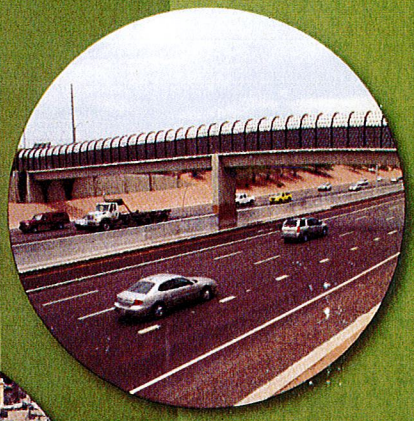
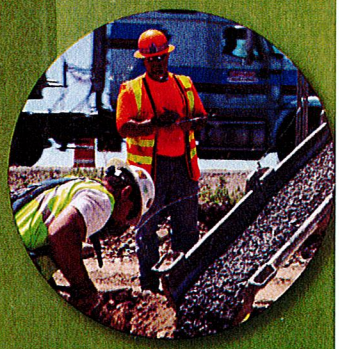
A Policy on Geometric Design of Highways and Streets

2011
6th Edition





American Association of State Highway and Transportation Officials
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4.6.1 Clear Zones

The term "clear zone" is used to designate the unobstructed, traversable area provided beyond the edge of the traveled way for the recovery of errant vehicles. The clear zone includes shoulders, bicycle lanes, and auxiliary lanes unless the auxiliary lane functions like a through lane. See the AASHTO *Roadside Design Guide* (*13*) for further guidance.

The AASHTO *Roadside Design Guide* (*13*) discusses appropriate clear zone widths as a function of speed, traffic volume, and embankment slope. The guide also provides a discussion of clear zones in the context of rural and urban applications. Where establishing a full-width clear zone in an urban area is not practical due to right-of-way constraints, consideration should be given to establishing a reduced clear zone or incorporating as many clear-zone concepts as practical, such as removing roadside objects or making them crashworthy.

One source of alternative clear zone design criteria that may be considered for local and collector roads and streets that carry 400 vehicles per day or less is the AASHTO *Guidelines for Geometric Design of Very Low-Volume Local Roads* ($ADT \leq 400$) (*3*).

4.6.2 Lateral Offset

In an urban environment, right-of-way is often extremely limited and in many cases it is not practical to establish a full-width clear zone using the guidance in the AASHTO *Roadside Design Guide* (*13*). These urban environments are characterized by sidewalks beginning at the face of the curb, enclosed drainage, numerous fixed objects (e.g., signs, utility poles, luminaire supports, fire hydrants, sidewalk furniture, etc.), and frequent traffic stops. These environments typically have lower operating speeds and on-street parking may be provided. In these environments, a lateral offset to vertical obstructions (signs, utility poles, luminaire supports, fire hydrants, etc., including breakaway devices) is needed to accommodate motorists operating on the roadway and parked vehicles. This lateral offset to obstructions helps to:

- Avoid adverse impacts on vehicle lane position and encroachments into opposing or adjacent lanes;
- Improve driveway and horizontal sight distances;
- Reduce the travel lane encroachments from occasional parked and disabled vehicles;
- Improve travel lane capacity; and
- Minimize contact between obstructions and vehicle mirrors, car doors, and trucks that overhang the edge when turning.

Further discussion and suggested guidance on the application of lateral offsets is provided in the *Roadside Design Guide* (*13*).

Where a curb is present, the lateral offset is measured from the face of curb. The *Roadside Design Guide* provides a discussion of lateral offsets where curbs are present. Traffic barriers should be located in accordance with the *Roadside Design Guide,* which may recommend that the barrier should be placed in front of or at the face of the curb.

On curbed facilities located in transition areas between rural and urban settings, there may be opportunity to provide greater lateral offset in the placement of fixed objects. These facilities are generally characterized by higher operating speeds and may have sidewalks separated from the curb by a buffer strip.

On facilities without a curb and where shoulders are present, the *Roadside Design Guide* provides suggested guidance concerning the provision of lateral offsets.

4.7 CURBS

4.7.1 General Considerations

The type and location of curbs affects driver behavior and, in turn, the safety and utility of a highway. Curbs serve any or all of the following purposes: drainage control, roadway edge delineation, right-of-way reduction, aesthetics, delineation of pedestrian walkways, reduction of maintenance operations, and assistance in orderly roadside development. A curb, by definition, incorporates some raised or vertical element.

Curbs are used extensively on all types of low-speed urban highways, as defined in Section 2.3.6 on "Speed." Although curbs are not considered fixed objects in the context of a clear zone, they may have an effect on the trajectory of an impacting vehicle and may have an effect on a driver's ability to control a vehicle that strikes or overrides one. The magnitude of this effect is to a great extent influenced by vehicle speed, angle of impact on the curb, curb configuration, and vehicle type. Sloping curbs with heights up to 100 mm [4 in.] may be considered for use on high-speed facilities when necessary due to drainage considerations, restricted right-of-way, or where there is a need for access control. When used under these circumstances, they should be located at the outside edge of shoulder. Sloping curbs with 150-mm [6-in.] heights may be considered for use on high-speed urban/suburban facilities with frequent access points and intersecting streets.

While cement concrete curbs are installed by some highway agencies, granite curbs are used where the local supply makes them economically competitive. Because of its durability, granite is preferred over cement concrete where deicing chemicals are used for snow and ice removal.

Conventional concrete or bituminous curbs offer little visible contrast to normal pavements, particularly during fog or at night when surfaces are wet. The visibility of channelizing islands with curbs and of continuous curbs along the edges of the traveled way may be improved through the use of reflectorized markers that are attached to the top of the curb.

In another form of high-visibility treatment, reflectorized paints or other reflectorized surfaces, such as applied thermoplastic, can make curbs more conspicuous. However, to be kept fully effective, reflectorized curbs need periodic cleaning or repainting, which usually involves substantial maintenance costs. Curb markings should be placed in accordance with the MUTCD (*29*).

facility should not be a fixed width predetermined on the basis of the most critical point along the facility. Instead, a desirable right-of-way width should be provided along most, if not all, of the facility.

7.3.4 Roadside Design

There are two primary considerations for roadside design along the traveled way for urban arterials—clear zones and lateral offset.

Clear Zones

While the values provided in the AASHTO *Roadside Design Guide* (*7*) are appropriate for freeways and other controlled-access facilities, in an urban environment the right-of-way is often limited and, in most cases, it is not practical to establish a clear zone using the guidance in the AASHTO *Roadside Design Guide*. Urban environments are often characterized by sidewalks beginning at the face of curb, enclosed drainage, numerous fixed objects (signs, utility poles, luminaire supports, fire hydrants, sidewalk furniture, etc.) and frequent traffic stops. These environments typically have lower operating speeds and in many instances on-street parking is provided.

On curbed facilities located in transition areas between rural and urban settings, there may be opportunity to provide greater lateral offset in the location of fixed objects. These facilities are generally characterized by higher operating speeds and have sidewalks separated from the curb by a grass strip. Although establishing a clear zone commensurate with the suggested values in the *Roadside Design Guide* (*7*) may not be practical due to right-of-way constraints, consideration should be given to establishing a reduced clear zone, or incorporating as many clear zone concepts as practical, such as removing roadside objects or making them crashworthy. The location of fixed objects should also be closely coordinated with any existing or planned pedestrian facilities in the border areas, paying particular attention to the *Public Rights-of-Way Accessibility Guidelines* (*17*).

Lateral Offset

In urban environments for arterials, a lateral offset to vertical obstructions (e.g., signs, utility poles, luminaire supports, and fire hydrants, and including breakaway devices) is needed to accommodate motorists operating on the highway. The lateral offset to obstructions helps to:

- Avoid adverse impacts on vehicle lane position and encroachments into opposing or adjacent lanes
- Improve driveway and horizontal sight distances
- Reduce the travel lane encroachments from occasional parked and disabled vehicles
- Improve travel lane capacity
- Minimize contact from vehicle-mounted intrusions (e.g., large mirrors, car doors, and the overhang of turning trucks)

Lateral offset is defined in Section 4.6.2. Further discussion and suggested guidance on the application of lateral offsets is provided in the AASHTO *Roadside Design Guide* (*7*).

Where a curb is used, the lateral offset is measured from the face of the curb. A minimum of 0.5 m [1.5 ft] should be provided from the face of the curb, with 1.0 m [3 ft] at intersections to accommodate turning

trucks and improve sight distance. Consideration may be given to providing more than the minimum lateral offset to obstructions where practical by placing fixed objects behind the sidewalk. Traffic barriers, where needed, should be located in accordance with the AASHTO *Roadside Design Guide* (*7*), which may recommend that the barrier should be placed in front of or at the face of the curb.

On facilities with shoulder width less than 1.2 m [4 ft] and without curb, a minimum lateral offset of 1.2 m [4 ft] from the edge of the traveled way should be provided. As noted above, the location of fixed objects should also be closely coordinated with any existing or planned pedestrian facilities in the border areas, paying particular attention to the *Public Rights-of-Way Accessibility Guidelines* (*17*).

7.3.5 Structures

New and Reconstructed Structures

The design of bridges, culverts, walls, tunnels, and other structures should be in accordance with the current *AASHTO LRFD Bridge Design Specifications* (*6*). The design loading should be the HL-93 calibrated live load designation.

The minimum clear width for new bridges on arterial streets should be the same as the curb-to-curb width of the street including any existing or proposed on-street bicycle lanes. In addition, on streets with sidewalks, the sidewalks should also continue across the bridge. On long bridges, defined as bridges with overall lengths in excess of 60 m [200 ft], the offsets to parapets, rails, or barriers may be reduced to 1.2 m [4 ft] where shoulders or parking lanes are provided on the arterial. For further relevant discussion, see Sections 4.7, 4.10, and 4.17.1 on "Curbs," "Traffic Barriers," and "Sidewalks, respectively.

Bridges to Remain in Place

Reasonable attempts should be made to improve existing structures that do not meet current design policies or guidelines, but are otherwise suitable for retention. When making this decision, an important consideration is the extent to which such features that do not meet current policies and guidelines are likely to contribute to crash frequency and operational deficiencies for all users. Other factors to be considered include the remaining life, the cost of improvements and/or rehabilitation compared to replacement, the continuity of pedestrian and bicycle facilities, and the historical significance and aesthetic value of the structure.

Vertical Clearances

New or reconstructed structures should provide 4.9-m [16-ft] vertical clearance over the entire roadway width. Existing structures that provide clearance of 4.3 m [14 ft], if allowed by local statute, may be retained. In highly urbanized areas, a minimum clearance of 4.3 m [14 ft] may be provided if there is an alternate route with 4.9-m [16-ft] clearance. Consideration should be given to providing additional clearance for future resurfacing of the underpassing road.

Because of their lesser resistance to impacts, the vertical clearance to sign trusses and pedestrian overpasses should be 5.1 m [17 ft]. On urban routes with less than the 4.9-m [16-ft] clearance, the vertical clearance to sign trusses should be 0.3 m [1 ft] greater than the minimum clearance for other structures. Similarly, the vertical clearance from the deck to the cross bracing of through-truss structures should also be a minimum of 5.1 m [17 ft], with a possible allowance for future resurfacing.