

# Guide Rail: Do You Need Guiderail?

When should guide rail be installed? You could install it everywhere there is a hazard along the side of the road, but that would be expensive. Or, you could install it in locations where run-off-road accidents have occurred. That means people may already have been hurt, and you may already be facing a liability lawsuit. Guide rail should be installed where it will make a meaningful improvement to public safety, at a reasonable cost for taxpayers.

It is important to realize that guide rail is itself a hazard. In fact, 121 New Yorkers died in collisions with guide rail in 1999. Guide rail is meant to protect traffic from hazardous objects or slopes. If hitting the guide rail would be worse than hitting the object, then the guide rail should not be installed.

## CLEAR ZONES

An important tool is the clear zone concept. The clear zone is the area alongside the road that is free from obstacles or dangerous slopes. It is the area available to drivers that drift off the road. This area should be free from unyielding objects such as utility and light poles, trees or boulders. The ground should be relatively flat and gently graded. Rounded changes in slope will help a driver regain control of the vehicle and return to the roadway.

On existing roads, the desired clear zone width is often difficult to achieve because of right-of-way or terrain constraints, but improvements should be made where run-off-road crashes are likely to occur, like curves and downgrades. When working on a road, look for opportunities to improve the clear zone, since traffic speeds often go up after resurfacing.

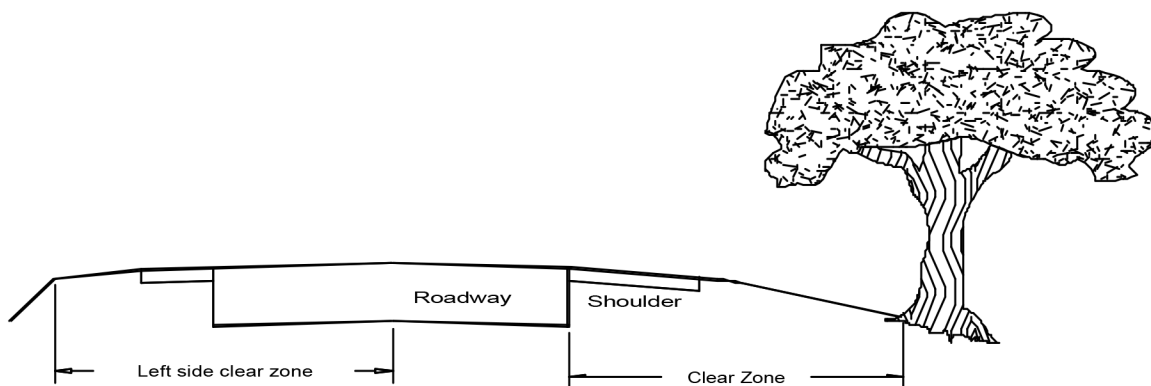


Figure 1: Measuring clear zone widths

### CORNELL LOCAL ROADS PROGRAM

416 RILEY-ROBB HALL, ITHACA, NY 14853

PHONE: (607) 255-8033

FAX: (607) 255-4080

E-MAIL: [clrp@cornell.edu](mailto:clrp@cornell.edu)

INTERNET: [www.clrp.cornell.edu](http://www.clrp.cornell.edu)

*Tech Tips* are published by the Cornell Local Roads Program with support from the Federal Highway Administration, the New York State Department of Transportation, and Cornell University. The content is the responsibility of the Local Roads Program.

On new roads, good clear zones should be provided. The desired clear zone width depends on the amount of traffic on the road, the prevailing speed, the cross slope of the roadside, and the curvature of the road. The clear zone should be wider on the outsides of curves and where the roadside slopes down away from the edge of the road. Clear zone width is measured from the vehicle lane to the nearest hazardous obstacles. On the left side of two-way roads, it is measured from the centerline to the nearest hazardous obstacles.

On curbed roads, utility poles, fire hydrants, and other obstructions should be at least 1.5 feet from the face of the curb. Curbs will not prevent a car from leaving the road, so more should be provided where possible.

Detailed discussions of desired clear zone width can be found in the AASHTO *Roadside Design Guide* and Chapter 10 of the New York State *Highway Design Manual*. For low volume roads, see the *Guidelines for Geometric Design of Very Low Volume Roads* (ADT < 400), AASHTO, 2001.

Desired Clear Zone Width by Road Class	
Road Type	Desired Clear Zone Width
Low volume road (ADT* < 400 vehicles per day)	6.5 ft
Local road (ADT* > 400 vehicles per day)	7 – 10 feet
Arterials and Collectors	See <i>Roadside Design Guide</i> or <i>HDM</i> Chapter 10

\*ADT = Average Daily Traffic

## TYPES OF ROADSIDE HAZARDS.

Run-off-road hazards generally fall into one of three types. Fixed objects are relatively small unyielding obstacles such as utility poles, trees with trunks more than 4 inches thick, and boulders. Roadside hazards, such as embankments and guide rail, extend for a ways along the road. Slopes are hazardous if they could roll a vehicle or launch it into the air.

Slopes parallel to the road are split into three categories, depending on how steep they are:

- *Recoverable* slopes are flatter than one on four. A driver will probably be able to regain control and return to the roadway.
- *Traversable* slopes between are one on four and one on three. A vehicle on a traversable slope will probably end up at the bottom of the slope, but remain upright. They are allowed within the clear zone, but don't count towards the desired clear zone width.

- *Critical* slopes are steeper than one on three. They should be avoided or shielded, since they increase the chances of a severe rollover crashes.

Transverse slopes are often found where side roads, driveways, and drainage channels intersect the highway. On high speed roads, these slopes should be gentle, so that they don't act as a launch ramp.



*Figure 1: Common roadside hazards include unprotected guiderail ends, headwalls, mailboxes, slopes, and improper signposts*

## TREATMENT OF ROADSIDE HAZARDS

When considering what to do with a hazard that reduces the available clear zone distance, ask these questions:

### Is the potential hazard dangerous?

If the hazard is an unyielding object or critical slope, you may want to do something about it.

- Is there an unyielding object in the clear zone?
- Is there a critical slope near the road?
- Is there an unyielding object at or near the bottom of a traversable slope?
- If so, how likely is it that a vehicle that goes off the road will reach the object or slope?

Look at the clear zone for that stretch of road. If the object or slope in question is closer to traffic than everything else nearby, then fixing it will improve the safety of the road. On the other hand, removing one tree from a row of them 3000 feet long is unlikely to make a big difference.

### Can you remove the hazard?

The best option is to eliminate the hazard. For example, cutting a headwall or tree stump down to ground level eliminates the hazard to vehicles that go off the road at that location.

### Can you relocate it to a place where it is unlikely to be hit?

Moving an object further from the road, or from the outside of a curve to the inside can reduce the chances that the hazard will be hit. Cross culverts can be extended to move the culvert end out of the clear zone\*, and utility poles can be moved further from traffic. Take advantage of places you need guide rail anyway, and place signs and utility poles behind the rail and outside of its deflection distance.

## Can the hazard be made safer to hit?

If you can't remove or relocate the hazard, try to reduce the severity of an impact.

Signposts, light and utility poles can be given breakaway bases that reduce the impact forces. Hardware has been developed that breaks in a controlled manner under impact, allowing the vehicle to pass under it.

Drainage features can be made traversable, so that errant vehicles can drive over them. Grates can be placed over culvert ends so a vehicle will pass over the opening rather than falling into it (and also improving safety for your mower operators). Using traversable ditch foreslopes and backslopes can make the ditch safer for an errant vehicle.

Crash cushions and impact attenuators can be used to soften the impact with solid objects, but the initial and maintenance costs are high, so they are rarely used on local roads.

## If the hazard can't be removed, moved, or modified, will guide rail make the road safer?

Remember that guide rail is a hazard and can cause injury. Guide rail should only be used where colliding with the object it protects traffic from would be worse than striking the guide rail.

If there is a potential hazard within the design clear zone width that cannot be reasonably removed, relocated, or modified to be crashworthy, consider providing guide rail. If it is a 'fatal at any speed' hazard (deep body of water, large propane tank, etc.) and it is reasonable to assume that an errant vehicle could reach it, provide a strong barrier system to shield it such as heavy post blocked-out corrugated or box beam.

## Delineation

Delineation is used to help guide drivers through curves or around obstacles. It is helpful if accident records show frequent nighttime run-off road accidents. Signs, pavement markings, hazard markers and post-mounted delineators are used.

If the hazard cannot be removed, moved, modified, or shielded with guide rail, delineation and signs should be used to warn drivers of its presence.

Delineation can be used instead of guide rail if hitting the guide rail would be more severe than hitting the object. It can also be used to make guide rail more visible to drivers and snowplow operators. This is especially important when "rustic" rail is used. These weathered brown guide rails can be hard to see at night and in bad weather.

Delineation can be a low cost interim measure if guide rail installation is warranted but will be delayed by budget, time or personnel constraints. It does not help drivers that have lost control of their vehicles, but it will help guide prudent drivers around the hazard.



This work by the Cornell Local Roads Program (CLRP) is licensed under a [Creative Commons Attribution-NonCommercial-Share Alike 3.0 Unported License](https://creativecommons.org/licenses/by-nc-sa/3.0/).