**	10 - 12	12 - 14	14 - 16
	1500 - 6000	16 - 18	20 - 26	**	12 - 14	14 - 16	16 - 18
	over 6000	18 - 20	24 - 28	**	14 - 16	18 - 20	20 - 22
55 mph	under 750	12 - 14	14 - 18	**	8 - 10	10 - 12	10 - 12
	750 - 1500	16 - 18	20 - 24	**	10 - 12	14 - 16	16 - 18
	1500 - 6000	20 - 22	24 - 30	**	14 - 16	16 - 18	20 - 22
	over 6000	22 - 24	26 - 32*	**	16 - 18	20 - 22	22 - 24
60 mph	under 750	16 - 18	20 - 24	**	10 - 12	12 - 14	14 - 16
	750 - 1500	20 - 24	26 - 32*	**	12 - 14	16 - 18	20 - 22
	1500 - 6000	26 - 30	32 - 40*	**	14 - 18	18 - 22	24 - 26
	over 6000	30 - 32*	36 - 44*	**	20 - 22	24 - 26	26 - 28
65-70 mph	under 750	18 - 20	20 - 26	**	10 - 12	14 - 16	14 - 16
	750 - 1500	24 - 26	28 - 36*	**	12 - 16	18 - 20	20 - 22
	1500 - 6000	28 - 32*	34 - 42*	**	16 - 20	22 - 24	26 - 28
	over 6000	30 - 34*	38 - 46*	**	22 - 24	26 - 30	28 - 30

* Where a site specific investigation indicates a high probability of continuing crashes, or such occurrences are indicated by crash history, the designer may provide clear zone distances greater than 30 feet as indicated. Clear zones may be limited to 30 feet for practicality and to provide a consistent roadway template if previous experience with similar projects or designs indicates satisfactory performance.

** Since recovery is less likely on the unshielded, traversable 1:3 slopes, fixed objects should not be present in the vicinity of the toe of these slopes.

CURVE CORRECTION FACTORS (Kcz)

Radius (ft)	DESIGN SPEED (mph)						
	40	45	50	55	60	65	70
2950	1.1	1.1	1.1	1.2	1.2	1.2	1.2
2300	1.1	1.1	1.2	1.2	1.2	1.2	1.3
1970	1.1	1.2	1.2	1.2	1.3	1.3	1.4
1640	1.1	1.2	1.2	1.3	1.3	1.3	1.4
1475	1.2	1.2	1.3	1.3	1.4	1.4	1.5
1315	1.2	1.2	1.3	1.3	1.4	1.4	
1150	1.2	1.2	1.3	1.4	1.5	1.5	
985	1.2	1.3	1.4	1.5	1.5	1.5	
820	1.3	1.3	1.4	1.5			
660	1.3	1.4	1.5				
495	1.4	1.5					
330	1.5						

$CZ_C = (L_C)(K_{CZ})$

Where:

CZ_C = clear zone on outside of curvature, feet

L_C = clear zone distance, feet (Design Guide 6.06.05)

K_{CZ} = curve correction factor

Note: The clear zone correction factor is applied to the outside of curves only. Curves flatter than 2860 feet do not require an adjusted clear zone.