

Flexibility in Michigan DOT Design Standards

- I. Introduction – MDOT Design Standards are based on national guidelines, FHWA adopted standards and geographic/environmental considerations specific to Michigan. The evolution of design standards both nationally and in Michigan have resulted in the development of design flexibilities more conducive to context sensitive solutions. The level of design standard is dependant on factors such as roadway classification, work type, terrain, traffic volume and composition. When design standards can not be met, flexibility may still be accessible by requesting and receiving approval for a formal exception to certain elements of design. Design exceptions should be identified during the scoping process so that all options can be considered prior to the submission of a formal design exception request.
- II. AASHTO Guidelines – National guidance for the design of highways are provided in several publications by American Association of State Highway and Transportation Officials (AASHTO). The most often referenced of these AASHTO publications is *A Policy on Geometric Design of Highways and Streets*, commonly referred to as the AASHTO “Green Book”. This publication is a series of guidelines on geometric design presented with recommended ranges of minimum and maximum design values. In order for the design criteria in the Green Book to become a state standard, they must be adopted by each individual state. The FHWA has adopted certain elements of the Green Book as national standards on the NHS (National Highway System).
- III. MDOT Design Standards - The standards adopted by MDOT for interstate and state highways are incorporated in several Department publications:
 - a. The MDOT Road and Bridge Standard Plans include detailed drawings approved by the Department and FHWA for repetitive use on road and bridge construction projects. They provide detailed technical information for use in both the design and construction of highways and highway appurtenances.
 - b. The MDOT Bridge Design Guides provide detailed drawings for bridge design that are not subject to the same formal approvals as standard plans. Although some MDOT standards are incorporated in the details, these drawings primarily serve as an aid for designing and detailing bridges.
 - c. The MDOT Road Design Manual and Bridge Design Manual provide both technical and procedural information to assist the designer throughout the design process for road and bridge projects. The

Michigan standards for controlling design elements are included in these two publications.

- IV. Local Agency Standards – The standards adopted by Local Agency Programs are the “Michigan Department of Transportation Local Agency Program Guidelines for Geometrics”. This document utilizes the MDOT 4R/3R standards as a baseline with a more detailed commentary on certain requirements and added features specific to local agency projects. The basic premise for Local Agency 4R standards is the AASHTO Green Book. Local Agency 3R standards are derived from the Transportation Research Board (TRB) Report 214, *Designing Safer Roads: Practices for Resurfacing, Restoration and Rehabilitation*. As with MDOT projects, design exceptions should be identified during the scoping process so that all options can be considered prior to the submission of a formal design exception request.
- V. New Construction / Reconstruction (4R) – New Construction, as the name implies, is construction of a roadway facility where one does not exist. Reconstruction includes complete replacement of or major changes to existing facilities to accommodate increased traffic demands and improve safety to older facilities. New Construction and Reconstruction projects are generally designed to the recommended standards in the AASHTO Green Book. The Green Book presents recommended ranges of values for roadway design dimensions.

Sufficient flexibility is permitted to encourage independent designs tailored to particular situations. Minimum values are either given or implied by the lower value in a given range of values. The larger values within the ranges will normally be used where social, economic and environmental (S.E.E.) impacts are not critical. Pg .xlili Green Book

- VI. Resurfacing Restoration and Rehabilitation (3R) – 3R projects include work undertaken to extend the service life of an existing highway and enhance highway safety. The types of improvements include resurfacing, and/or other work to return an existing roadway, including shoulder, bridges, and roadside appurtenances to structural or functional adequacy. 3R minimum design guidelines are published in the Road Design Manual and bridge rehabilitation criteria in the Bridge Design Manual. As with the AASHTO Green Book guidelines, the 3R Guidelines and Bridge Rehabilitation Criteria include ranges of values dependent on factors such as design speed, traffic volume and roadway functional classification. These provide more appropriate minimum standards for this level of roadway work.

3R Guidelines apply to Non Freeway projects only. Freeways, both Interstate and Non Interstate are higher speed facilities carrying a wider range of vehicles and are therefore designed to higher standards. MDOT 3R guidelines are available for non freeway application and allow a wider

range of flexibility than the AASHTO ranges. For 3R work on the non-NHS routes, the Guidelines offer yet a wider range.

- VII. Design Exceptions – When design criteria can not be met within the specified ranges, designs outside the range may still be considered but documentation including crash analyses must justify the alternative design.

The FHWA requires formal requests and documentation for design exceptions for 13 specific controlling criteria on the NHS:

1. Design Speed
2. Lane Width
3. Shoulder Width
4. Bridge Width
5. Structural Capacity
6. Horizontal Alignment
7. Vertical Alignment
8. Grade
9. Stopping Sight Distance
10. Cross Slope
11. Superelevation
12. Vertical Clearance
13. Horizontal Clearance (not including clear zone)

An additional MDOT design exception requirement is added for freeway ramp taper lengths. These requirements are detailed in the MDOT Geometric Design Guides.

MDOT considers formal design exception requirements applicable to the same list of elements for Non-NHS routes.

- VIII. References –

2001 AASHTO A Policy on Geometric Design of Highways and Streets
MDOT Road and Bridge Standard Plans*
MDOT Road Design Manual*
MDOT Bridge Design Manual*
MDOT Bridge Design Guides*
MDOT Geometric Design Guides*
MDOT Local Agency Program Guidelines for Geometrics*

* Available on the Michigan Department of Transportation website
www.michigan.gov/mdot