



Frequently Asked Questions For Roadside Safety Hazards

Motor vehicles, pedestrians and bicyclists all use our highways and all have their own safety concerns. This paper will focus on roadside safety hazards that could cause serious injuries to occupants of an errant vehicle that runs off the roadway. Provided below are answers to questions a municipality may have when considering how they should respond these types of roadside safety hazards.

Definitions

Clear Zone: means an unobstructed, traversable area provided beyond the edge of the traveled portion of the roadway for the recovery of errant vehicles and includes shoulders, bike lanes, and auxiliary lanes, except those auxiliary lanes that function like through lanes

Critical slope: means an embankment or cut slope steeper than 3 horizontal to 1 vertical (3H:1V)

Highway: means a common or public highway, street, avenue, parkway, driveway, square, place, bridge, viaduct or trestle, any part of which is intended for or used by the general public for the passage of vehicles and includes the area between the lateral property lines thereof

Non-recoverable slope: means an embankment slope between 3H:1V to 4H:1V and may be traversable, but a vehicle will continue to the bottom of the slope

Recoverable slope: means an embankment slope of 4H:1V or flatter upon which a driver may, to a greater or lesser extent, retain or regain control of a vehicle

Recovery Zone: means the total unobstructed traversable area available along the edge of the road, and by convention it is measured from the edge of the closest travel lane.

The recovery zone includes the clear zone and may have recoverable slopes or non-recoverable slopes and a clear runout area

Roadside: means the area between the outside shoulder edge and the right of way limits

Roadside obstacle: means a man-made or natural non-traversable terrain or fixed object(s)

Roadway: means the part of the highway that is improved, designed or ordinarily used for vehicular traffic, but does not include the shoulder. Where a highway includes two or more separate roadways, the term “roadway” refers to any one roadway separately and not to all of the roadways collectively

What are roadside safety hazards?

Roadside safety hazards include: fixed objects within the clear zone and/or recovery zone; steep embankments parallel to the road; steep banks on cross ditches, streams, rivers and lakes; other such roadside obstacles within the right of way.

Fixed objects include, but are not limited to: barriers, bridge abutments, bridge rails, bridge end rails, bridge piers, culverts, curbs, fences, fire hydrants, guide rails, inlets, mailboxes, parked vehicles, retaining walls and walls, railroad crossing warning devices, signs posts, signal and luminaire supports, trees and shrubs, tree stumps, utility poles.

Why should a municipality be concerned?

Trees are the most common fixed object struck on the roadside, accounting for 50% of all fixed object fatalities, followed by utility poles at 12% and traffic barriers at 8%.¹ A vehicle will leave the roadway and strike a tree, roadside obstacles or other fixed objects on the roadside for many reasons, including the following:

1. Driver fatigue;
2. Driver distractions and inattention;
3. Excessive speed;
4. Driving under the influence of alcohol and/or drugs;
5. Crash avoidance;
6. Adverse roadway conditions, such as snow and ice;
7. Vehicle component failure;
8. Poor visibility.

How does a municipality identify and catalogue roadside safety hazards?

1. Determine the clear zone for each road section within the municipality's road inventory taking into account the function of the road (arterial, collector, local), the traffic volume on the road section, the posted and design speed of the road section - engineering judgement may be required.
2. Drive through the road network and catalogue: all roadside obstacles and fixed objects within the clear zone, all non-recoverable and critical slopes within the clear zone on parallel and cross embankments, noting the offset of the non-recoverable and critical

parallel slopes from the edge of the traveled portion of the roadway and noting if a non-recoverable slope within the clear zone has a runout area; note any unprotected drains, streams, rivers or lakes with 0.6m or more of water.

3. On the same drive through catalogue all fixed objects within the clear zone or recovery zone and measure their offset from the edge of the traveled portion of the roadway to the face of an unprotected fixed object, measure the width of the fixed object (perpendicular to the roadway) noting if the fixed object is on a traversable non-recoverable slope or a critical slope.
4. Determine the maximum unshielded height of a critical slope - engineering input may be required.
5. Gather all data on collision history, complaints and all local policies.

What options does a municipality have to treat roadside safety hazards?

While there are several reasons why errant vehicles leave the roadway and strike a fixed object as noted earlier, there are also many treatment options that can be considered in the following order of preference:

1. Remove the hazard;
2. Relocate the hazard outside the clear zone or recovery zone;
3. Minimize the hazard by making it traversable or in the case of sign, signal and luminaire supports consider using breakaway devices;
4. Shield the hazard with barriers or crash cushions;
5. In the absence of other options improve awareness of the hazard through delineation or other warning devices;
6. Reduce posted speed.

How does a municipality determine if a guiderail is warranted?

Shielding a non-traversable terrain or a roadside safety hazard with a guiderail is usually only warranted when the non-traversable terrain or roadside safety hazard is in the clear zone and cannot be economically removed, relocated, or made breakaway. A barrier provides a safety improvement over the unshielded condition. Engineering input will be required to review the type of road (arterial, collector, local), traffic volume, design and posted speed, vertical and horizontal alignment, number of through lanes,

surface and shoulder width, surface condition and so on. The engineer can then determine what opportunities are available for mitigating the possibility of a roadside collision by considering the following options:

1. Can the possibility of a vehicle running-off the roadway be reduced?
2. If a run-off the roadway were to occur, what opportunities can be provided for the driver of the vehicle to recover and return to the road without incident ie traversable recoverable slope and/or traversable non-recoverable slope plus a clear runout area?
3. If a collision with a roadside safety hazard were to occur, what design elements (guiderail, crash cushions, etc) can be provided to reduce the severity of said collision?

It should be noted that traffic barriers (guiderail, crash cushions, etc) do not prevent collisions; they too are obstacles on the roadside. Vehicles striking a barrier will have some degree of damage and occupants in the vehicle may or may not be injured. Traffic barriers should be installed only if it is likely to reduce the severity of potential collisions.

A decision has been made on how to address existing roadside safety hazards, what should a municipality do?

Municipalities should have a road needs study which identifies the condition of the road surface and should include items such as vertical and horizontal alignment needs, drainage needs, surface width needs and so on. The cost of removing, relocating, making an obstacle breakaway or shielding of roadside safety hazards should be added to the road section and subsequently the road needs study as a spot improvement. Once the total cost for capital work on a road section has been updated, the capital plan for the municipality can be revised. If it is decided that the probability and consequence of a collision with a roadside safety hazard is significant on a given road section and the removing, relocating, making an obstacle breakaway or shielding of roadside safety hazards cannot wait for the capital work outlined in the road needs study, then removing, relocating, making an obstacle breakaway or shielding of roadside safety hazards should be prioritized based on collision history, type of road, offset of fixed objects from the traveled roadway and traffic volume. The work would be scheduled for completion within annual municipal budget limitations.

Is there an acceptable level of risk?

The alternate to removing, replacing or shielding roadside safety hazards is to accept some risk.² If the probability and consequence of a collision with a roadside safety hazard is low, based on a professional assessment of the site, it may be prudent to accept some risk at these locations and spend available funds on safety improvements that will achieve the greatest safety return.

What should a municipality do to minimize future roadside safety hazards?

1. On all new road construction or reconstruction projects:
 - a. Require all parallel slopes to be constructed with the required recovery zone which includes at a minimum, a traversable non-recoverable slope;
 - b. Require the recovery zone to be free of all roadside safety hazards;
 - c. Require all perpendicular slopes on cross ditches etc to be 6H:1V or flatter;
 - d. Require all fire hydrants, trees, utility poles and other such fixed objects which must be located within the highway right of way to be placed at or near the limits of said right of way.

NOTE: If sufficient right of way width is not available to place all fire hydrants, utility poles and other such fixed objects outside the clear zone and within the right of way and the probability and consequence of a collision with a roadside safety hazard is significant for a given road section, the municipality may want to consider the acquisition of an easement on private property for the placement of fire hydrants, utility poles and other such fixed objects.

2. Require all utility companies to place all new above ground plant at or near the limit of the right of way.
3. Require all new or replacement ground mounted sign supports, signal and luminaire supports and railroad crossing warning device supports to be breakaway.

References

Transportation Association of Canada (TAC) Geometric Design Guide for Canadian Roads, 1999

American Association of State Highway and Transportation Officials (AASHTO) Roadside Design Guide, 4th Edition 2011

Ministry of Transportation (MTO) Roadside Safety Manual, 1993

National Cooperative Highway Research Program, (NCHRP) Highway Safety Manual 2014

1AASHTO Roadside Design Guide, 4th Edition 2011

2MTO Roadside safety Manual, 1993

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