2.2 CLEAR ZONE POLICY

OVERVIEW

A significant number of serious accidents and injuries can be reduced if a clear zone is provided. This clear zone must be traversable, and should be free of obstacles such as unyielding landscaping, sign supports and light poles, non traversable ditches or drainage structures, and steep slopes. Vehicles striking barriers and energy attenuators can cause some occupant injury and/or vehicle damage. It is, therefore preferable to eliminate the need for these by either removing the hazard or reducing its severity.

For background information on the clear zone concept, refer to Chapter 1, Section 1.2.3. Refer also to Chapter 1, Section 1.4 for Risk Acceptance.

DEFINITION

Clear zone width is defined as the distance from the edge of the travelled portion of the roadway to the face of an unprotected hazard. This clear zone must be traversable, allowing errant vehicles to recover or come to a safe stop. Any hazards which remain within this offset must be either removed or shielded. The clear zone relative to the traffic in the opposite direction is typically measured from the centreline.

At locations where traversable nonrecoverable embankments are within the clear zone, and do not require protection according to the Embankment Warrant Guide, Chapter 2, Section 2.5.1, the clear zone definition is modified and is measured from the toe of the non-recoverable slope. Since it is expected that vehicles leaving the roadway may be in the process of braking a design speed 20 km less than that of the roadway may be used to calculate the clear zone offset from the toe of slope. Refer to example 3, Chapter 2, Section 2.5.

JUDGEMENT

The designer should use judgement when applying the clear zone offsets. Where the cross section or slope of the terrain tends to channel errant vehicles towards a hazard outside the clear zone, or for critical isolated hazards, such as permanent bodies of water, bridge piers, rock outcrops, etc., just beyond the clear zone, where the consequences of a collision may be extremely severe, consideration should be given to providing protection for the motorist. The designer should be aware that the clear offsets provide degree of protection for approximately 80% of errant vehicles. While this may be a cost-effective measure across the entire system, in isolated, high risk locations, the clear zone offsets should be exceeded, especially when there is little or no additional cost involved in doing so. The key consideration is driver expectancy of a hazard and the risk exposure. Conversely, if isolated objects, say trees, are found to be just within the zone, while other trees in the immediate vicinity are outside the clear zone, removal of the tree inside the hazard zone will not significantly reduce the risk to motorists. Protection or removal may not be necessary in this case. See Figure 2.2.2.

2.2.1 CLEAR ZONE WIDTH - TANGENT

This section specifies the clear zone offsets to be used on Provincial Highways on tangent sections.

POLICY

ANY HAZARDS WITHIN THE CLEAR ZONE WHICH CANNOT BE REMOVED OR MADE FORGIVING MUST BE PROTECTED BY AN APPROVED BARRIER SYSTEM OR CRASH CUSHION. ON LOWER VOLUME ROADS THE CLEAR ZONE MAY BE REDUCED TO THE OFFSETS SHOWN IN PART B TABLE 2.2.1, SUBJECT TO AN OPERATIONAL REVIEW AS OUTLINED BELOW.

The Clear Zone offsets to be applied on tangent road sections are shown in Table 2.2.1.
For curved roadways, refer to Section 2.2.2. For risk acceptance refer to Chapter 1, Section 1.4.

APPLICATION

The clear zone offsets apply to permanent hazards. It should not be used as justification for providing protection from opposing traffic such as locations with narrow medians with low volumes or nested ramps. The median barrier warrant guide, Figure 2.10, applies in the former situation.

OPERATIONAL REVIEW

General

It is normal practise for a traffic analyst to review the following material and compare the application, use and resultant performance against other similar locations that have been established as acceptable and hence represent benchmarks to which all remaining installations will be compared. This may be done from a municipal perspective, a regional view, or from a province wide overview. It is the responsibility of the traffic analyst to identify any operational concerns along with the determined cause and relay these concerns to the designer.

Table 2.2.1
Clear Zone Widths - Tangent Road Sections

*Design Speed km/h	**Clear Zone Width (m)				
	A		B		
	AADT ≥ 6000		AADT ≥ 1500	AADT ≥ 750	AADT < 750
120	10		8	7	6
110	9		7	6	5
100	7		6	5	4
90	6		5	4	4
80	5		4	4	4
70	4		3	3	3
60 or less	3		3	3	3
60 or less with barrier curb	0.5		0.5	0.5	0.5

** For point of measurement see "definition"
* For explanation of Design Speed refer to the Geometric Design Manual

Refer to Section 2.2.3 for application of the Clear Zone in urban areas.

On any project where these offsets cannot be cost-effectively accommodated and protection is not provided, a statement in the design criteria will indicate this fact. Approval of the Design Criteria Committee will be required. Justification for reduced offsets will be retained in the project file.

Procedure

Operational analysis typically includes a review of:

- Motor Vehicle Accident Reports with the focus on determining causal factors including the influence of roadway geometrics. Typically reviews will focus on the following information:
  - injury/occupant ratios
  - injury severity (i.e. fatals, major injuries, minor, etc.)
  - injuries/collision
  - vehicle damage severity
  - sequence of events
  - driver action
  - location on/off roadway
  - fixed object involvement/offset from roadway
  - environmental considerations
  - visibility conditions
  - vehicle condition

- Volume information initially to determine flow patterns and future growths/demands. This data is combined with accident data to produce accident rates so that the operation may be compared to benchmarks representing operations elsewhere in the Province. Volume data is used to produce the following information;
  - General characteristics such as AADT
  - Traffic composition
  - Turning movement information

- Geometric information in conjunction with accident data and volume data to assess general highway characteristics. Reviews generally assess the use of standards versus as constructed and attempts to determine the role if any that roadway geometrics may have played in the day to day operation or in the occurrence of accidents. The analyst should review the following geometric concerns;

- vertical and horizontal alignment
- number of through lanes
- existence of auxiliary lanes
- shoulder width and surface condition
- traffic barrier types and location
- median types/widths
- curb and gutter type/location
- sidewalk locations
- structure locations/clearance/capacity for traffic (vehicular and pedestrian)

• Existing traffic control devices in conjunction with accident data, volume data, and knowledge of geometric conditions to determine what role if any that the presence of absence of traffic control devices may have had on the day to day operations or what manner it may have contributed to a motor vehicle accident. The analyst must review the location, position, and functionality of the following devices;
  - traffic signals
  - signing/delineation
  - pavement marking
  - special devices (i.e. railway gates, etc.)

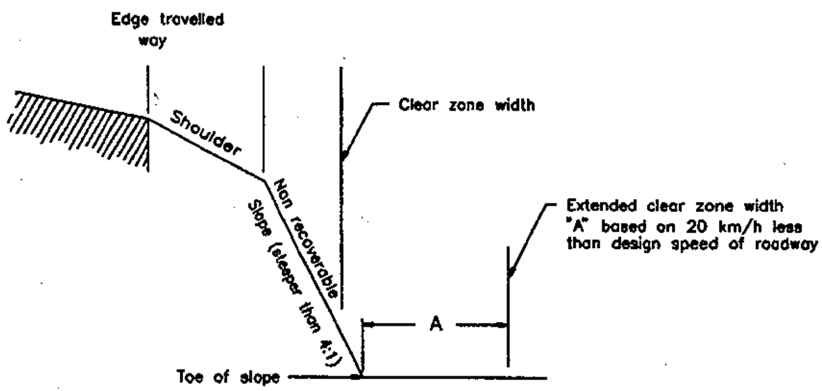

Figure 2.2.1 Extension of Design Clear Zone

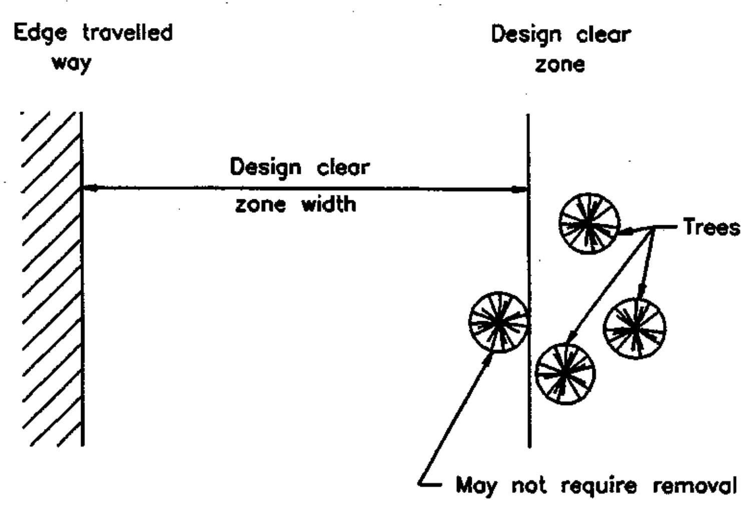

Figure 2.2.2 Decrease in the clear zone to accommodate judgement

2.2.2 CLEAR ZONE WIDTH - CURVE

Vehicles out of control while travelling on a horizontal curve can be expected to travel further away from the roadway due to centrifugal forces on the outside and due to the driver tendency to oversteer on the inside. The tangent clear zone offsets must therefore be increased to compensate for this.

POLICY

CLEAR ZONE WIDTHS ON BOTH THE INSIDE AND OUTSIDE OF HORIZONTAL CURVES MUST BE INCREASED, TO ALLOW FOR THE CENTRIFUGAL FORCE ON THE OUTSIDE, AND THE TENDENCY TO OVER STEER ON THE INSIDE.

Table 2.2.2 Provides curve correction factors for increasing clear zone widths on the inside and outside of curved road sections.

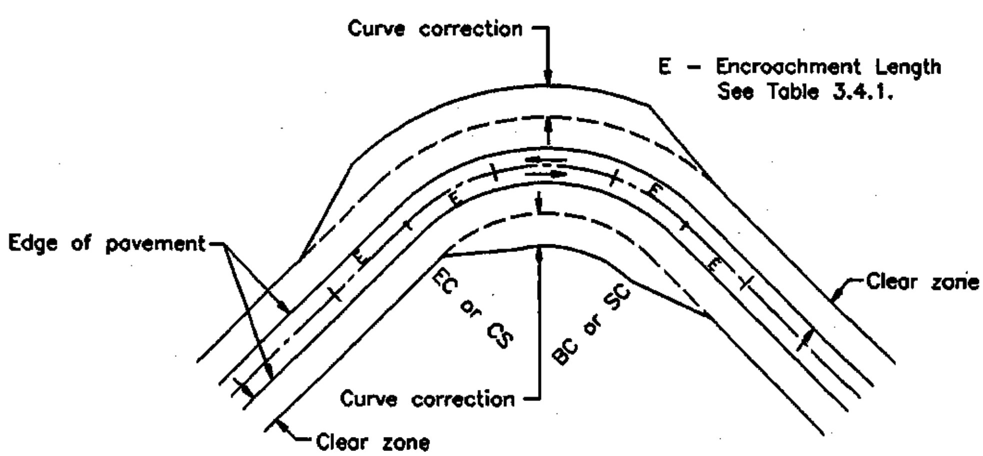

Figure 2.2.3 Clear Zone Extension on Curve

PROCEDURE

Total clear zone widths on the outside and inside of curves are obtained by multiplying the clear zone widths for tangents, (Table 2.2.1) by the appropriate curve correlation factor (provided in Table 2.2.2) and rounding to the nearest 0.5 metre. Exceptions to the clear zone width are to be treated as shown in Section 2.2.1.

Table 2.2.2
Curve Correlation Factors

Radius (m)	Design Speed (km/hr)						
	60	70	80	90	100	110	120
1000	1.00	1.00	1.00	1.00	1.00	1.00	1.00
900	1.07	1.09	1.11	1.15	1.19	1.24	1.31
800	1.08	1.10	1.13	1.17	1.23	1.28	1.34
700	1.09	1.12	1.15	1.20	1.25	1.32	1.43
600	1.10	1.14	1.17	1.23	1.29	1.37	1.46
500	1.11	1.16	1.22	1.27	1.35	1.44	-
400	1.14	1.19	1.27	1.35	1.42	-	-
350	1.17	1.23	1.31	1.39	-	-	-
300	1.20	1.27	1.35	1.46	-	-	-
250	1.22	1.32	1.42	-	-	-	-
220	1.25	1.35	-	-	-	-	-
200	1.29	1.40	-	-	-	-	-
180	1.32	1.45	-	-	-	-	-
150	1.35	-	-	-	-	-	-
120	1.4	-	-	-	-	-	-
100	1.5	-	-	-	-	-	-
50	1.75	-	-	-	-	-	-

2.2.3 CLEAR ZONE - URBAN AREAS

The offsets shown in Table 2.2.1 may not always be practical in urban centres. In these communities, utility poles, fire hydrants, etc. may be located immediately adjacent to the roadway. Removal or relocation may not be possible, and shielding with guide rails may not be practical, due to the number of entrances and crossings.

GUIDELINE

In urban areas where the operating speed is 60 km/h or less, a barrier curb may be used to shield hazards, provided the clear zone offsets cannot be met and removal or relocation is not practical. Also refer to Sections 6.3 to 6.7.