

Chapter 7: Miscellaneous Design Elements

Section 1: Longitudinal Barriers

Overview

This section contains information regarding the following elements of longitudinal barriers:

- Concrete Barriers (Median and Roadside)
- Guardrail
- Attenuators (Crash Cushions).

Concrete Barriers (Median and Roadside)

Application. Concrete barriers may be used to prevent the following:

- unlawful turns
- out-of-control vehicles from entering the opposing traffic lanes, and, in some cases
- unlawful crossing of medians by pedestrians.

Concrete barriers, much like guardrail, may also be used as roadside barriers to prevent vehicles from encountering steep slopes or obstacles.

Location. On controlled access highways, concrete barriers will generally be provided in medians of 30 ft [9.0 m] or less. On non-controlled access highways, concrete barriers may be used on medians of 30 ft [9.0 m] or less; however, care should be exercised in their use in order to avoid the creation of an obstacle or restriction in sight distance at median openings or on horizontal curves. Generally, the use of concrete barriers on non-controlled access facilities should be restricted to areas with potential safety concerns such as railroad separations or through areas where median constriction occurs. Concrete barriers may be considered in medians wider than 30 ft [9.0 m] based on an operational analysis.

Standard Installations. Medians for urban freeway sections generally are relatively narrow and flush. For new construction, an urban freeway usually includes a flush median (see Medians in Chapter 3) with concrete barrier.

In determining the type of barrier to be used for any project, the primary consideration is safety, both for vehicular impacts and during any maintenance activities. Field experience with concrete barriers indicates that, unlike the metal beam system, maintenance operations are not normally required following accidental vehicular encroachment.

Reconstruction projects with median barriers should be considered on a project-by-project basis. Often, the structural capability of existing bridges may make the use of concrete median barriers infeasible due to increased dead load.

TxDOT's design standards and standard construction specifications provide more information on the design and construction details for concrete barriers.

Guardrail

Application. Guardrail is considered a protective device for the traveling public and is used at points on the highway where vehicles inadvertently leaving the facility would be a significant safety concern. Guardrail is designed to resist impact by deflecting the vehicle so that it continues to move at a reduced velocity along the rail in the original direction of traffic. The limits of rail to be installed are shown on the plans; however, they may be adjusted in the field after the grading is completed.

Location. Guardrail should be installed in areas where the consequence of an errant vehicle leaving the roadway is judged to be more severe than impacting the guardrail. Guardrail should be offset at least 2.5 ft [750 mm] and desirably 5 ft [1,500 mm] from the nearest edge of fixed objects. At overpasses, guardrail should be anchored securely to the structure.

Standard Installations. Guardrail should be installed in accordance with the current roadway standards.

End Treatments. Providing appropriate end treatments is one of the most important considerations in the design of guardrail. An untreated guardrail will stop a vehicle abruptly and can penetrate the passenger compartment. For more information on the installation of various types of end treatments, refer to TxDOT's standard construction specifications and roadway standards.

Attenuators (Crash Cushions)

Application. Crash cushions or impact attenuators are protective devices that prevent errant vehicles from impacting fixed objects. This is accomplished by gradually decelerating a vehicle to a safe stop for head-on impacts or redirecting a vehicle away from the fixed object for side impacts.

Location. Attenuators are ideally suited for use at locations where fixed objects cannot be moved, relocated, or made breakaway, and cannot be adequately shielded by a longitudinal barrier. A common application of a crash cushion is in an exit ramp gore where a bridge rail end requires shielding. Crash cushions are also frequently used to shield bridge columns as well as roadside and median barrier terminals.

Standard Installations. There are numerous types of attenuators that are in common use today. When more than one system is under consideration, the designer should carefully evaluate the structural, safety, and maintenance characteristics of each candidate system. Characteristics to be considered include the following

- impact decelerations
- redirection capabilities
- anchorage and back-up structure requirements
- debris produced by impact
- ease and cost of maintenance.

For more detailed information on the installation of various types of attenuators, refer to TxDOT's standard specifications and roadway standards.