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ENGINEERING DIRECTIVE

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CHIEF ENGINEER

Supersedes: E-97-007

Design Criteria for MassHighway Projects and Bicycle and Pedestrian Accommodation Requirements

The purpose of this Engineering Directive is to clarify the design criteria that shall be applied to MassHighway projects, particularly projects on the National Highway System (NHS). This Directive supersedes Engineering Directive E-97-007, dated 10/9/97, and supplements Policy/Engineering Directive P/E-06-001, dated 2/13/06. This Directive also updates the Pedestrian and Bicycle Accommodation criteria and review procedure.

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

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

Project Development Process

The project development process for all projects shall be in accordance with the Guide.

Design 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).

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- 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. Normally this includes most of MassHighway's resurfacing projects and most "footprint" roadway projects. This also includes 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.*

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

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1. These are the minimum roadway 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 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.
- Lane and shoulder widths are the most common criteria subject to Design Exceptions. Refer to the guidance in the previous section 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.
- Bicycle accommodation is an important consideration in the development of roadway widths. When using either the Guide or the Green Book, use of the minimum lane and shoulder widths provides minimum bicycle accommodation. Use of a lower combination of lane and shoulder widths would compromise bicycle accommodation and would require additional justification in a Design Exception.
- Design criteria and any required Design Exception shall be reviewed and approved at the 25% design stage. The design submission shall include a narrative describing the rationale for choosing selected design criteria. This should normally be in the form of a Functional Design Report. The report shall also include a narrative describing the efforts the project designer has taken to improve bicycle and pedestrian accommodation.

Exemptions from 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

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formal Design Exception Report is not required; however, geometric deficiencies should be addressed in a Functional Design Report or other documentation.

Exempt Projects

- 3R projects within the existing roadway footprint where the project Purpose and Need is solely to maintain the roadway surface 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.
- Sidewalk and crosswalk only projects.
- Drainage only projects.
- Noise barrier only projects (provided horizontal alignment, 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.)
- Traffic signal only projects (provided horizontal and vertical clearance met.)

Reviews by the Bicycle and Pedestrian Accommodation Engineer (BPAE)

The BPAE shall receive the 25% design submission for all projects on roadways where pedestrians and bicyclists are allowed. The designer shall include with the submission a narrative describing the rationale for selecting the design criteria for the project. In addition, the designer shall include a narrative describing how the project improves or addresses bicycle and pedestrian accommodation. The BPAE will review the information submitted and will determine whether proposed accommodation is reasonable. If the proposed design criteria meet minimum criteria from the Guide or Green Book as described previously herein,

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minimum bicycle accommodation is met and no Design Exception Report is required. If the proposed criteria fall below the minimum values, the designer shall submit a copy of the Design Exception Report to the BPAE for review.

Typical Bicycle Accommodation

- Bicycle accommodation shall be in accordance with Chapter 5 of the Guide and the 1999 AASHTO Guide for the Development of Bicycle Facilities.
- In general, desirable bicycle accommodation is achieved with a 4' paved shoulder adjacent to a 12' travel lane or with a 16' shared lane (with approved signage.) Minimum bicycle accommodation is achieved with a 15' combined travel lane and shoulder.
- A 5' space is desirable between a travel lane and an on-street parking lane.
- Alternatively, a separate shared-use or bicycle path provides desirable accommodation.
- Bicycle accommodation can also be enhanced by providing smooth pavements, bicycle-safe drainage grates, proper traffic control devices, signage and other similar features.

Typical Pedestrian Accommodation

- Pedestrian accommodation shall be in accordance with Chapter 5 of the Guide.
- In general, desirable pedestrian accommodation is achieved with at least one 5' sidewalk, exclusive of curb.
- Minimum pedestrian accommodation on a sidewalk is achieved with a 4' width (exclusive of curb), where a 5' passing zone is provided every 200'. A 3' minimum path of travel must be provided next to every fixture such as poles, signs, mailboxes, etc.
- Pedestrian accommodation may also be provided in the roadway shoulder in accordance with the Guide, or on a separate shared-use path.
- Accessibility must be met in accordance with AAB/ADA policy and MassHighway standards.
- Pedestrian accommodation can also be enhanced by providing buffer zones, appropriate crossing locations, pedestrian signal phases and other similar features.

Off Road Facilities

- The BPAE will also review all proposed off road bicycle and shared-use paths at the 25% design stage. This review will be primarily for path width and geometry for accommodation of bicyclists and pedestrians. Desirable path width is at least 12' plus graded shoulders.
- A minimum path width of 10' may be used with sufficient justification. A path width of 8' may be allowed under unusual circumstances, but must be supported with a Design Exception Report.

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Exempt Projects

The following types of projects are exempt from BPAE review:

- All projects on facilities where bicyclists and pedestrians are prohibited, such as Interstates and freeways.
- Routine roadway maintenance projects such as crack sealing, joint repair, micro surfacing, chip seals, etc.
- Bridge maintenance projects such as joint repair, deck repair, superstructure repair, substructure repair, etc.
- Drainage only projects.
- Noise barrier only projects.
- Guardrail only projects.
- Lighting only projects.
- Signing only projects.
- Landscape only projects.

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