



# TRAFFIC TIPS

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## *Designing Highways in Context*

An important concept in highway design is that every project is unique. The setting and character of the area, the values of the community, the needs of the highway users, and the challenges and opportunities are unique factors that designers must consider with each highway project. Whether the design is to be developed for a modest safety improvement, or ten miles of new location rural freeway, there are no patented solutions. For each potential project, designers are faced with the task of balancing the need for highway improvement, and the need to safely integrate the design into the surrounding natural and human environments.

To do this, designers need flexibility. There are a number of options available to aid in achieving a balanced road design and resolve design issues. These include:

- Use the flexibility within the standards adopted for the State
- Recognize that design exceptions may be needed where the environmental consequences are great
- Be prepared to re-evaluate decisions as made in the planning phase
- Lower the design speed where appropriate
- Maintain the road's existing horizontal and vertical geometry and cross section, and undertake only resurfacing, restoration and rehabilitation improvements
- Consider developing alternative standards for the State, especially for scenic roads
- Recognize the safety and operational impact of various design features and modifications

There is flexibility available to designers within adopted State standards. These standards, often based on the American Association of State Highway and Transportation Officials (AASHTO) "Green Book," allow designers to tailor their designs to particular situations encountered in each highway project. Often these standards alone provide enough flexibility to achieve a harmonious design that both meets the objectives of the project, and is sensitive to the surrounding environment.

The official title of the "Green Book" is *A Policy on the Geometric Design of Highways and Streets*. It has been published by the AASHTO since the late 1930s, with the most recent edition issued in 2001. Although often viewed as dictating a set of National standards, this document is actually a series of guidelines on geometric design, within which the designer has a range of flexibility. The intent of the policy is to provide guidance to the designer by referencing a recommended range of values for critical dimensions. Sufficient flexibility is permitted to encourage independent designs tailored to particular situations.

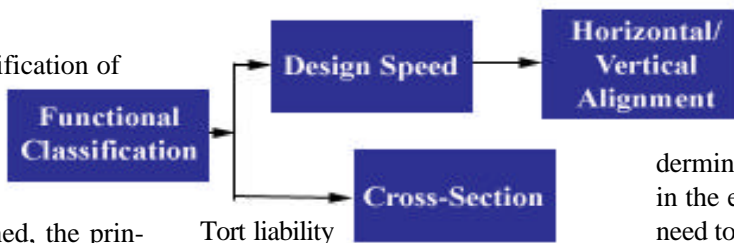
The AASHTO "Green Book" explicitly recognizes the relationship between highway functional classification and design criteria. The first step in the design process is to define the function that the facility is to serve. The level of service required to fulfill this function for the anticipated volume and composition of traffic provides a rational and cost-effective basis for the selection of design speed and geometric criteria within the range of values available to the designer for this specified functional classification. The use of functional classification as a design type should appropriately integrate the highway planning and design process.

Functional classification is the process by which streets and highways are grouped in classes or systems according to the character of traffic service that they are intended to provide. There are three functional classifications: arterial, collector and local roads. All streets and highways are grouped into one of these classes depending on the character of the traffic (local or long distance) and the degree of land access they allow. **Arterial** streets and highways provide the highest level of service at the greatest speed, for the longest uninterrupted distance, with some degree of access control. **Collector** streets and highways provide a less highly-developed level of service at a lower speed for shorter distances, by collecting traffic from local roads and connecting them with arterials. **Local** streets and highways consist of all roads not defined as arterials or collectors. They primarily provide access to land, with little or no through movement.

Once the functional classification of a particular roadway has been established, so has the allowable range of design speed. With the allowable range of design speed defined, the principal limiting design parameters associated with horizontal and vertical alignment are also defined. The determination of functional classification also establishes the basic roadway cross-section, in terms of lane width, shoulder width, and type and width of median.

Despite the range of flexibility that ex-

ists with respect to virtually all major road design features, there are situations in which the application of even the minimum criteria would result in unacceptably high cost or major impact on the adjacent environment. For such instances when it is appropriate, the design exception process allows for the use of criteria lower than those specified in the minimum acceptable values in State standards and the "Green Book." For projects on the National highway system, the Federal Highway Administration requires that all exceptions from accepted guidelines and policies be justified and documented in some manner, and requires formal approval for thirteen specific controlling criteria. These criteria are design speed, lane width, shoulder width, bridge width, structural capacity, horizontal alignment, vertical alignment, grade, stopping sight distance, cross slope, superelevation, vertical clearance, and horizontal clearance.



Tort liability claims against highway agencies have steadily risen since the early 1970s. Although the number of cases alleging design defects is relatively small, tort liability is a real concern for highway engineers. The AASHTO "Green Book" and other guidelines are often used in tort cases to educate the jury about the standard level

of practice for design. In addition, expert witnesses are used, who in turn rely on written text to explain the standard practices for design to the jury. This does not mean, however, that adherence to accepted standard practices, such as the AASHTO "Green Book" guidelines, automatically establishes that reasonable care was exercised. Conversely, deviation from the guidelines through the use of a design exception does not automatically establish negligence. The best defense for a design engineer is to present persuasive evidence that the guidelines were not applicable to the circumstances of the project, or that the guidelines could not reasonably be met.

As a result of concerns about litigation, designers may be tempted to be very conservative in their approaches to highway design and avoid innovative and creative approaches to design problems. While it is important for design engineers to do their jobs as thoroughly and carefully as possible, avoiding unique situations or solutions is not the answer. This may undermine design practice and limit growth in the engineering profession. Designers need to remember that their skills, experience and judgment are still valuable tools that should be applied to solve design problems, and that with reliance on complete and sound documentation, tort liability concerns need not be an impediment to achieve good road design, sensitive to its context.

*Adapted from: Flexibility in Highway Design, Federal Highway Administration*

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