
Warrants for Specific Objects

Design Manual
Chapter 8
Roadside Safety

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This section provides guidance on when and how certain objects located within the clear zone should be treated. Objects located at or beyond the clear zone may also be evaluated for treatment on a case-by-case basis. Treatment of these objects is encouraged where a relatively minor change can bring about a major safety benefit. For example, a treacherous cliff located just beyond the clear zone could be shielded with a barrier.

Refer to Section [1C-8](#) for information on documenting decisions that do not comply with the best practices listed below.

Embankments

Roadside embankments, whether parallel or perpendicular to the roadway, may warrant treatment. Where treatment is warranted, flattening and/or reshaping are the preferred treatment methods.

Transverse Slopes (Perpendicular Slopes)

Refer to Section [3F-3](#).

Parallel Slopes (Foreslopes and Backslopes)

The higher the embankment and the steeper the foreslope, the more likely an errant vehicle is to overturn. Providing foreslopes that are 4:1 or flatter can mitigate this. Foreslopes that are 6:1 or flatter are desired wherever possible.

Foreslopes that are 3:1 or flatter do not warrant treatment, regardless of fill height. Foreslopes that are steeper than 3:1 with fill heights greater than 8 feet should be treated. Foreslopes that are steeper than 3:1 with fill heights 8 feet or less may or may not warrant treatment. Contact the [Roadside Safety Engineer](#) for guidance.

Backslopes as steep as 2.5:1 do not warrant treatment if the slope is uniform, smooth, and free of objects. A backslope steeper than 2.5:1 may warrant treatment if it has a rough face that might cause vehicle snagging or if it flares toward the roadway at a sharp angle. If a steep backslope with a rough face cannot be flattened, reshaping or cutting the face to provide a smooth, nearly vertical surface is preferable to shielding it with a barrier.

Fixed Objects

Fixed objects are those that might cause damage to any vehicle impacting them. In most cases, shielding fixed objects with a barrier is the least preferred method of treatment. Whenever possible, consider using one of the other treatment methods discussed in Section [8A-3](#).

Bridge Piers

Due to their large size and rigidity, shield all bridge piers located within the clear zone. Barrier type (see Sections [8B-5](#) and [8C-1](#)) and zone of intrusion (see Section [8A-6](#)) will affect barrier placement relative to the bridge pier. On high speed multilane facilities, shield all median piers and consider shielding outside piers located beyond the clear zone.

Bridge Rail End Section

Bridge railings are usually terminated with blunt shaped endposts, which if left unprotected could be impacted head-on by an errant vehicle. Treat the approach end of all bridge rail end sections located

within the clear zone. For bridges on high speed roadways, steel beam guardrail is the preferred treatment. However, crash cushions may be used where site conditions cannot accommodate steel beam guardrail. For bridges in urban areas, posted speed determines which type of treatment should be used:

- If the posted speed is 35 mph or greater, use guardrail or a crash cushion.
- If the posted speed is 30 mph or less, use of guardrail or a crash cushion is preferred. If constraints don't allow for placement of either of these options, a sloped concrete end treatment (Standard Road Plan [BA-108](#)) may be used.

Walls

Walls having sufficient structural capacity and a relatively smooth face may be able to safely redirect an impacting vehicle. It may be possible to leave such walls in place untreated. Examples include reinforced concrete retaining walls, ornamental stone walls, and some types of noise walls.

Walls lacking the strength or shape to safely redirect an impacting vehicle should be treated. Examples include MSE walls and concrete block retaining walls. Barrier placement relative to a wall will affect barrier choice (see Sections [8A-6](#), [8B-5](#), and [8C-1](#)).

Fences

Although most types of fences, including chain link, tubular steel, and woven field fence, are not considered to be significant objects, their use should usually be restricted to locations outside the clear zone. This is especially true when such fences are used near a sidewalk or multi-use path. A vehicle impacting the fence could generate flying debris. Where these fences are required to be installed within the clear zone, contact the [Roadside Safety Engineer](#) for a special design.

Revetment/Rock Flumes

Areas of revetment placement, such as at rock flumes or near culvert outlets, could cause an errant vehicle to become unstable. This is especially true where the revetment covers a large area or where it extends more than 4 inches vertically above the surrounding ground. Evaluate the potential for these areas to cause vehicle snagging or instability. Consider treatment, such as a layer of smaller macadam stone on top of the larger stone, where these effects are likely.

Trees and Shrubs

Trunk diameters are measured at a point 6 inches above the ground surface. For trees with multiple trunks at this height, add the individual trunk diameters together to determine an effective trunk diameter. For shrubs with multiple trunks at this height, use the diameter of the largest trunk as the effective trunk diameter. Trees and shrubs with an effective trunk diameter of 4 inches or greater should be treated.

Removal is the preferred treatment method. However, in some situations, it may be desirable to keep trees that would otherwise be considered for removal. For example:

- At parks, recreation sites, or residential areas where the functional and/or aesthetic values will be lost.
- If trees are unique based on their size, species, or historic value.
- Where removal would adversely affect endangered/threatened species, wetlands, water quality, or result in significant erosion/sedimentation problems. For further guidance, contact the [Location Engineer](#).

Where removal is not possible or feasible, trees should be shielded with a barrier.

Utility Poles

Utility poles within the clear zone should be treated. The most preferable treatment method is to eliminate the need for the poles by burying the utility lines. If this is not possible, the poles should be relocated to the right-of-way line.

Wherever poles are used, the chances of them being impacted can be reduced by providing longer spans between poles, which results in fewer poles being installed.

Luminaire Supports

Luminaire supports can pose a snagging risk to errant vehicles or may cause loss of control. On high speed roadways, provide breakaway bases for all new luminaries unless they are placed where they cannot be impacted or if they are located on or behind a concrete barrier. On low speed roadways or in urban areas, the use of breakaway supports is encouraged to provide additional safety to pedestrians from flying debris.

Sign Truss Footings (Overhead Sign Supports)

Sign truss footings should be protected if located in the clear zone. Attention needs to be given to zone of intrusion (see Section [8A-6](#)) when locating a barrier. Sign truss footings may be eliminated by installing or relocating overhead signs to other nearby structures. The [Traffic and Safety Project Engineer](#) will normally determine the location and need for sign trusses. Any proposed changes should be discussed with both bureaus.

Ground-Mounted Sign Supports

Use breakaway sign supports for ground-mounted signs wherever possible.

Although breakaway sign supports are considered crashworthy, reducing the number of these supports near the roadway can provide a safety benefit as well as a reduction in maintenance needs. Investigate opportunities to attach new signs to other roadside fixtures such as luminaire poles, or to mount them behind existing barriers. Consult with the [Traffic and Safety Project Engineer](#) to identify nearby sign installations that may accommodate the mounting of additional signs.

Railroad Signal Footings

The concrete footings of automatic railroad signals are solid structures that pose a potential risk to motorists. Because they cannot be made breakaway, they should be treated. Typically, steel beam guardrail is used to shield these objects, see Standard Road Plan [BA-253](#). If site restrictions prohibit the use of steel beam guardrail, consult the [Roadside Safety Engineer](#) for guidance.

Culverts

Evaluate culvert openings for treatment. Refer to Section [8B-2](#).

Water

Be liberal when evaluating water hazards and consider shielding any that are questionable, such as shallow streams that occasionally experience heavy flows or deep ponds located beyond the clear zone. Those portions of a body of water that are 2 feet deep or greater and within the clear zone should be shielded with a barrier if no other treatment options exist. The depth of a body of water is determined from its normal pool elevation.

Others

Although not technically objects, the presence of pedestrians and bicyclists should also be evaluated for treatment under certain circumstances.

Consider treating:

- Sidewalks and shared use paths near high speed roadways.
- Schools, parks, and playgrounds.
- Other places where large groups might gather (parking lots, shopping malls, and fair grounds).

Chronology of Changes to Design Manual Section:

008A-004 Warrants for Specific Obstacles

3/4/2021	Revised Added references to 8A-6, 8B-5, and 8C-1 for information regarding zone of intrusion, choosing a barrier, and concrete barrier rail.
11/12/2020	Revised Retitled the section. Updates throughout the section.
6/24/2020	NEW Changed Office of Location and Environment to Location Engineer. Changed Office of Traffic and Safety to Traffic and Safety Project Engineer. Deleted Office of Bridges and Structures from Sign Truss Footings subsection.
6/25/2019	Revised Updated hyperlinks. Updated header logo and text.
1/5/2017	Revised Added in information that all median piers are to be shielded. Changed posted speed for use of tapered concrete end treatment to 30 mph to account for the fact that drivers are typically driving over posted speed limits and are driving taller vehicles. Removed information regarding shielding boulders - no documentation to support that statement. Added guidance to place a layer of choke stone on top of areas of revetment. Moved information regarding culverts to Section 8B-2.
4/17/2012	Revised Updated link on page 3 from 8B-4 to 8D-4.
7/29/2011	Revised Added more information for the use of guardrail on bridge and water hazards. Modified Figure 1, re-wrote Bridge Endposts section, changed "riprap" to "revetment".
12/13/2010	NEW To document how specific obstacles should be treated.