
Chapter One

ROAD DESIGN MANUAL INTRODUCTION

The mission of the Delaware Department of Transportation (DelDOT) is to provide a safe, efficient and environmentally sensitive transportation network that offers a variety of convenient, cost-effective choices for the movement of people and goods.

In meeting this mission, one goal of DelDOT is to plan, design and implement projects that serve existing and future transportation needs, including alternative modes that are safe, have a long service life with low maintenance costs. In addition, projects have to satisfy the purpose and needs as perceived by the driver, other users, and the community. To accomplish this, the designer must adopt design criteria that are in harmony with the community and preserve environmental, scenic, aesthetic, historic and natural resource values of the area. Current design standards allow and suggest that there is flexibility to select design guidelines that will help to deliver a "context sensitive" design.

Projects for making improvements to the transportation network are the result of an annual Capital Transportation Program (CTP). The CTP establishes priorities for new projects, continues funding for ongoing projects, and establishes new initiatives to meet changing transportation needs. The CTP is developed based on the State's Long-Range Transportation Plan and the Department's Project Development and Implementation Process (Pipeline Process). The Long-Range Plan provides for managing and developing a transportation system that supports county and local government

comprehensive plans. The Department's Pipeline Process further defines, assesses, categorizes and prioritizes projects for inclusion in the CTP.

Projects from the Pipeline Process that are deemed eligible for the CTP are submitted to the Project Development Committee (PDC) which consists of Division Directors and their support staff. The PDC prioritizes projects for further refinement of their scope of work, costs, complexity of design, staffing needs and scheduling requirements. After completion of these tasks, projects are resubmitted to the PDC for approval and inclusion in the recommended Transportation Improvement Program. The approved projects make up the annual Capital Transportation Program (CTP).

Upon approval of the CTP, the Project Development Committee formally initiates and assigns projects to the section responsible for either beginning the design process or further project development. Many projects approved through the CTP process require some level of design. Each project design begins with understanding the purpose and need for the project. The design process recognizes that each project is unique and has its own community values, social, economic, and environmental concerns and constraints. The design process identifies and addresses these elements through a collaborative approach in which the public is a part of the design team. A successful design must balance many factors that will result in a safe facility with features that meet the expectations of the user and community.

Factors to be recognized and addressed in the design process include:

- Selecting design guidelines that will provide for the safety of the user.
- Identifying the need for access to the facility, as well as mobility along the facility.
- Preservation or enhancement of historic sites and districts.
- Protection or enhancement of existing environmental assets.
- Identifying the economic needs of and impacts to the affected community or area.
- Developing an understanding of the social context of the community and area within which the facility exists.

Ensuring that a project design will have a balance of these factors is the result of a continuous and meaningful public involvement process. Throughout the public involvement process, the designer must make sure the purpose for the project as established in the project initiation is fulfilled while understanding and addressing the needs of the community. By doing this the introduction of new or additional issues during the final design phase that may result in delays and/or redesign will be minimized.

The basic design tools available to the designer are this manual and the 2004 American Association of State Highway Transportation Officials, (AASHTO) "A Policy on Geometric Design of Highways and Streets" commonly referred to as the "Green Book". In addition designers need to refer to other related publications and guidelines prepared by the Federal Highway Administration (FHWA), the Transportation Board (TRB), and other recognized experts in the transportation field. The principal publications are:

- AASHTO's *Roadside Design Guide*,

- AASHTO'S *Context Sensitive Design for Integrating Highway and Street Projects with the Community and the Environment*,
- Transportation Research Board's (TRB) *Highway Capacity Manual*,
- TRB's *Special Report 214 Designing Safer Roads*,
- FHWA's *Manual on Uniform Traffic Control Devices*,
- FHWA's *Flexibility in Highway Design*, and
- DelDOT's *Traffic Calming Manual*.

In addition, there are numerous other documents, particularly related to highway drainage and intersection design that must be referenced in designing a project.

Using these documents, the Road Design Manual was developed with emphasis on standards and practices that have proven to be successful in this state. The flexibility to design a project that will meet the expectations of the user, the community and Department exists in the Green Book and in the standards found in this manual. Published design standards have a measure of flexibility, usually stating a maximum and minimum value. Many of these values are empirically based using mathematical modeling techniques with assumed roadway surface conditions, driver reaction times and adverse weather conditions.

Designers need to recognize that there is a difference between the strict application of design standards found in the tables and charts versus providing consistency in design. The design should ensure there is consistency in application of the standards that allows the driver to react in a consistent and predictable manner when encountering similar roadway conditions. However, in responding to the many issues that arise on each project, there is a need for flexibility in

selecting design features while maintaining operational consistency and user safety.

Design features that fall outside normal design criteria and accepted practice are to be determined using sound engineering judgment and should be thoroughly documented. Liability is a potential concern when design standards are not met. The key to minimizing liability is documentation of the rationale for major design decisions in terms of safety, capacity, route compatibility, project intent, time to construct, construction costs, and environmental, historic, and aesthetic considerations. Documentation is particularly valuable on projects having extensive public involvement where participants frequently change. Information on previously studied issues can be rapidly disseminated reducing duplication of effort.

The steps for selecting each project's design criteria have historically remained fundamentally the same. At the earliest stages of a project the designer needs to determine and gather information concerning the following:

1. The functional classification of the roadway—who is it to serve and for what purpose?
2. Specific design controls such as design speed, predominant type of vehicle anticipated to use the facility, future traffic volumes, proposed level of service, access needs and other modes of transportation to be served.
3. The elements of geometric design such as stopping and passing sight distance, horizontal alignment, vertical alignment and other elements that affect the geometric design.
4. The proposed physical cross sectional elements, such as: lane widths, shoulder widths, pavement types, lateral clear zones, use of curbs, median

width, median treatment and type of drainage systems.

Selecting the appropriate design speed has one of the most significant impacts on a project's design parameters. The selected design speed considers the topography, adjacent land use, the type of facility, available funding, projected traffic volume, acceptable level of service, traffic composition, anticipated operating speed, anticipated posted speed, the expected 85th percentile speed and other constraints that exist on most projects. Most of the tables and charts that give guidance in selecting critical design elements are based on design speed. In the context sensitive design environment, it is recognized that there are limitations, constraints, community values, and other factors that require the designer to look beyond the full standards found in these tables and charts for a workable solution. The selected criteria should properly reflect driver safety, desires, expectations, comfort and convenience.

The design process also allows for recognition of areas of increased residential and commercial growth and density. These areas have a design environment that is not only sensitive to the safety of the reasonable and prudent driver but also the bicyclist, pedestrian, rollerblader and elderly as well as the general well being of the community. If a road's existing functional classification does not recognize these users then the designer needs to address them in the design process.

In areas with a highly diverse user population, one option for creating a safe roadway may be selecting design features that encourage drivers to operate at lower speeds, change driver behavior, and improve the environment for non-motorized uses. This concept is referred to as "traffic calming." The Department's *Traffic Calming Design Manual* should be consulted before introducing traffic calming features since the designer should consider the many possible consequences of their use. When properly

applied, with community acceptance, traffic calming is an enhancement to a community's overall living environment.

Selecting the right combination of design guidelines that will control the designer's

work tasks is very complex, requiring flexibility and the use of good judgment. The final design must meet the needs and expectations of the Department and community, as well as providing for the user's safety.