



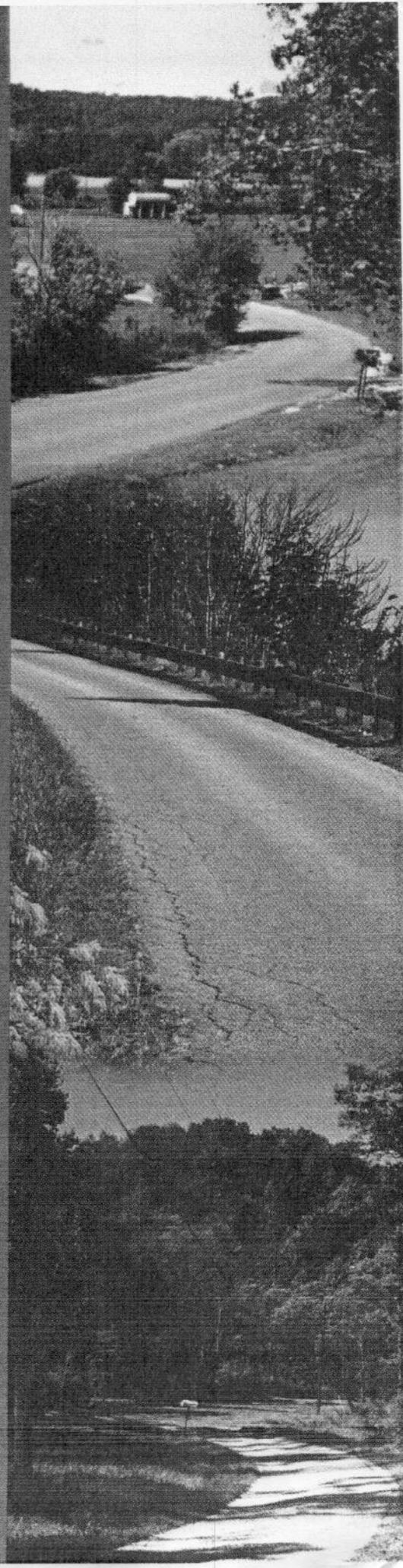
American Association of  
State Highway and  
Transportation Officials

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**Guidelines for  
Geometric  
Design of Very  
Low-Volume  
Local Roads  
(ADT  $\leq$  400)**

**2001**

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# Foreword

As highway designers, highway engineers strive to provide for the needs of highway users while maintaining the integrity of the environment. Unique combinations of design requirements that are often conflicting result in unique solutions to the design problems. The geometric design of very low-volume local roads presents a unique challenge because the very low traffic volumes and reduced frequency of crashes make designs normally applied on higher volume roads less cost effective. The guidance supplied by this text, *Geometric Design Guidelines for Very Low-Volume Local Roads (ADT  $\leq$  400)*, addresses the unique needs of such roads and the geometric designs appropriate to meet those needs. These guidelines may be used in lieu of the guidance in *A Policy on Geometric Design of Highways and Streets*, also known as the Green Book. The guidance presented here will be incorporated in a future edition of that policy.

The guidelines for geometric design of very low-volume local roads are the result of a research and development process initiated by AASHTO in 1996. These guidelines were initially developed through two projects of the National Cooperative Highway Research Program (NCHRP), which is jointly sponsored by AASHTO and FHWA. After completion of the NCHRP research, these guidelines went through the normal AASHTO review process. During the development process, representatives of other interested organizations such as the National Association of County Engineers, the American Society of Civil Engineers, the U.S. Forest Service, the American Public Works Association, and the National League of Cities have participated in review of the guidelines.

Design values are presented in this document in both metric and U.S. customary units and were developed independently within each system. The relationship between the metric and U.S. customary values is neither an exact (soft) conversion nor a completely rationalized (hard) conversion. The metric values are those that would have been used had the policy been presented exclusively in metric units; the U.S. customary values are those that would have been used if the policy had been presented exclusively in U.S. customary units. Therefore, the user is advised to work entirely in one system and not attempt to convert directly between the two.

The fact that new design values are presented herein does not imply that existing streets and highways are unsafe, nor does it mandate the initiation of improvement projects. *A Policy on Geometric Design of Highways and Streets* states that specific site investigations and crash history analysis often indicate that the existing design features are performing in a satisfactory manner. The cost of full reconstruction for these facilities, particularly where major realignment is not needed, will often not be justified. This is especially true for very low-volume roads which experience substantially fewer crashes than higher volume roads. These guidelines recommend an approach to geometric design for very low-volume roads, including both new construction and projects on existing roads, that is based on research concerning the safety cost-effectiveness of geometric elements and on reviews of site-specific safety conditions.

These guidelines address issues for which appropriate geometric design guidance for very low-volume local roads differs from the policies normally applied to higher volume roads. For any geometric design issues not addressed by these guidelines, design professionals should consult *A Policy on Geometric Design of Highways and Streets*.

The intent of these guidelines is to assist the designer by referencing a recommended range of values for critical dimensions. It is not intended to be a detailed design manual that could supersede the need for the application of sound principles by the knowledgeable design professional. Flexibility in application of these guidelines is encouraged so that independent designs tailored to particular situations can be developed.

The highway, vehicle, and individual users are all integral parts of transportation safety and efficiency. While this document primarily addresses geometric design issues, a properly equipped and maintained vehicle and reasonable and prudent performance by the user are also necessary for safe and efficient operation of the transportation facility.

# CHAPTER 1

## INTRODUCTION

This document presents geometric design guidelines for very low-volume local roads. The purpose of the guidelines is to help highway designers in selecting appropriate geometric designs for roads with low traffic volumes traveled by motorists who are generally familiar with the roadway and its geometrics. The design guidelines presented here may be used on very low-volume local roads in lieu of the applicable policies for design of local roads and streets presented in AASHTO *Policy on Geometric Design of Highways and Streets (1)*, commonly known as the Green Book.

This chapter defines very low-volume local roads, describes the scope of the design guidelines, explains the relationship of the guidelines to other AASHTO policies, and presents the organization of the remainder of this document.

### DEFINITION OF VERY LOW-VOLUME LOCAL ROADS

The guidelines presented in this document are applicable to very low-volume local roads. Very low-volume local roads are defined as follows:

*A very low-volume local road is a road that is functionally classified as a local road and has a design average daily traffic volume of 400 vehicles per day or less.*

The preceding statement clarifies that the functional classification of a road is a key element of the definition of a very low-volume local road. A local road is a road whose primary function is to provide access to residences, farms, businesses, or other abutting property, rather than to serve through traffic. Although some through traffic may occasionally use a local road, through traffic service is not its primary purpose. The term local road is used here to refer to the functional classification of the road and is not intended to imply that the road is necessarily under the jurisdiction of a local or municipal unit of government. Administrative arrangements for operation of the highway system vary widely and, in different parts of the United States, roads that are functionally classified as local roads may be under Federal, state, or local control.

The guidelines presented in this document may also be applied in the design of roads that are functionally classified as collectors, so long as the road has a design average daily traffic volume of 400 vehicles per day or less and primarily serves drivers who are familiar with the roadway. There are roads in some states that, because of their length and position in the road network, are functionally classified as collectors, even though they serve very low volumes of primarily local or repeat drivers. Collector roads, by their nature, serve more through traffic than local roads; however, much of that through traffic consists of familiar drivers moving between local roads and arterials. The risk assessment on which the design guidelines are based is applicable to any roadway with design average daily traffic volume of 400 vehicles per day or less that serves primarily familiar drivers. Therefore, throughout the remainder of this document, when reference

is made to very low-volume local roads, it should be understood that the guidelines are also applicable to very low-volume collector roads that primarily serve familiar drivers.

Nearly 80 percent of the roads in the United States have traffic volumes of 400 vehicles per day or less. The very low-volume local and collector roads, defined above, to which the guidelines presented in this document are applicable, should include most of this extensive road mileage. In some states, portions of the state numbered route system meet the definition of very low-volume collector roads that serve familiar drivers and can be addressed with these guidelines.

## **SCOPE OF GUIDELINES**

The guidelines presented in this document are intended for application in the design of very low-volume local roads, as defined above, including application in both new construction and in the improvement of existing roads. The scope of the guidelines includes roads in both rural and urban areas.

The design guidelines enable designers for projects on very low-volume local roads to apply design criteria that are less restrictive than those generally used on higher volume roads. The risk assessment on which the guidelines are based shows that these less restrictive design criteria can be applied on very low-volume local roads without compromising safety. The guidelines discourage widening of lanes and shoulders, changes in horizontal and vertical alignment, and roadside improvements except in situations where such improvements are likely to provide substantial safety benefits. Thus, projects designed in accordance with these guidelines are less likely to negatively impact the environment, roadway and roadside aesthetics, existing development, historic and archeological sites, and endangered species. In reviewing the geometric design for sections of existing roadway, designers should strive for consistency of design between that particular section and its adjoining roadway sections. The potential effects of future development that may affect the traffic volume and vehicle mix on the roadway should also be considered.

The design guidelines are intended to encourage rational safety management practices on very low-volume local roads. Expenditures for safety improvements are discouraged at sites where such improvements are likely to provide little safety benefit, but are strongly encouraged at sites where safety problems exist that can be corrected by a roadway or roadside improvement. Designers are provided substantial flexibility to retain the existing roadway and roadside design, where that existing design is performing well, but are also provided flexibility to recommend improved designs, even designs that exceed the guidelines presented here, where necessary to correct documented safety problems.

The scope of the guidelines includes geometric design for new construction and for improvement of existing roads. Geometric design criteria for new construction apply to construction of a new road where none existed before. Projects on existing roads may involve reconstruction, resurfacing, rehabilitation, restoration, and other types of improvements.

## RELATIONSHIP TO OTHER AASHTO POLICIES

The design guidelines presented in this document may be applied to very low-volume roads in lieu of the applicable policies of the AASHTO *Policy on Geometric Design of Highways and Streets* (1) and the AASHTO *Roadside Design Guide* (2). These design guidelines may be applied in place of Chapter 5 (Local Roads and Streets) of the AASHTO *Policy on Geometric Design of Highways and Streets* (1) to local roads that serve traffic volumes of 400 vehicles per day or less. For very low-volume collector roads that primarily serve familiar drivers, these design guidelines may be applied in lieu of the applicable policies in Chapter 6 (Collector Roads and Streets) of the AASHTO *Policy on Geometric Design of Highways and Streets* (1). The design guidelines presented here address design issues for which an explicit safety risk assessment has been performed. For design issues that are not addressed in these guidelines, the designer should consult the applicable sections of the AASHTO *Policy on Geometric Design of Highways and Streets* (1) and the AASHTO *Roadside Design Guide* (2).

## ORGANIZATION OF THIS DOCUMENT

Chapter 2 of this document presents a framework for design guidelines that helps to define the situations in which specific design guidelines should be applied.

Chapter 3 describes the design philosophy on which the guidelines are based. Specifically, this chapter identifies the unique characteristics of very low-volume local roads, the basis for the design recommendations, the risk assessment approach used in their development, the applicability of the guidelines to new construction and to improvement projects on existing roads, and the flexibility provided to designers by these guidelines.

Chapter 4 presents the design guidelines applicable to cross section elements, bridge width, horizontal alignment, stopping sight distance, intersection sight distance, roadside design, unpaved roads, and two-way single-lane roads.

Chapter 5 presents examples of the application of the design guidelines to specific design situations.