Chapter 1
Getting Started

Achieving a successful roadside enhancement project can be confusing if there is a lack of understanding between the roadway policymakers, community leaders or officials, landowners, maintenance crews and designers. Finding an acceptable solution for all parties can be a difficult process if there is no direction. The confusion can also be compounded by the rules and regulations of roadway design and maintenance. Terminology used in the roadway design manuals is not always common to the lay-person; the guidelines and criteria are not always understandable and the visions for the project are not always clear. This manual seeks to make the process less complicated and intimidating by providing recommendations that work within established roadway design polices.

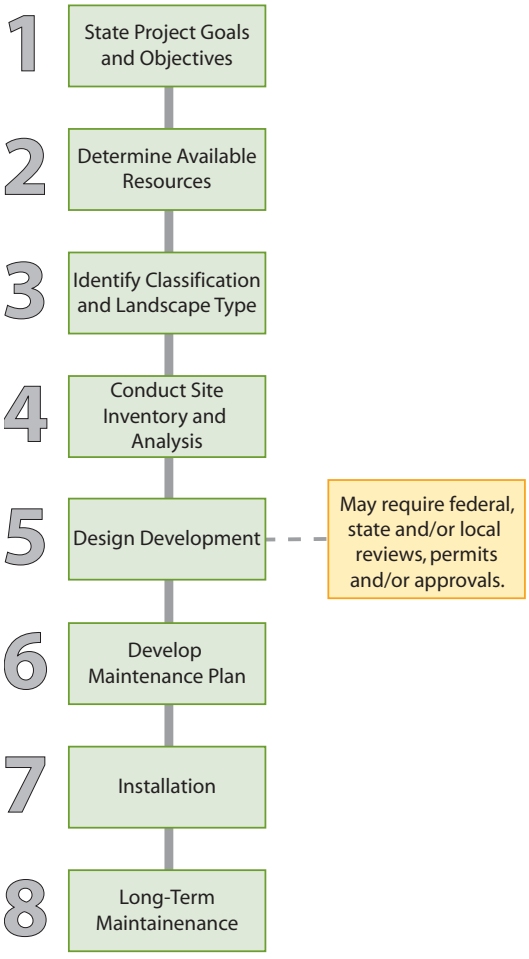
This chapter outlines a step-by-step planning and design process to be used for roadside enhancement projects and an overview of the roadway design criteria that will impact roadside enhancement projects. Preparing a well conceived plan will have lasting payoffs, including reduced maintenance, aesthetic appeal, enhanced economic development and fewer unwanted surprises.

PLANNING AND DESIGN PROCESS

Roadside enhancement projects may be installed as part of a new road project or to enhance an existing roadway. The standard TDOT–installed landscape is turf, but may include other plant materials as required for buffers or mitigation. Local governments can beautify their roadsides with a variety of plant materials but must obtain approval from TDOT if the project falls within the federal or state right-of-way. Local governments can also enhance the roadside environment by applying for Transportation Enhancement and/or Roadscapes grants. These types of projects will require close coordination between the local government and TDOT, as well as a maintenance agreement.

Regardless of the project type, several factors must be considered during the planning and design process in order to maximize aesthetic and economic benefits and protect natural environments. This section provides an overview of the planning and design process that is explained in detail in each chapter of the manual. Some steps of the process may vary by project, but the overall objective is to provide a step-by-step guide (Figure 1.1) by which a project can go from an idea to installation to long-term benefit.

Figure 1.1: Planning and Design Process




State Route 91 - Mountain City


View of Memphis from I-40E


I-81 Welcome Center - Bristol


Medical Center Parkway - Murfreesboro

Step 1. State Project Goals and Objectives

By defining goals and objectives, one may find that the project scope is much larger than previously thought, or can be achieved by doing less than imagined. Each project's goals and objectives will vary, but this step is necessary for starting a project by providing a clear vision, intent and desired function of the end product.

A goal is a statement that describes, in general terms, a desired outcome and sets the direction of the project. To define the goal or goals of the project, ask the following questions: What should the roadside enhancement project achieve? Why do improvements need to be made? The answer can be as simple as one: improve aesthetics. Or, several answers may result: retain or attract business, reduce maintenance to save on costs and fix eroding banks to improve water quality.

Objectives are more practical concepts that describe the specific task that is to be achieved. Whereas goals are the *'what'* and *'why,'* objectives are the *'how.'* Objectives begin to define the nature of the project. How they are implemented and what design techniques are used will be determined by the following steps.

Step 2. Determine Available Resources

Next, one must consider the available funding and manpower resources for both installation and long-term maintenance in order to keep the roadside looking its best throughout its lifecycle. Aesthetics do not have to be sacrificed because of limited resources — a smaller, well kept landscape is much more appealing than a large, unkempt one.

For new roadway construction and renovation projects, budgets are determined by federal, state or local agencies long before design. It is important to anticipate and plan for the enhancements or landscape materials that will be part of the project so they can be budgeted accordingly. Again, these do not need to be high cost items to contribute to a well designed, aesthetically pleasing landscape. Many of the enhancements can be performed at no additional cost by simply choosing different materials or treatments.

For enhancements along existing roadways, funds will typically come from local governments, special interest groups and other organizations. Funding assistance for roadside enhancement projects is available through many federal, state and local programs; however, these funds are typically for planning and installation costs, not

maintenance. Proper maintenance funding is critical to prolonging a project's benefits and resources should be closely evaluated. In order to help maximize available resources, Chapter 6 provides sample design solutions based on a range of available funds and maintenance.

Step 3. Identify Classification and Landscape Type

The next step is to identify the project's classification and landscape type. Landscape classification is the overall character of the roadside enhancement site and its surrounding landscape. The landscape type is the project's setting, such as an interchange, right-of-way or highway facility. Chapter 2 provides a process for determining a site's classification as urban, suburban, rural or community, as well as descriptions and images of the different landscape types. A project's classification and landscape type will determine the design solutions and recommendations provided in Chapter 4.

Step 4. Conduct Site Inventory and Analysis

A thorough site inventory and analysis must be conducted to document a site's existing conditions and identify its opportunities and constraints. This process documents natural and built features as well as safety and design criteria. Chapter 3 describes this process in detail and provides helpful guidelines and tools for completing a site inventory and analysis.

Step 5. Design Development

This is perhaps the most detailed and labor intensive step to the planning and design process. This step involves design (from concept to construction drawings), and material research and selection. Chapter 4 provides a thorough discussion about design development and material selection.

This step may also include community input, assistance from design professionals, and federal, state and local permits, reviews and approvals. For example, projects that include clearing, grading or excavation that result in an area of disturbance of one or more acres will require an NPDES Storm Water Construction Permit through the Tennessee Department of Environment and Conservation (TDEC). This application process includes the preparation of a Notice of Intent (NOI) for Construction Activity and a site-specific Storm Water Pollution Prevention Plan (SWPPP).


Highway 321 - Washington Co.


State Route 91 - Johnson Co.


US 41A/State Route 12 - Nashville


I-24E Rest Area - Marion Co.

Projects that are funded in whole or in part with federal funds or have major federal actions must follow the requirements of the National Environmental Policy Act of 1969, widely known as NEPA, as well as related federal and state environmental regulations. Certain state-funded transportation projects undertaken by TDOT or by local governments for TDOT are subject to a state-level environmental evaluation, the Tennessee Environmental Evaluation Report (TEER). The TDOT Environmental Division's *Tennessee Environmental Protection Manual* (TEPM) and the Environmental Division's website (http://www.tdot.state.tn.us/environment/) provide additional information regarding the NEPA process. Furthermore, projects funded by federal funds will also be reviewed by the TDOT Right-of-Way Division.

Plans required for review by TDOT may include, but not be limited to, landscape plans, a traffic control plan, and a plan indicating sight distances, clear zones and stopping distances. These plans should be sealed by the appropriate professionals (i.e., engineers, landscape architects) and must comply with TDOT standards. Depending on the project type and location, the plans will be reviewed by TDOT's regional horticulturalists and traffic engineers, Right-of-Way Division staff, Environmental Division staff, Design Division staff and others.

The important thing to understand about this step is that this process takes time. The development of plans and the review process will take several months. Depending on the scale of the project and site-specific factors, it may take more than a year before a project is approved. Coordination on the front end will help make the project run more smoothly, but the process still takes time.

Step 6. Develop Maintenance Plan

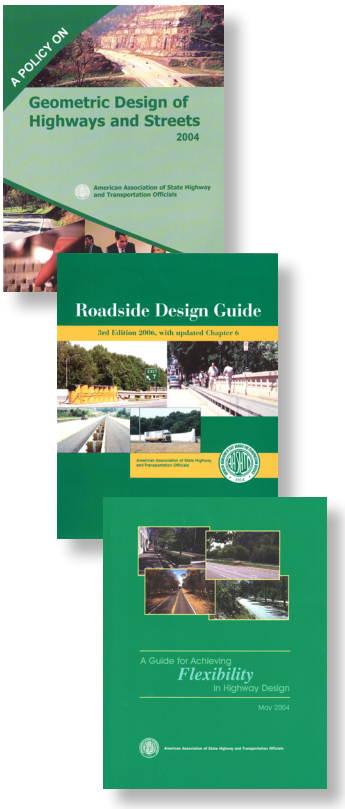
Before installation, it is important to develop a maintenance plan for the care of the project. Determine who will maintain a project, how often it will be maintained and the funding that will be required. Roadside enhancement projects are a large investment with big payoffs if maintained properly. Having a maintenance plan in place prior to installation will protect the investment and contribute to its long-term success. Chapter 5 provides suggestions for developing a maintenance plan.

Step 7. Installation
Proper installation will contribute to a roadside enhancement project's immediate success and will prolong its lifespan. Chapter 5 describes techniques for site preparation and installing plant material.

Step 8. Long-Term Maintenance
Finally, the implementation of the maintenance plan is, perhaps, the most important step of all. Proper maintenance will keep the roadside enhancement project looking its best for as long as possible. All projects have a lifecycle, but proper maintenance will extend a project's aesthetic appeal. Chapter 5 describes maintenance techniques and recommendations for watering, mowing, pruning and weed control. Chapter 5 also provides guidance on the development of a long-term maintenance plan.

ROADWAY DESIGN CRITERIA
Now that the planning and design process has been described, it is important to understand the roadway design criteria and the policymaking bodies who develop and maintain them. These design criteria will have a major impact on the design of all roadside enhancement projects.

The Policymaking Bodies
The Federal Highway Administration (FHWA) is a federal agency under the U.S. Department of Transportation that is responsible for keeping America's roads and highways safe and efficient. The FHWA also provides funding to state and local governments for roadway projects. The American Association of State Highway and Transportation Officials (AASHTO) is an association comprised of highway and transportation departments across the United States. AASHTO establishes the geometric design criteria and transportation-related policies to provide safe and efficient roadways. The Tennessee Department of Transportation (TDOT) has developed its own design criteria, standards and procedures around AASHTO's design criteria.



These federal and state design criteria must be used when designing roadways and the roadside environment in the state of Tennessee. This manual adheres to the design criteria published by AASHTO's *A Policy on Geometric Design of Highways and Streets* and AASHTO's *Roadside Design Guide*, as well as the guidelines in the *TDOT Roadway Design Guidelines*.

QUICK FACTS

In Tennessee, the interstate system accounts for only 1.2% of the state's total miles of roadway; however, 28.8% of total travel occurs on interstates. The local roadway system accounts for 69.2% of the state's total road length but only 12.7% of total travel.

Source: TDOT 2007 ADT Book

Other federal, state and local agencies may be consulted depending on the nature of the project. For example, a project may require coordination with the Tennessee Department of Environment and Conservation (TDEC) if it impacts a waterway, threatened or endangered species, or a historic property. Likewise, local governments may have their own design standards for roadside enhancements, such as streetscapes and gateways, that must be consulted during the design phase.

Definitions

The following terms are used throughout this manual when discussing the roadway design criteria that impact roadside design. These terms are explained in much greater detail in the manuals listed previously and in the Appendix.

Average Daily Traffic

The average daily traffic count, or ADT, is the total volume of vehicular traffic along a roadway. It is used to measure how busy or heavily traveled a roadway is. TDOT's Project Planning Division keeps a record of these counts in yearly Traffic Flow Map books, which can be found at *http://www.tdot.state.tn.us/projectplanning/adt.asp* or ordered from the Long-Range Planning Division. These counts, arranged by county, are taken along all major roadways throughout the state.

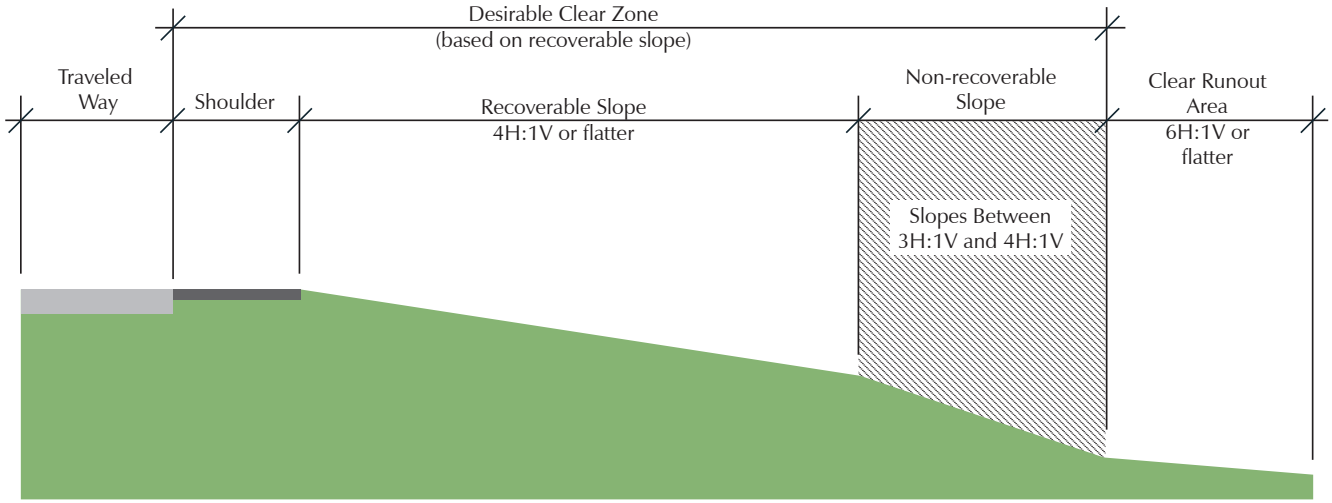
Clear Zone

The clear zone (Figure 1.2) is the distance from the edge of the traveled way that allows an errant vehicle to stop safely or recover control.

The clear zone is comprised of the roadway shoulder and a recoverable slope, but may also include a non-recoverable slope and/or a clear runout area. A recoverable slope is one on which an errant vehicle can regain control. Recoverable slopes are defined as being flatter than 4H:1V (25%). A non-recoverable slope is considered traversable, but a vehicle is not able to regain control and will continue to the bottom of the slope. Slopes between 3H:1V (33%) and 4H:1V (25%) are considered to be non-recoverable. The clear runout area is at the toe of the non-recoverable slope and is generally 6H:1V (16%) or flatter.

The minimum width of the clear zone depends on roadside geometry, design speed, traffic volume, crash history, and the presence of curb and gutter, guardrails and other barriers. On roadways with design speeds less than 45 mph, consult AASHTO's *Roadside Design Guide* and the TDOT Design

Figure 1.2: Clear Zone Concept



Division for engineering guidance of site-specific clear zone requirements. On roadways with design speeds of 45 mph or greater, only turf, native and ornamental grasses, and flowers are appropriate vegetation choices for the clear zone.

Context Sensitive Solutions

The roadway policymakers can do their part to respond to the needs of communities and the surrounding landscape without sacrificing safety. In the best case scenario, a community will be involved in the planning process long before the road is designed. This inclusive process is commonly known as Context Sensitive Solutions (CSS). The process has been used successfully to design roadways that respond to traffic needs while remaining sensitive to the context of the surrounding landscape (e.g., culture, aesthetics, history, environmental features, future goals of the community, etc.).

While this manual's premise lies in the idea of Context Sensitive Solutions, it will not include discussing the CSS process. Instead, this manual will support TDOT's commitment to CSS, which is to "*serve as a partner with the citizens of Tennessee in creating cost effective transportation investments that consider all modes of transportation and complement the natural beauty, economic vitality and livability of the state.*"

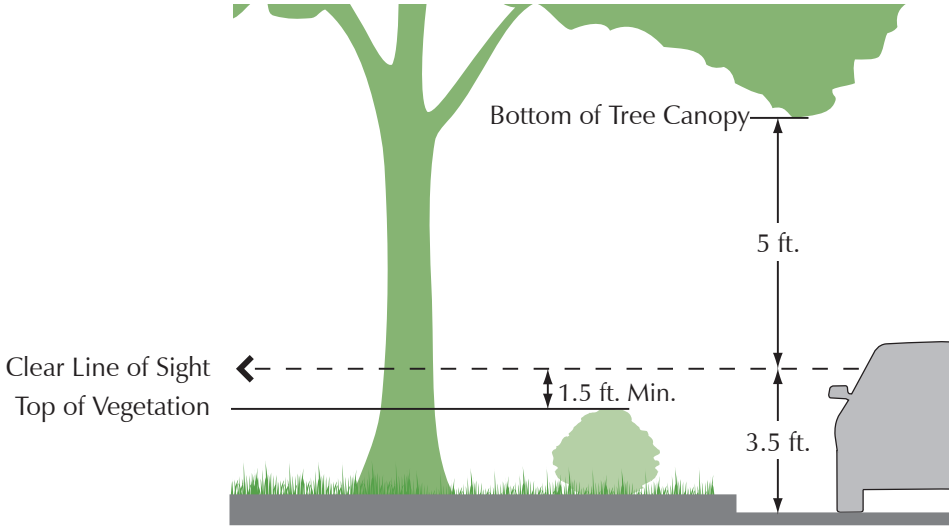
The Demonbreun Street Viaduct in downtown Nashville was designed following CSS principles. This project incorporated aesthetic elements in its design from Nashville's history, including its train and music heritage.

Sight Distance

Sight distance is the length of roadway that is visible to a driver. AASHTO's *A Policy on Geometric Design of Highways and Streets* defines several types of sight distances, but for the purpose of roadside enhancement projects, this manual will discuss sight distances at intersections, known as sight triangles, and around horizontal curves (e.g., interchange ramps). These areas must be clear of obstructions that block the driver's view, per the TDOT Design Division's Roadway Standard Drawings.

The vertical limits of the sight triangle should be clear between 3.5 feet and 8.5 feet above grade to create a clear sight window as shown in Figure 1.3. The top of any shrubs, ground covers or other vegetation should be a minimum of 1.5 feet below the clear line of sight, or a maximum of 2 feet above grade.

Figure 1.3: Clear Sight Window



At intersections, the size of sight triangles is based on the speeds of the intersecting roads and can be determined by consulting the TDOT Design Division's Roadway Standard Drawings. The sight triangles at intersections (Figure 1.4) perform two functions: they allow drivers that are approaching an intersection to see oncoming vehicles on the intersecting road and they allow a stopped driver on a minor road adequate sight distance to depart from an intersection to enter or cross a major road.

This concept applies to medians as well (Figure 1.5). The ends of the medians must be clear of objects that will obstruct the driver's view. The TDOT Design Division's Roadway Standard Drawings provides charts to determine the size of the sight triangles on divided and undivided roadways.

Figure 1.4: Sight Triangles at Intersection

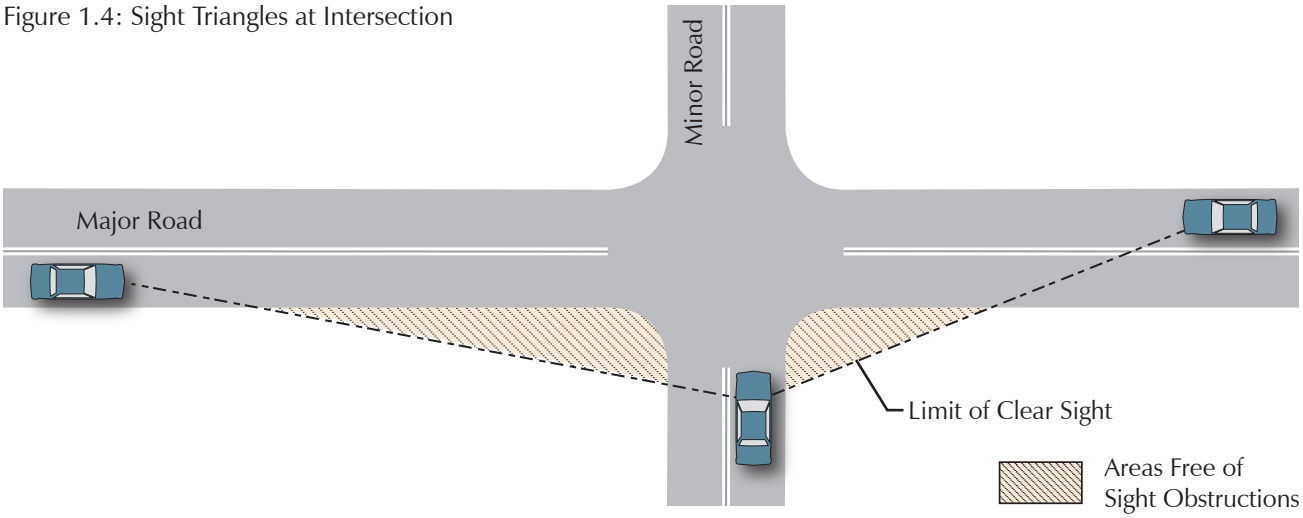


Figure 1.5: Sight Triangles at Intersection with Median

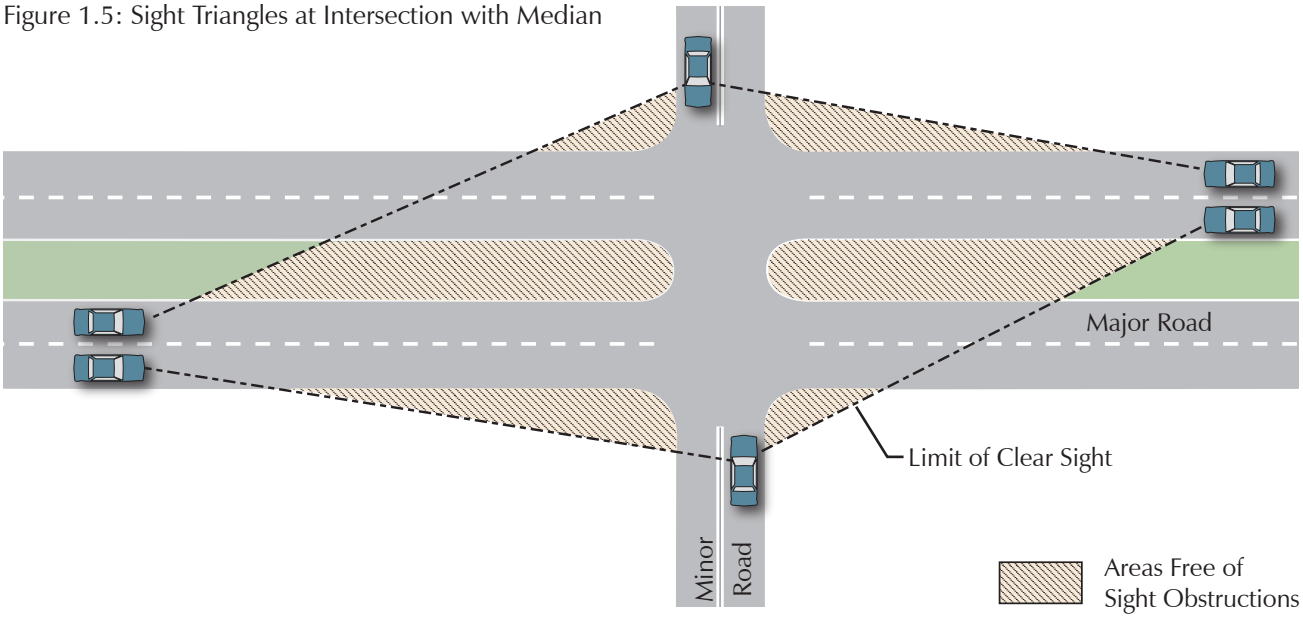
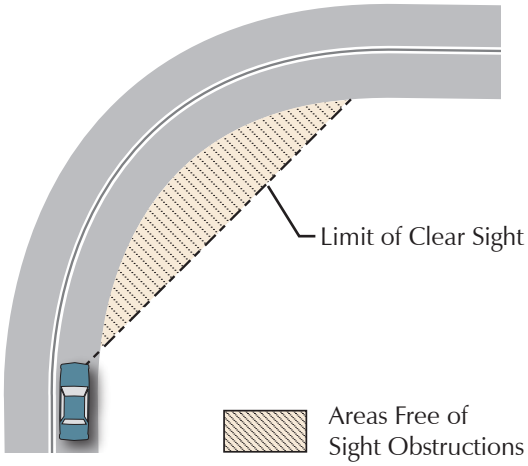


Figure 1.6: Sight Triangle at Horizontal Curve



The sight distance on horizontal curves allows drivers to have a clear view around the curve in order to have adequate time to stop. It is measured from the center of the driving lane and is determined by the radius of the curve and the stopping distance, which is related to speed. AASHTO's *A Policy on Geometric Design of Highways and Streets* (Chapter 3) provides charts and equations for determining the sight distance around horizontal curves.

Items like utility poles, sign posts and tree trunks should not obstruct more than 50% of the sight triangle and should be spaced to allow for a clear view.

Slope

Slope is a measurement of steepness. Slope is determined by dividing the rise (vertical distance) by the run (horizontal distance) between two points. The greater the slope, the steeper the incline. Slope is often written in one of two ways: as a ratio (H:V) or a percentage (%). For example, a slope can be shown as 4H:1V (or 1 foot vertically for every 4 feet horizontally) or 25%.

Figure 1.7: Slope