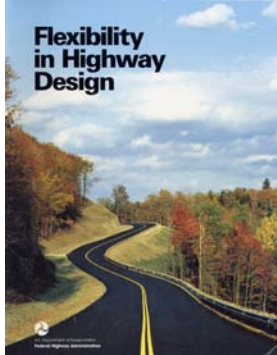


FLEXIBILITY IN HIGHWAY DESIGN



Federal Highway Administration (1997). *Flexibility in Highway Design*. Washington, DC.

ABSTRACT

This guide was prepared by the FHWA in association with AASHTO and other interest groups. It encourages highway designers to consider other factors besides established geometric standards when designing highways. It discusses how to use a new process that includes public involvement and allows creative thinking while still incorporating safety and serviceability.

The 192-page book is divided into three main sections:

- Part I—The Design Process
- Part II—Design Guidelines
- Part III—Case Studies

Part I—The Design Process

Chapter 1: Overview of the Highway Planning and Development Process summarizes the primary steps of highway planning and development:

- Planning—Government agency identifies transportation needs, potential projects, and financial resources.
- Project Development—An individual project is defined and a preferred alternative is selected.
- Design—A design team develops detailed plans, specifications, and cost estimates.
- Right-of-Way—Land needed for the project is purchased.
- Construction—Government agency selects a contractor to build the project.

Part II—Design Guidelines

Chapter 2: Highway Design Standards provides an overview of highway design references and standards, most notably the AASHTO publication, *A Policy on the Geometric Design of Highway Standards*, also known as the “Green Book.” The relationship of the Green Book with state and local design manuals is also discussed.

Four types of highway projects are discussed:

1. New construction
2. Reconstruction
3. Resurfacing, Restoration, and Rehabilitation (3R)
4. Maintenance

The design exception process and tort liability as it relates to highway design are also covered.



Chapter 3: Functional Classifications discusses the grouping of streets and highways into classes, according to the character of traffic service that they provide. The main classifications are:

- Arterial—roads with the highest level of service and speed, with lowest degree of access.
- Collector—roads that balance mobility and access.
- Local—roads that provide access to adjacent properties with little or no through movement.

The classification and other characteristics such as urban vs. rural is critical in establishing a design speed and other criteria for the roadway. Issues such as updating functional classifications and using engineering judgment to make design decisions are also discussed.

Chapter 4: Design Controls describes criteria that affect the design of a highway, such as design speed, level of service, the design vehicle, and driver capabilities. In general, a higher design speed results in a more conservative design and a higher impact to the surroundings. In some cases, a lower design speed can be justified to better integrate a project into the community.

Chapter 5: Horizontal and Vertical Alignment discusses the factors that influence horizontal and vertical alignment of roadways, including design controls, topography, adjacent properties, and community values. Proper consideration of these factors and coordination of horizontal and vertical geometry can help ensure that roadways fit harmoniously into their surroundings.



Chapter 6: Cross-Section Elements provides an overview of the items that define roadway cross-sections, including travel lanes, shoulders, medians, bicycle and pedestrian facilities, utility and landscape areas, side slopes, and clear zones. Additional issues such as accommodating transit and working within restricted right-of-way, are also covered.

Chapter 7: Bridges and Other Major Structures provides general guidelines for the geometrics of bridge design, as well as a discussion of ancillary elements such as railings and light fixtures. It also includes a discussion of resolving issues such as rehabilitation versus new construction and keeping a structure in scale with its surroundings.

Chapter 8: Intersections discusses the design of at-grade roadway intersections, including design elements such as geometric criteria, medians and islands, traffic control devices, turn lanes, and pedestrian facilities. Intersection design can greatly affect the capacity of a roadway and is often complicated due to the numerous design elements involved. New intersection concepts such as

roundabouts are discussed as an alternative approach to improving safety and efficiency.

Part III—Case Studies

Route 9 Reconstruction. A six-lane urban arterial street in Manhattan, NY was revamped using a collaborative, multidisciplinary planning process, incorporating continuous public involvement. The new design used a lower design speed to mitigate right-of-way impacts and added a center landscaped median and facilities for bicyclists and pedestrians.

Carson Street Reconstruction. An urban arterial in Torrance, CA was reconstructed through a residential neighborhood, using concrete interlocking pavers in medians and boulevards, extensive plant material, and buried utilities to improve aesthetics. The project led to the improvement of many adjacent properties and an overall positive impact on the community.



Historic Columbia River Highway. A historic two-lane highway in Oregon was rehabilitated and restored to mimic its original condition in 1922. Features such as timber guardrails and stone walls were included to preserve the roadway's original rustic character.

State Route 89—Emerald Bay. A narrow, 0.7 mile, two-lane section of State Route 89 was upgraded to a modern two-lane section near Lake Tahoe in California. A variety of geotechnical measures and slope treatments were taken to address rock stability issues and maintain scenic views.

East Main Street Reconstruction. A one-mile stretch of a local, historic street in Westminster, MD, was reconstructed with staggered curbing, textured walkways, and pedestrian-friendly areas.

US Route 101—Lincoln Beach Parkway. A two-mile, two-lane roadway was upgraded as a four-lane, divided, principal arterial with turn lanes for improved safety. It was the first rural, limited-access roadway in Oregon to employ such features.

SUMMARY

This book provides guidance on how to think beyond established criteria when designing highways. It encourages creativity, collaboration, and public involvement throughout the process of planning and designing highways.

KEY WORDS

Applicable Project Delivery Stages: Administration, Planning, Design, Construction

Applicable Transportation Professionals: Highway, Engineers, Structural Engineers, Planners, Urban Designers, Landscape Architects, Historians

Applicable Transportation Modes: Vehicular, Bicycle, Pedestrian, Transit

Transportation Topics: Aesthetics, Flexibility, Highway Geometrics, Alignment, Grading, Vegetation, Rural Roads, Scenic Highways, Education, Communication, Community, Balance, Process, Roles and Responsibilities, Technical Staff, Partnerships, Clear Zone, Crosswalks, Curbs