

## ***ENGINEERING DIRECTIVE***

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CHIEF ENGINEER

### **Design Criteria for MassDOT Highway Division Projects**

The purpose of this Engineering Directive is to clarify the design criteria that shall be applied to MassDOT Highway Division projects, as listed below. This Directive introduces new controlling criteria for pedestrian and bicycle accommodation that will be used together with FHWA's 13 controlling criteria for roadways and bridges. This Directive updates and supersedes Engineering Directive E-14-001, dated 2/4/14, and supports MassDOT Healthy Transportation Policy Directive P-13-0001, dated 9/9/13.

This Directive applies to all projects not yet advertised for construction. Projects that have received 25% Project Approval as of 2/4/14 are exempt from meeting the pedestrian and bicycle accommodation requirements of this Directive, unless directed otherwise by MassDOT on a case-by-case basis. However, designers are encouraged to apply all elements of this Directive, where practical, to every project regardless of design status.

As stated in the *MassHighway Project Development and Design Guide* (Guide), the design criteria and processes contained herein apply when:

1. MassDOT Highway Division is the project proponent, or
2. MassDOT Highway Division is responsible for project funding (state or federal aid), or
3. MassDOT Highway Division controls the affected infrastructure (State Highway).

### **Design Criteria for Roadways and Bridges (FHWA's 13 Controlling Criteria)**

1. For projects not on the NHS, the design criteria shall be in accordance with the Guide.
2. For projects on the NHS, the design criteria shall be as follows:
  - a. For projects on NHS Interstate Highways:
    - i. For Interstate non-3R\* projects, the design criteria shall be in accordance with the latest edition of the *AASHTO, A Policy on Design Standards, Interstate System* (AASHTO Interstate).
    - ii. For Interstate 3R\* projects, the minimum design criteria for horizontal alignment, vertical alignment and widths of median, traveled way and shoulders remain the standards that were in effect at the time of original construction or inclusion into the Interstate System.

- b. For projects on other NHS freeways (other than Interstate) the design criteria shall be in accordance with the latest edition of the *AASHTO, A Policy on Geometric Design of Highways and Streets* (Green Book). 3R\* allowances for NHS freeways are included in the Green Book.
- c. For projects on non-freeway NHS roadways:
  - i. For non-freeway non-3R\* projects, the design criteria shall be in accordance with the Green Book.
  - ii. For non-freeway 3R\* projects, the design criteria shall be in accordance with the Guide.

*\* 3R projects are projects that are primarily resurfacing, restoration or rehabilitation projects that extend the service life of highways, bridges and related appurtenances; and/or restore safe, efficient travel on an existing facility. Normally, 3R projects include most of MassDOT's resurfacing projects and most bridge preservation and rehabilitation projects. They also include roadway projects where box widening is proposed to widen shoulders for improved bicycle accommodation and safety. 3R projects generally have no significant geometric changes to horizontal or vertical alignment and generally have no significant widening such as widening for additional capacity. Projects that include minor lane and/or shoulder widening may be considered to be 3R projects. Projects that are beyond the 3R definition are normally defined as reconstruction projects and new construction projects which are subject to the respective standards identified above and their established design exception approval process.*

<b>DESIGN CRITERIA for ARTERIAL TRAVEL LANES AND SHOULDERS</b>						
<b>ROADWAY TYPE</b>	<b>PROJECT TYPE</b>	<b>BOOK</b>	<b>EXHIBIT NUMBER</b>	<b>ARTERIAL MINIMUM WIDTHS<sup>1,3</sup></b>		
				<b>TRAVEL LANE</b>	<b>LEFT SHOULDER</b>	<b>RIGHT SHOULDER<sup>2</sup></b>
Interstate	Non 3R <sup>4</sup>	Interstate	2005 Page 3	12'	4' (to 12') <sup>2</sup>	10' (to 12')
Interstate	3R <sup>4</sup>	Interstate	1956 or later	12'	3.5' offset	10' (to 12')
NHS Freeway	All	Green	7-3	12'	4' <sup>2</sup>	10'
NHS Non- Freeway	Non 3R <sup>4</sup>	Green	7-3	12'	2' offset	8'
NHS Non- Freeway	3R <sup>4</sup> Only	Guide	5-12 5-14	11'	2' offset	4'
Non NHS	All	Guide	5-12 5-14	11'	2' offset	4'

1. These are the minimum widths below which a Design Exception is normally required.
2. These dimensions are for usable shoulder. Add a 2' offset for objects over 6" high, such as guardrail.
3. These criteria apply regardless of project funding.
4. "3R" stands for resurfacing, restoration or rehabilitation.

## **Design Criteria for Pedestrian and Bicycle Accommodation**

### **Pedestrian Accommodation**

- Pedestrian accommodation shall be in accordance with Chapter 5 of the Guide and the *AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities*.
- Wherever adjacent land uses include commercial or residential development greater than 5 units per acre, a sidewalk shall be provided along the roadway adjacent to the use. (See P-13-0001, Section 2C.)
- For projects in urbanized areas on roadways where pedestrians are legally allowed, sidewalks shall be provided on both sides of the roadway. (See P-13-0001, Section 2E. Refer to MassDOT's Road Inventory Maps for urbanized area boundaries.)
- For bridge projects, sidewalks shall be provided on both sides of the roadway if pedestrians are legally allowed. (See P-13-0001, Section 2E.)
- For projects on roadways that pass under bridges and where pedestrians are legally allowed, sidewalks shall be provided on both sides of the roadway beneath each bridge. (See P-13-0001, Section 2E.)
- The minimum sidewalk width below which a design exception is required is 5', exclusive of curb.

### **Bicycle Accommodation**

- Bicycle accommodation shall be in accordance with Chapter 5 of the Guide and the *AASHTO Guide for the Development of Bicycle Facilities*.
- For all freeways, arterials and collectors where bicycles are legally allowed, a paved outside shoulder or designated bicycle lane shall be provided on both sides of the roadway.
- The minimum paved outside shoulder or designated bicycle lane width below which a design exception is required is 5', exclusive of any parking lane.
- In lieu of paved outside shoulders or designated bicycle lanes, protected bicycle facilities (i.e. cycle tracks, side paths, shared-use paths, bicycle paths, etc.) may provide accommodation for bicycles. However, the presence of such facilities does not relieve the designer of the need to properly consider applicable design criteria for outside (right) shoulder width.
- Refer to the *AASHTO Guide for the Development of Bicycle Facilities* and other current guidance documents for design criteria for off-road paths and cycle tracks.

### **Design Exceptions**

- Criteria proposed below minimum values may be considered after providing sufficient justification and documentation while following the Design Exception process outlined in Chapter 2 of the Guide.
- In determining the standards for horizontal alignment, the minimum length of curve criteria need not be met on 3R projects.
- Refer to the guidance in the previous sections of this Directive to determine design criteria for lane and shoulder widths. When using the Guide, the values in Exhibits 5-12 and 5-14 shall apply. When using the Green Book, the values in Exhibit 7-3 shall apply. Additional language in the Green Book, particularly for constraints associated with Urban Arterials, may be used to support justification for a Design Exception.
- In using the AASHTO Interstate standards, the shoulder width criteria, regardless of the terminology used, such as "shall", "should be considered", etc., by virtue of their adoption by

FHWA, are the minimum values for each condition described. Design Exceptions are therefore required for projects that do not provide applicable widths.

- In some cases, the minimum shoulder width criterion for bicycle accommodation exceeds the minimum right shoulder width criterion for roadways. Regardless, the designer must consider each element independently, and must document any necessary design exceptions accordingly. In cases where design exceptions are required for both elements, the discussion and justification of these exceptions may be combined in the Design Exception Report.
- The designer shall prepare and submit any necessary Design Exception Reports as part of the 25% design submission, or for permit projects, as part of the permit application.
- Upon receipt of a Design Exception Report, the Project Manager shall provide by email a copy of the Report to the Chair of the Design Exception Review Committee. The Committee shall discuss project elements and offer advice or endorsements to the Project Manager and the project reviewers for each issue. The Committee is responsible for tracking and reporting on all Design Exception issues, and for ensuring consistency in the application of design standards and in the documentation of Design Exceptions.
- The primary project reviewer, typically the District office, shall review the Design Exception Report. In addition, the Complete Streets Engineer shall review the 25% design submission, including the Design Exception Report, for all projects on roadways where pedestrians and bicyclists are allowed, including projects to be completed under a permit.
- If all reviewers recommend approval of the Design Exception Report, the Project Manager shall forward the signed Design Exception Report to the Chief Engineer for approval. If the Design Exception Report includes exceptions to the design criteria for Pedestrian and Bicycle Accommodation, the Project Manager shall subsequently request project sign off by the Secretary and CEO of Transportation, or their designee, in accordance with P-13-0001. The approved Design Exception Report shall be used as justification for the Secretary's sign off. If the project is subject to FHWA oversight, the Project Manager shall subsequently forward the approved Design Exception Report to FHWA for final approval.
- Projects should not be advanced beyond the 25% design stage until all necessary Design Exception approvals and project sign offs are secured. Highway Access Permits should not be approved by District Highway Directors until all necessary Design Exception approvals and project sign offs are secured.
- For maintenance projects that are not categorically exempt from design criteria for pedestrian and bicycle accommodation and for which design plans and normal design review submissions are not applicable, the project proponent shall ensure that the proposed typical section(s) are reviewed by appropriate District Projects staff and the Complete Streets Engineer, improvements to pedestrian and bicycle accommodation are considered, and reasons for not making pedestrian and bicycle accommodation improvements are documented and retained in the project file.

### **Exemptions from Controlling Criteria**

#### **Design Criteria for Roadways and Bridges (FHWA's 13 Controlling Criteria)**

The following types of projects are exempt from the need to comply with FHWA's 13 controlling criteria. When design criteria for these types of projects are not in compliance, a formal Design Exception Report is not required; however, geometric deficiencies should be identified in a Functional Design Report or other documentation:

- 3R projects within the existing roadway footprint where the project Purpose and Need is solely to maintain the roadway surface or bridge structure and the crash history does not indicate any apparent geometric deficiency.
- Interstate 3R projects (if the roadway meets the standards used for horizontal alignment, vertical alignment and widths of median, traveled way and shoulders that were in effect at the time of original construction or inclusion into the Interstate System, and the crash history does not indicate any apparent geometric deficiency).
- Non-NHS Footprint Bridge projects in accordance with the Footprint Bridge Policy.
- Isolated single intersection safety improvement projects (with minimal work on approach roadways).
- Routine roadway maintenance projects such as crack sealing, joint repair, micro surfacing, chip seals, etc.
- Non-roadway maintenance projects such as catch basin cleaning, street sweeping, grass mowing, etc.
- Bridge maintenance projects such as joint repair, deck repair, superstructure repair, substructure repair, etc.
- Sidewalk and curb ramp only projects.
- Drainage only projects.
- Noise barrier only projects (provided sight distance and horizontal clearance met).
- Guardrail only projects (provided sight distance and horizontal clearance met).
- Landscape only projects (provided sight distance, vertical clearance and horizontal clearance met).
- Highway lighting only projects (provided sight distance, vertical clearance and horizontal clearance met).
- Signing only projects (provided sight distance, vertical clearance and horizontal clearance met).
- Pavement marking only projects.
- Traffic signal equipment only projects (provided horizontal and vertical clearance met).
- Vertical construction and other non-roadway/bridge projects.
- Projects done under Minor Vehicle Access Permits or Non-Vehicular Access Permits.

#### Design Criteria for Pedestrian and Bicycle Accommodation

The following types of projects are exempt from the need to comply with Pedestrian and Bicycle Accommodation design criteria:

- All projects on facilities where bicyclists and pedestrians are prohibited, such as Interstates and freeways.
- Routine roadway maintenance projects that don't involve application of new pavement markings, such as crack sealing, pothole patching and joint repair.
- Bridge maintenance projects such as joint repair, deck repair, superstructure repair, substructure repair, etc. In addition, any bridge deck resurfacing work to be done as part of a roadway resurfacing project shall have the same design criteria and exemptions as the full roadway resurfacing project.
- "Footprint" Bridge projects on Rural Collector Roads and Rural Local Roads where no sidewalks currently exist on the approach roadways, and that are also exempt from the 13 Controlling Criteria in accordance with the "Footprint" Bridge Policy.
- Drainage only projects.

- Noise barrier only projects.
- Guardrail only projects.
- Lighting only projects.
- Traffic Signal Equipment only projects.
- Signing only projects.
- Landscape only projects.
- Vertical construction and other non-roadway/bridge projects.
- Projects done under Minor Vehicle Access Permits or Non-Vehicular Access Permits.

<b>EXEMPTIONS FROM CONTROLLING CRITERIA SUMMARY TABLE</b>		
<b>Project Type<sup>1</sup></b>	<b>Exemption Type</b>	
	<b>FHWA's 13 Controlling Criteria</b>	<b>Pedestrian and Bicycle Accommodation Criteria</b>
3R Roadway (Non-Interstate) <sup>1</sup>	✓	
3R Interstate <sup>1</sup>	✓	✓
Non-NHS Footprint Bridge <sup>1</sup>	✓	
“Footprint” Bridge on Rural Collector Road or Rural Local Road <sup>1</sup>	✓	✓
Isolated Intersection <sup>1</sup>	✓	
Routine Roadway Maintenance <sup>1</sup>	✓	
Routine Roadway Maintenance – No New Pavement Markings <sup>1</sup>	✓	✓
Non-Roadway Maintenance <sup>1</sup>	✓	✓
Bridge Maintenance <sup>1</sup>	✓	✓
Sidewalk and/or Curb Ramp Only <sup>2</sup>	✓	
Pavement Marking Only <sup>3</sup>	✓	
Drainage Only	✓	✓
Noise Barrier Only <sup>1</sup>	✓	✓
Guardrail Only <sup>1</sup>	✓	✓
Lighting Only <sup>1</sup>	✓	✓
Traffic Signal Equipment Only <sup>1</sup>	✓	✓
Signing Only <sup>1</sup>	✓	✓
Landscape Only <sup>1</sup>	✓	✓
Non-Vehicular or Minor Vehicle Access Permit	✓	✓
Vertical Construction and other Non-Roadway/Bridge	✓	✓
On Facilities where Bicycles and Pedestrians are Prohibited		✓

**Notes**

<sup>1</sup> See expanded Project Type descriptions above.

<sup>2</sup> These projects are also exempt from Bicycle Accommodation Criteria.

<sup>3</sup> These projects are also exempt from Pedestrian Accommodation Criteria.