CLEAR ZONES

Presented By:
Bill Gulick, P.E. P.L.S.
Director of Highway Design

HOW WE GOT HERE

1960's – Moved from head-on crashes to more roadside crashes

Late 1960's – AASHTO created the "Yellow Book"

1974 – 30' "*Unencumbered Recovery Area*"

1989 – AASHTO published the first edition of the Roadside Design Guide

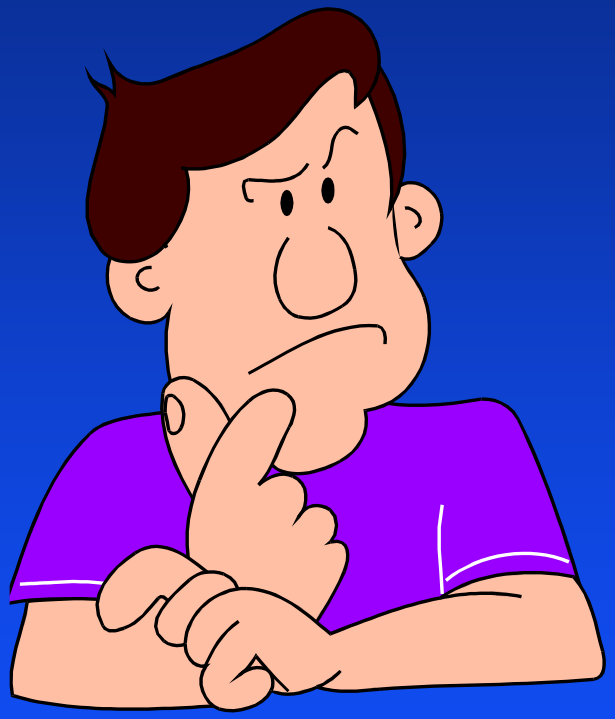
CLEAR ZONES!

Types of Environments

- Rural
- Low Speed / Low Volume
  - Very Low
- Urban
  - Suburban

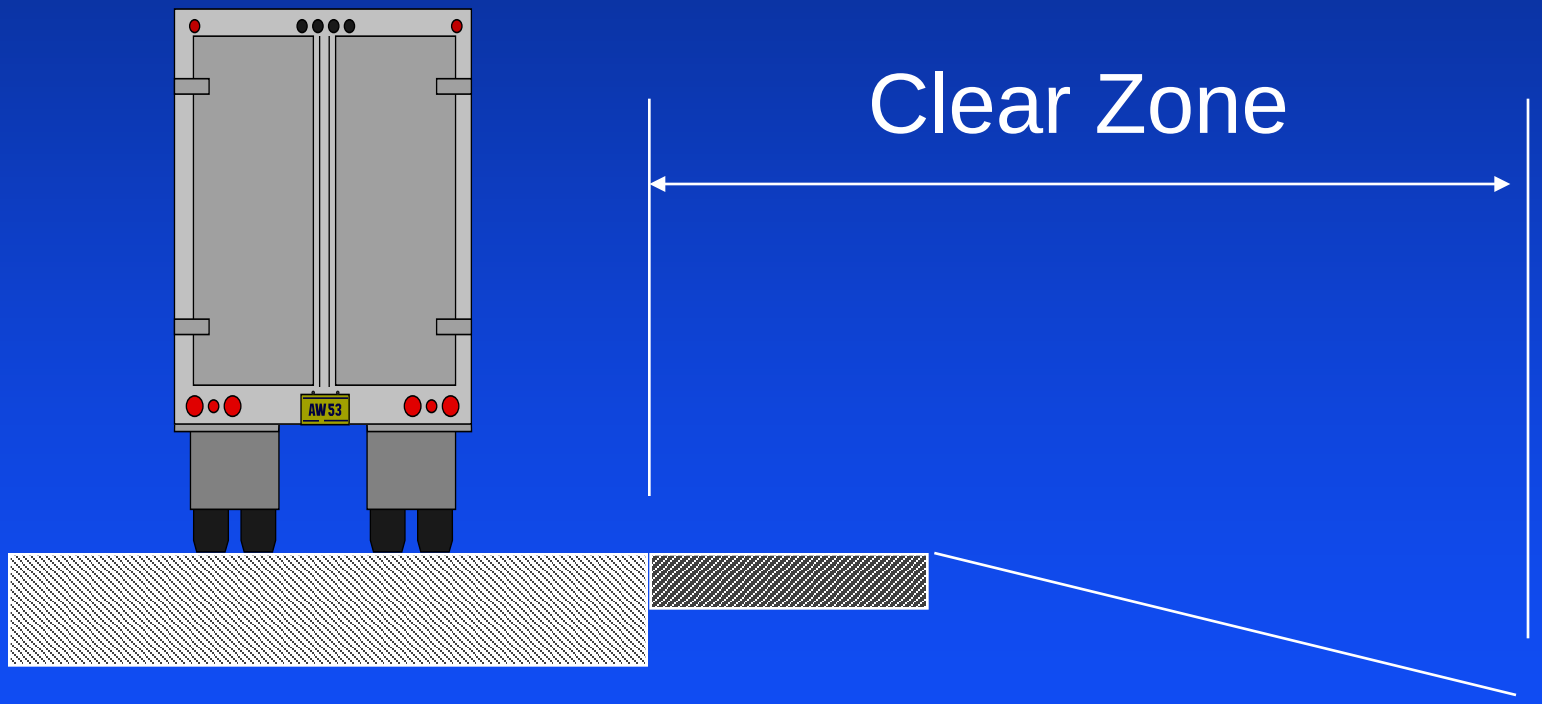
Roadside Design Guide - 2011
Chapter 3
Clear Zones

Clear Zone Concept



What is a Clear Zone?

Area Available For Safe Use By Errant Vehicle



Clear Zone Concept

30 Feet

Not Necessarily

Dependent on:
Speed
ADT
Roadside Slope

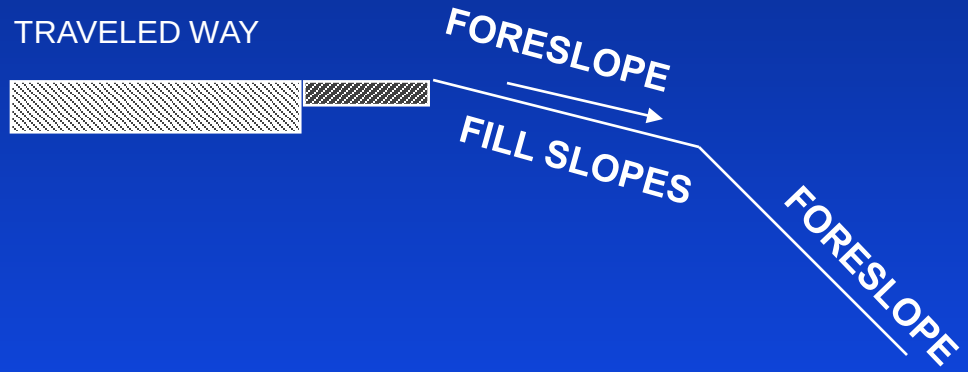
Table 3-1. Suggested Clear-Zone Distances

U.S. Customary Units

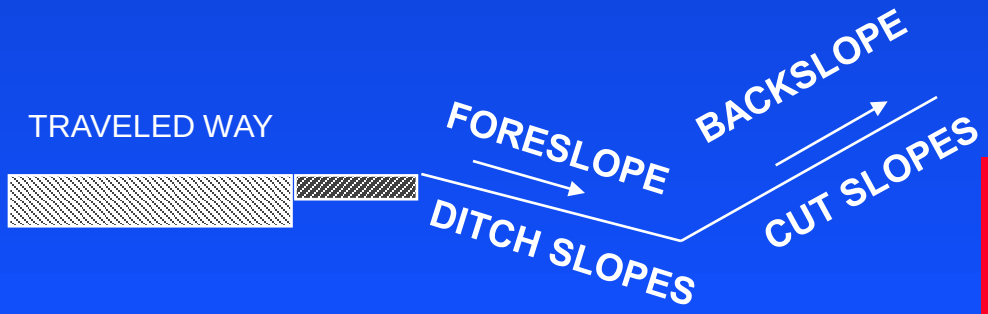
Design Speed (mph)	Design ADT	Foreslopes			Backslopes		
		1V:6H or flatter	1V:5H to 1V:4H	1V:3H	1V:3H	1V:5H to 1V:4H	1V:6H or flatter
≤40	UNDER 750[c]	7–10	7–10	[b]	7–10	7–10	7–10
	750–1500	10–12	12–14	[b]	12–14	12–14	12–14
	1500–6000	12–14	14–16	[b]	14–16	14–16	14–16
	OVER 6000	14–16	16–18	[b]	16–18	16–18	16–18
45–50	UNDER 750[c]	10–12	12–14	[b]	8–10	8–10	10–12
	750–1500	14–16	16–20	[b]	10–12	12–14	14–16
	1500–6000	16–18	20–26	[b]	12–14	14–16	16–18
	OVER 6000	20–22	24–28	[b]	14–16	18–20	20–22
55	UNDER 750[c]	12–14	14–18	[b]	8–10	10–12	10–12
	750–1500	16–18	20–24	[b]	10–12	14–16	16–18
	1500–6000	20–22	24–30	[b]	14–16	16–18	20–22
	OVER 6000	22–24	26–32[e]	[b]	16–18	20–22	22–24
60	UNDER 750[c]	16–18	20–24	[b]	10–12	12–14	14–16
	750–1500	20–24	26–32[e]	[b]	12–14	16–18	20–22
	1500–6000	26–30	32–40[e]	[b]	14–18	18–22	24–26
	OVER 6000	30–32[e]	36–44[e]	[b]	20–22	24–26	26–28
65–70[f]	UNDER 750[c]	18–20	20–26	[b]	10–12	14–16	14–16
	750–1500	24–26	28–36[e]	[b]	12–16	18–20	20–22
	1500–6000	28–32[e]	34–42[e]	[b]	16–20	22–24	26–28
	OVER 6000	30–34[e]	38–46[e]	[b]	22–24	26–30	28–30

ROADSIDE SLOPES

DOWN SLOPES = FORESLOPES



UP SLOPES = BACKSLOPES



HEAD-ON = TRANSVERSE SLOPES

Approaches
Entrances
Median Crossovers

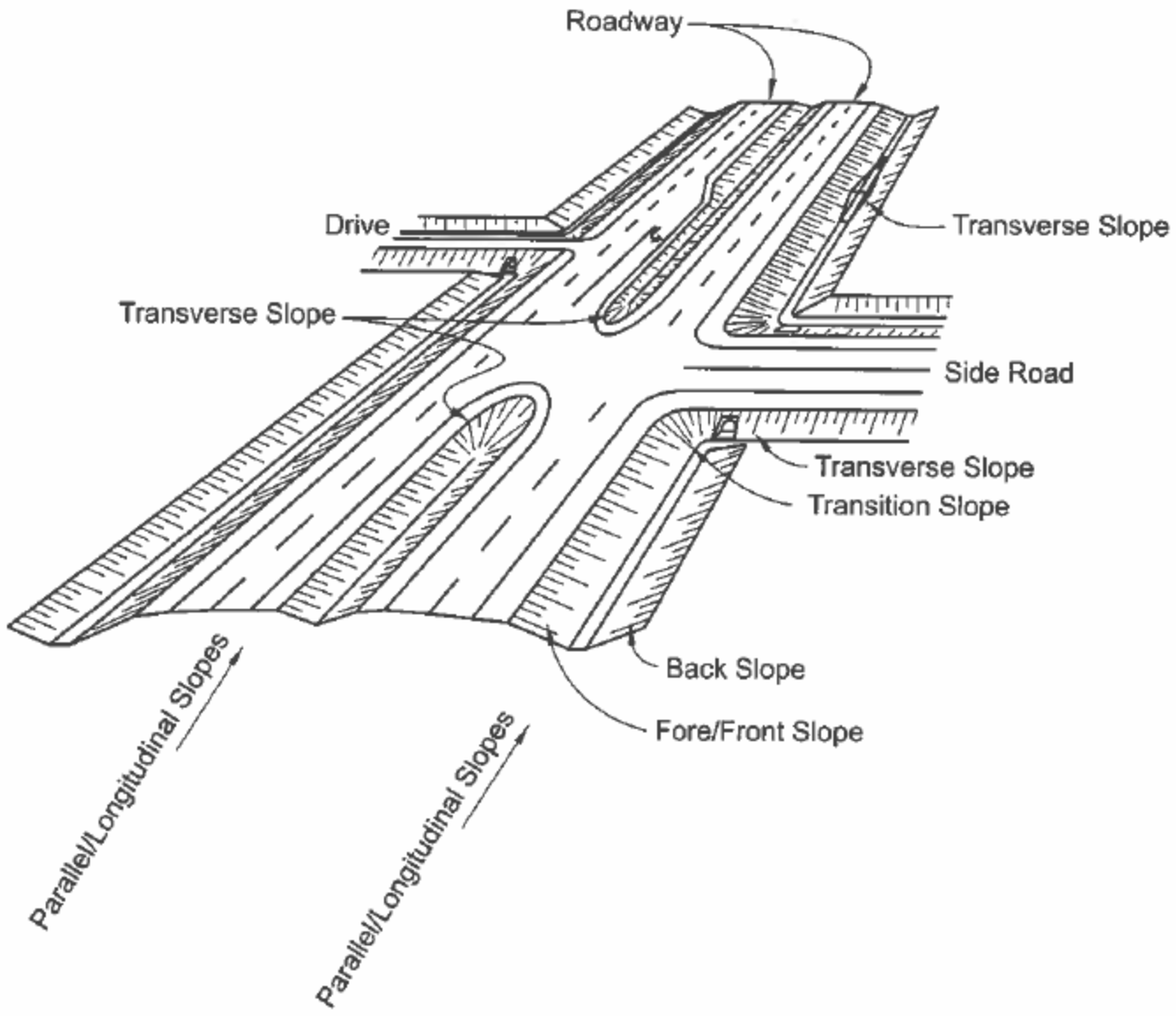


Figure 3-1. Roadway Geometry Features

Table 3-1. Suggested Clear-Zone Distances

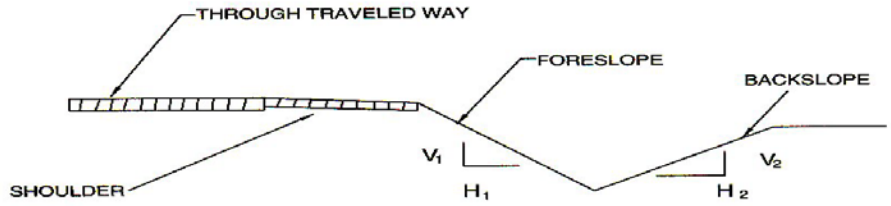
U.S. Customary Units

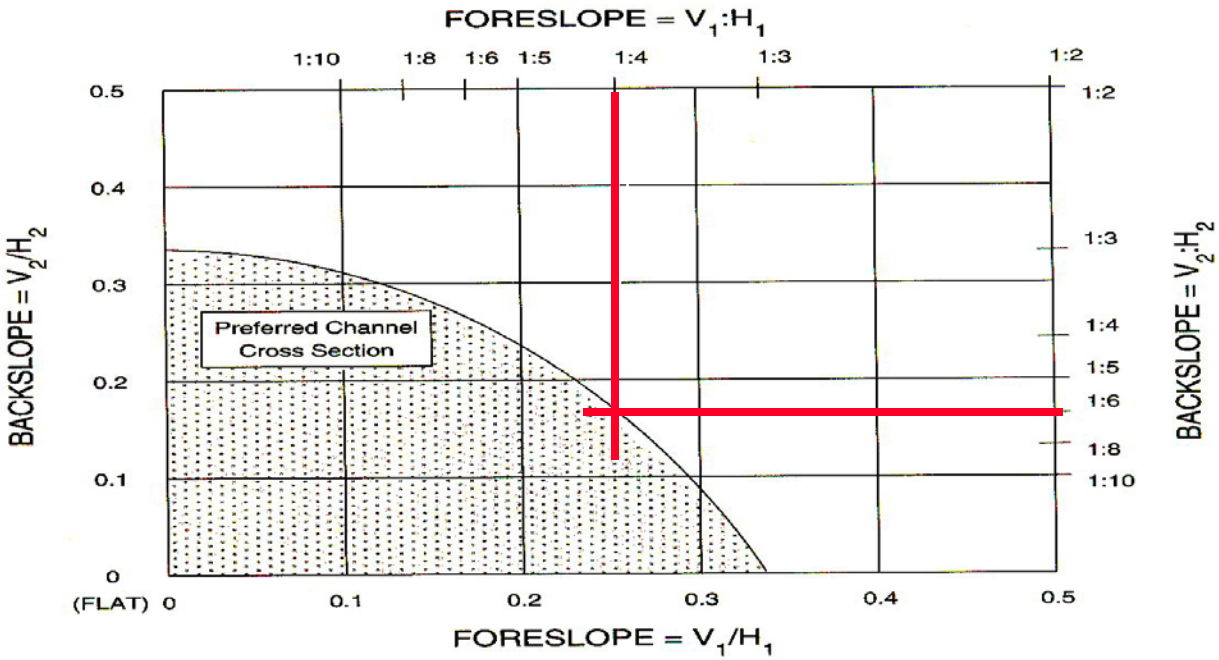
Design Speed (mph)	Design ADT	Foreslopes			Backslopes		
		1V:6H or flatter	1V:5H to 1V:4H	1V:3H	1V:3H	1V:5H to 1V:4H	1V:6H or flatter
≤40	UNDER 750[c]	7–10	7–10	[b]	7–10	7–10	7–10
	750–1500	10–12	12–14	[b]	12–14	12–14	12–14
	1500–6000	12–14	14–16	[b]	14–16	14–16	14–16
	OVER 6000	14–16	16–18	[b]	16–18	16–18	16–18
45–50	UNDER 750[c]	10–12	12–14	[b]	8–10	8–10	10–12
	750–1500	14–16	16–20	[b]	10–12	12–14	14–16
	1500–6000	16–18	20–26	[b]	12–14	14–16	16–18
	OVER 6000	20–22	24–28	[b]	14–16	18–20	20–22
55	UNDER 750[c]	12–14	14–18	[b]	8–10	10–12	10–12
	750–1500	16–18	20–24	[b]	10–12	14–16	16–18
	1500–6000	20–22	24–30	[b]	14–16	16–18	20–22
	OVER 6000	22–24	26–32[a]	[b]	16–18	20–22	22–24
60	UNDER 750[c]	16–18	20–24	[b]	10–12	12–14	14–16
	750–1500	20–24	26–32[a]	[b]	12–14	16–18	20–22
	1500–6000	26–30	32–40[a]	[b]	14–18	18–22	24–26
	OVER 6000	30–32[a]	36–44[a]	[b]	20–22	24–26	26–28
65–70[d]	UNDER 750[c]	18–20	20–26	[b]	10–12	14–16	14–16
	750–1500	24–26	28–36[a]	[b]	12–16	18–20	20–22
	1500–6000	28–32[a]	34–42[a]	[b]	16–20	22–24	26–28
	OVER 6000	30–34[a]	38–46[a]	[b]	22–24	26–30	28–30

Clear zones may be limited to 30 ft for practicality and to provide a consistent roadway template if previous experience with similar projects or designs indicates satisfactory performance.

For roadways with low volumes it may not be practical to apply even the minimum values found in Table 3-1. Refer to Chapter 12 for additional considerations for low-volume roadways and Chapter 10 for additional guidance for urban applications.

ROADSIDE DITCHES

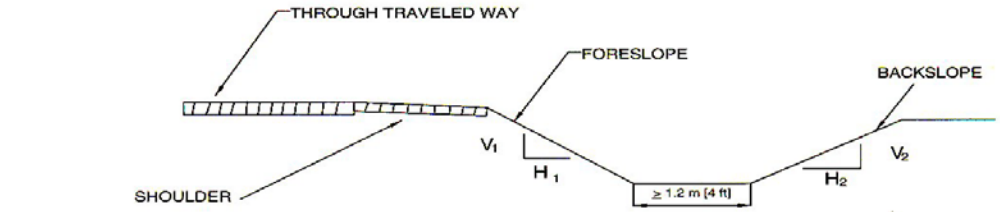


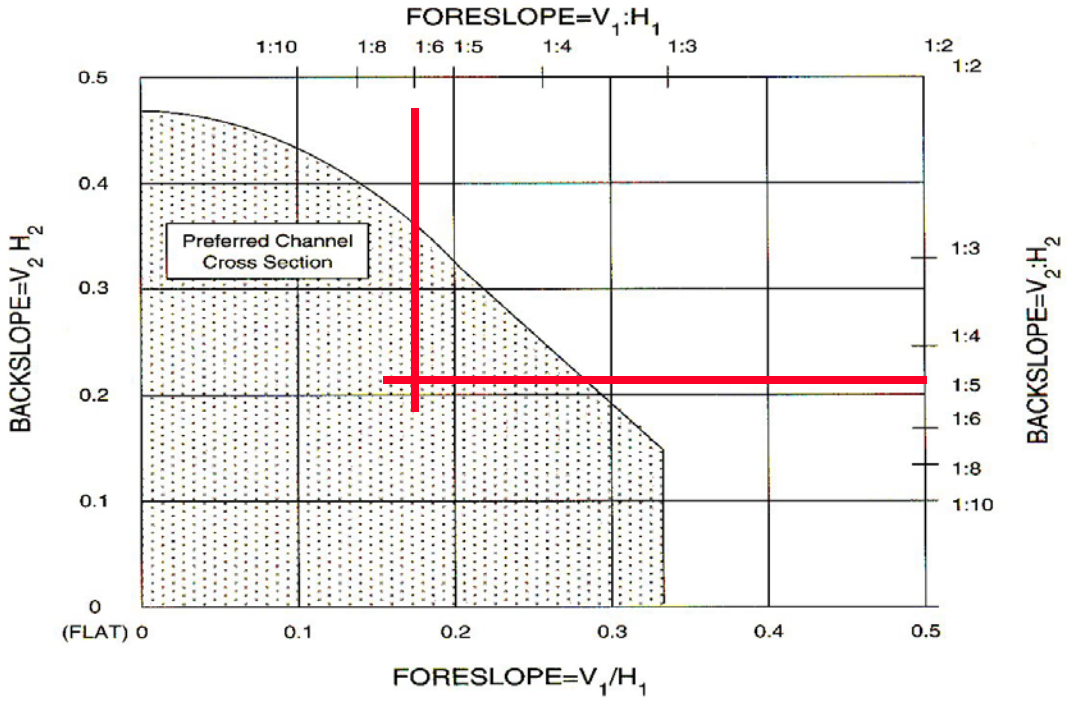


*This chart is applicable to all Vee ditches, rounded channels with a bottom width less than 2.4 m [8 ft] and trapezoidal channels with bottom widths less than 1.2 m [4 ft].

FIGURE 3.6 Preferred cross sections for channels with abrupt slope changes

ROADSIDE DITCHES





*This chart is applicable to rounded channels with bottom widths of 2.4 m [8 ft] or more and to trapezoidal channels with bottom widths equal to or greater than 1.2 m [4 ft].

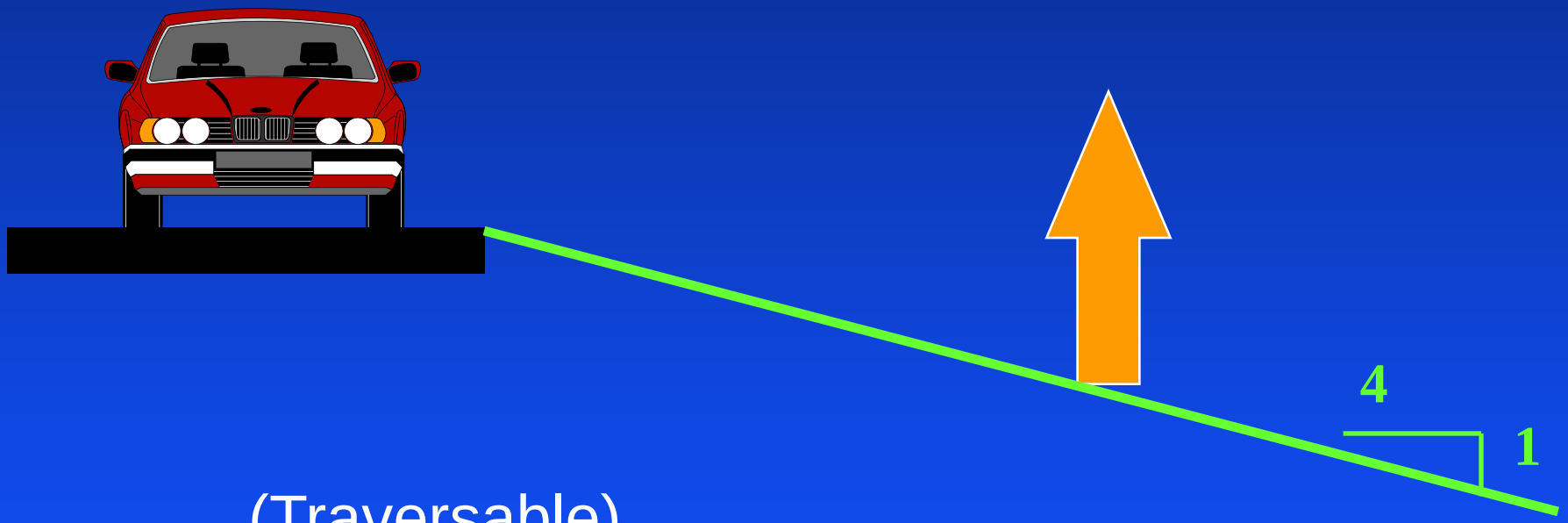
FIGURE 3.7 Preferred cross sections for channels with gradual slope changes

Parallel Slopes

- **Recoverable: 4:1 or Flatter
- **Non-Recoverable: 3:1 to 4:1
- Critical: Steeper than 3:1

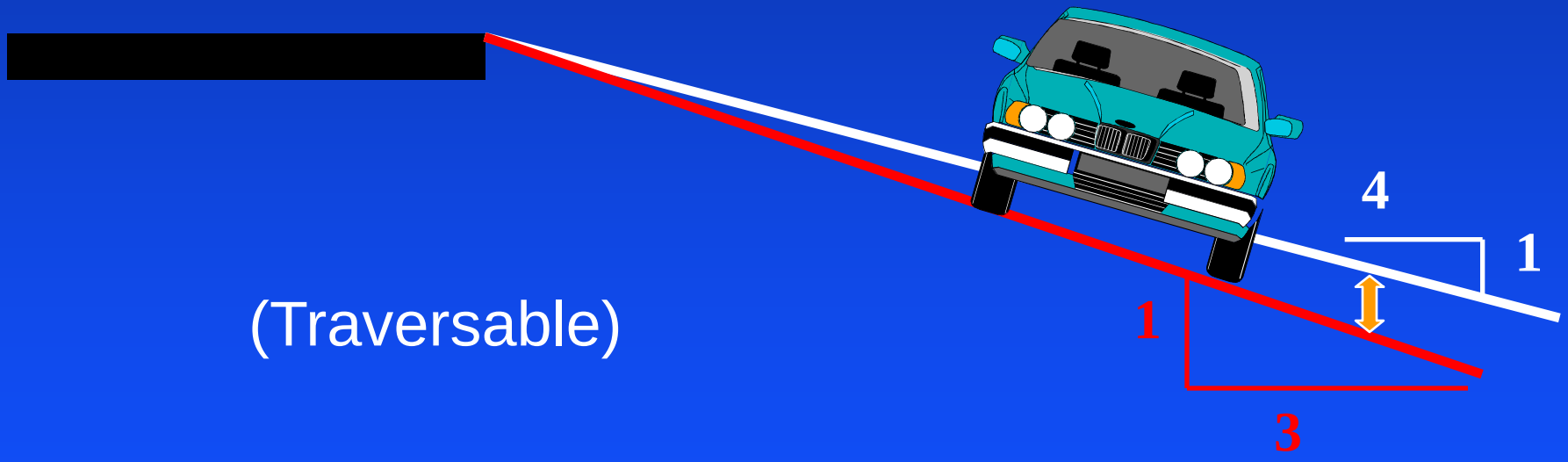
**Traversable

Recoverable



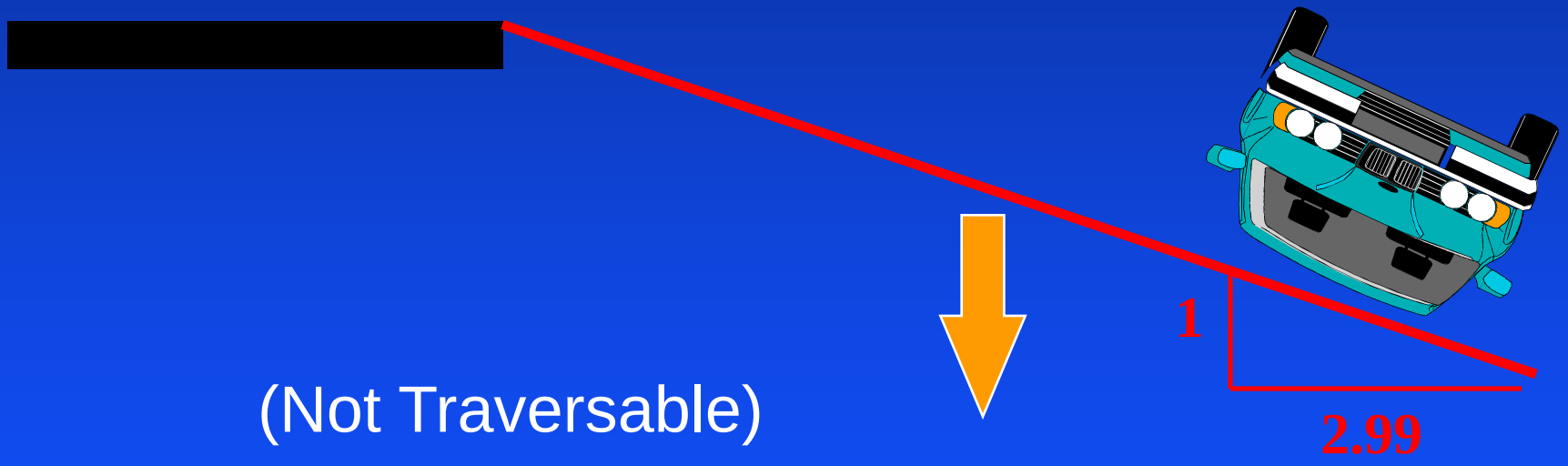
(Traversable)

Non-Recoverable



(Traversable)

Critical



(Not Traversable)


NORTH
27
EAST
68

CLEAR ZONES
IN

LOW SPEED – LOW VOLUME CONDITIONS

BARRIER GUIDE
For Low Volume and Low Speed Roads

Publication No. FHWA-CFL/TD-05-009 November 2005

U.S. Department of Transportation
Federal Highway Administration

CTIP

Federal Lands Highway
Commitment to Excellence

Central Federal Lands Highway Division
12300 West Dakota Avenue
Lakewood, CO 80228

Barrier Guide for Low Volume and Low Speed Roads

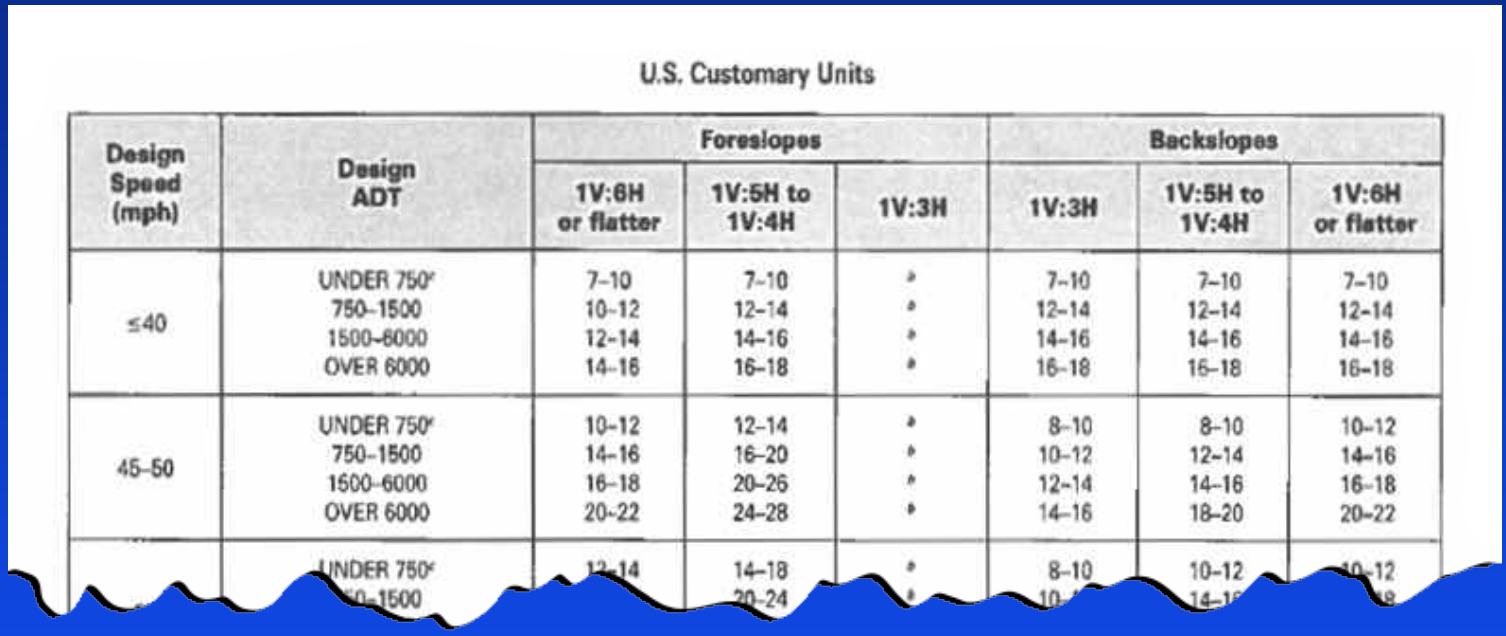
Table 2.1

Table 2.1: Clear Zone Distances from Edge of Through Traveled Way

(Continued) (U.S. Customary Units)

DESIGN SPEED	DESIGN ADT	FORESLOPES			BACKSLOPES		
		1V: 6H or flatter	1V: 5H to 1V: 4H	1V: 3H	1V: 3H	1V: 5H to 1V: 4H	1V: 6H or flatter
20 mph	Under 750	2 - 6	3 – 7	**	2 - 6	2 - 6	3 - 7
	750 - 1500	3 - 7	5 - 8		2 - 6	2 - 6	3 - 7
	1500 - 6000	5 - 8	6 - 10		3 - 7	3 - 7	5 - 8
	over 6000	7 - 10	7 - 10		5 - 8	5 - 8	7 - 10
25 - 30 mph	Under 750	3 - 7	5 – 8	**	2 - 6	2 - 6	3 - 7
	750 - 1500	5 - 8	6 - 10		3 - 7	3 - 7	5 - 8
	1500 - 6000	7 - 10	7 - 10		5 - 8	5 - 8	7 - 10
	over 6000	7 - 10	10 - 12		7 - 10	7 - 10	7 - 10
35 mph	Under 750	5 - 8	6 – 10	**	3 - 7	3 - 7	5 - 8
	750 - 1500	7 - 10	7 - 12		5 - 8	5 - 8	7 - 10
	1500 - 6000	10 - 12	12 - 14		7 - 10	7 - 10	10 - 12
	over 6000	12 - 14	14 - 16		10 - 12	10 - 12	12 - 14

Roadside Design Guide
Table 3-1



U.S. Customary Units

Design Speed (mph)	Design ADT	Foreslopes			Backslopes		
		1V:6H or flatter	1V:5H to 1V:4H	1V:3H	1V:3H	1V:5H to 1V:4H	1V:6H or flatter
≤40	UNDER 750[a]	7–10	7–10	[b]	7–10	7–10	7–10
	750–1500	10–12	12–14	[b]	12–14	12–14	12–14
	1500–6000	12–14	14–16	[b]	14–16	14–16	14–16
	OVER 6000	14–16	16–18	[b]	16–18	16–18	16–18
45–50	UNDER 750[a]	10–12	12–14	[b]	8–10	8–10	10–12
	750–1500	14–16	16–20	[b]	10–12	12–14	14–16
	1500–6000	16–18	20–26	[b]	12–14	14–16	16–18
	OVER 6000	20–22	24–28	[b]	14–16	18–20	20–22
	UNDER 750[a]	12–14	14–18	[b]	8–10	10–12	10–12
	750–1500		20–24	[b]			

All situations where:

Speed ≤ 40 MPH

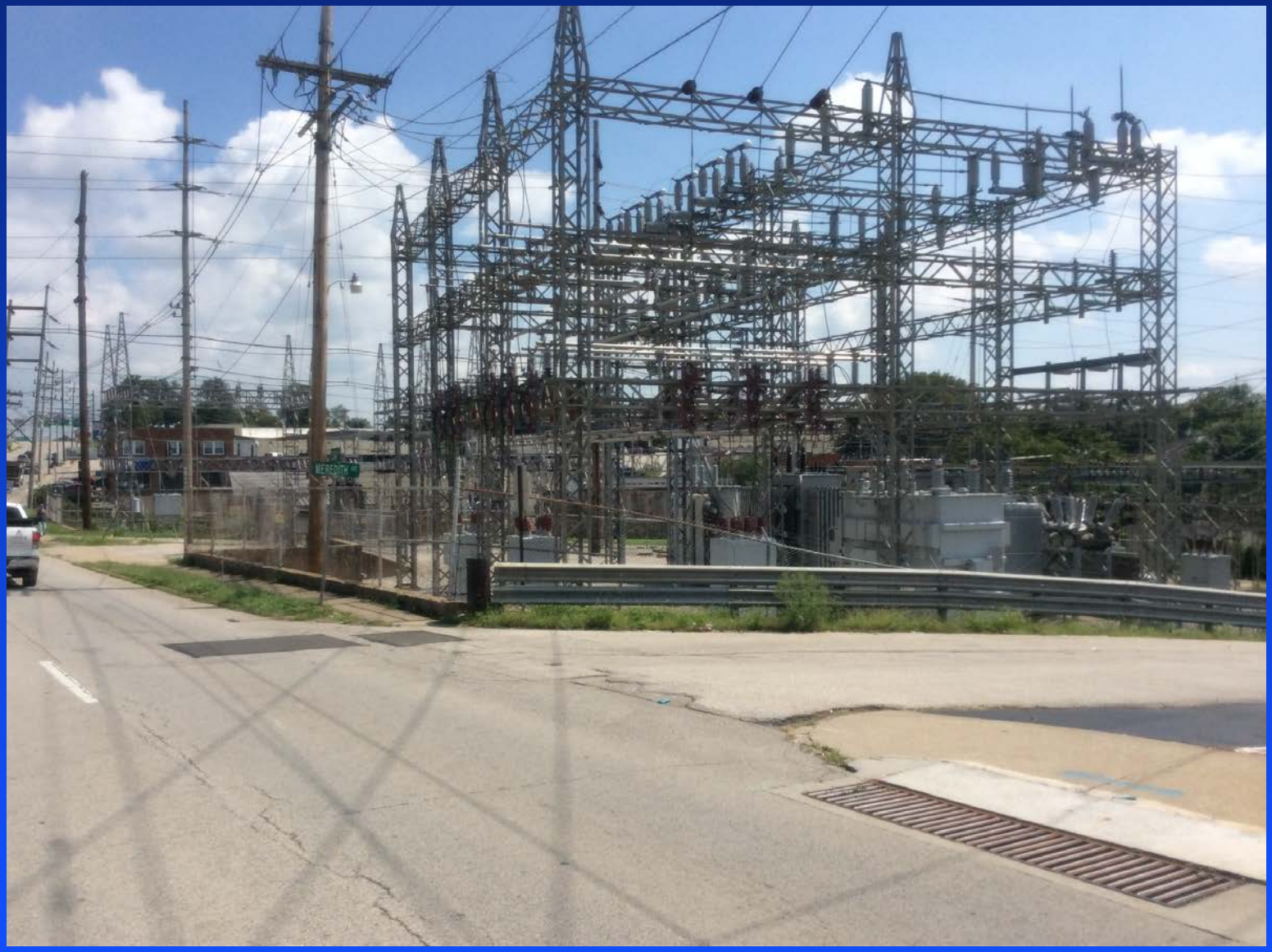
ADT < 750

Slopes DO NOT matter

How to Mitigate

- Remove or Redesign
- Relocate
- Make Breakaway
- Shield
- Delineate


SOUTH
127
TO
INTERSTATE
64
MARTHA LAYNE COLLINS
BLUEGRASS
PARKWAY
Kentucky
UNBRIDLED SPIRIT
H



CLEAR ZONES IN

Urban or Restricted Environments

Speeds

- Design Speed
- Posted Speed
- Operating Speed

45 or 45

?


LINDALL CENTER
PLATOS

Roadside Design Guide - 2011
Chapter 10
Recommendations

- 1.5 ft. minimum lateral offset
  [3.0 ft. at intersections]
- 4.0 ft. clear zone
  [8 ft. at “hot spots”]
- 6.0 ft. desirable clear zone
  [12.0 ft. at “hot spots”]
- See Chapter 3, Table 3-1 for non-curb and/or high speed

* Even minimum clear zone may not be practical in urban areas.

Roadside Design Guide

Figure 10-5

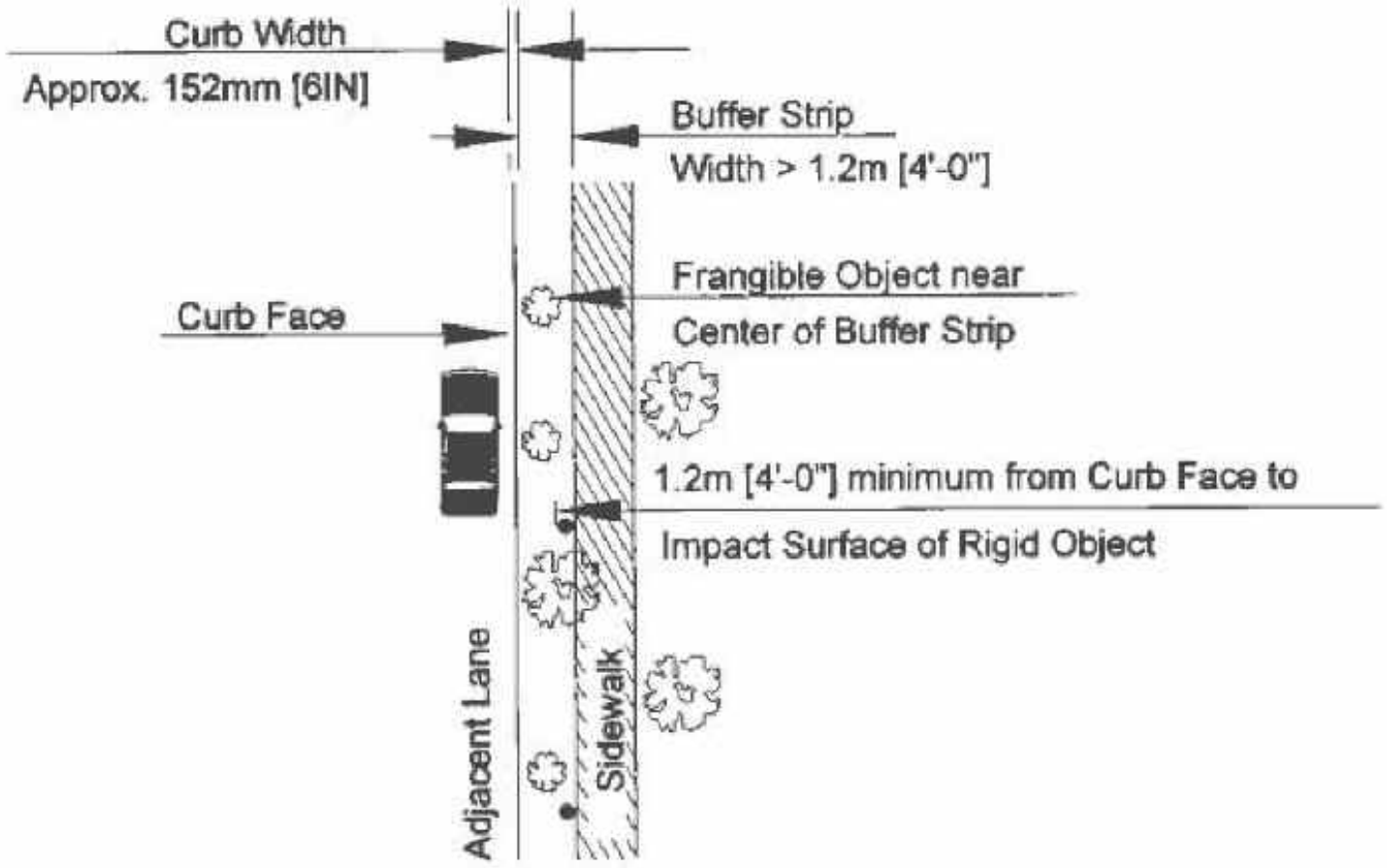


Figure ~~10-4~~. Landscape and Rigid Object Placement for Buffer Strip Widths ≤1.2 m [4 ft]

Roadside Design Guide

Figure 10-4

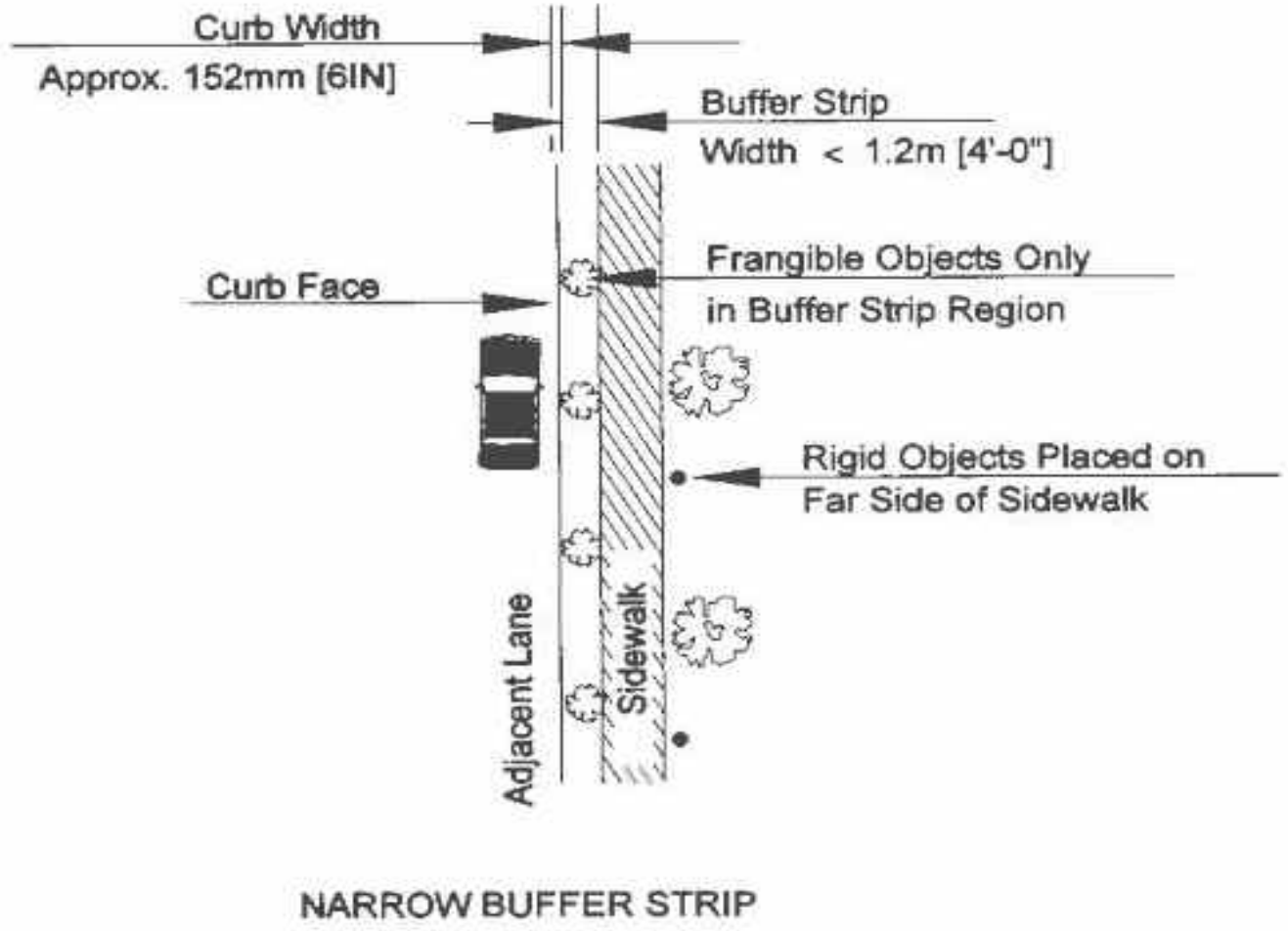


Figure 10-5. Landscape and Rigid Object Placement for Buffer Strip Widths >1.2 m [4 ft]

Evaluation of fixed Object Crashes Urban Corridors – Raised Curb

Lat. Dist.	Crashes	%	Cumul.%
0-1’	129	28.3%	28.3%
1-2’	157	34.4%	62.7%
2-4’	90	19.7%	82.5%
4-6’	50	11.0%	93.4%
6-8’	23	5.0%	98.5%
8-10’	6	1.3%	99.8%
10-15’	1	0.2%	100%
Total:	456	100%	

Over 80% of crashes with fixed objects 4’ or less from curb

Over 90% of crashes with fixed objects 6’ or less from curb

Source: NCHRP Report 612

OBSTACLES

~ 80% of roadside crashes involve obstacles 4 ft. or less from the face of the curb

~ 90% of roadside crashes involve obstacles 6 ft. or less from the face of the curb

Roadside Design Guide
Figure 10-2
(HOT SPOT)

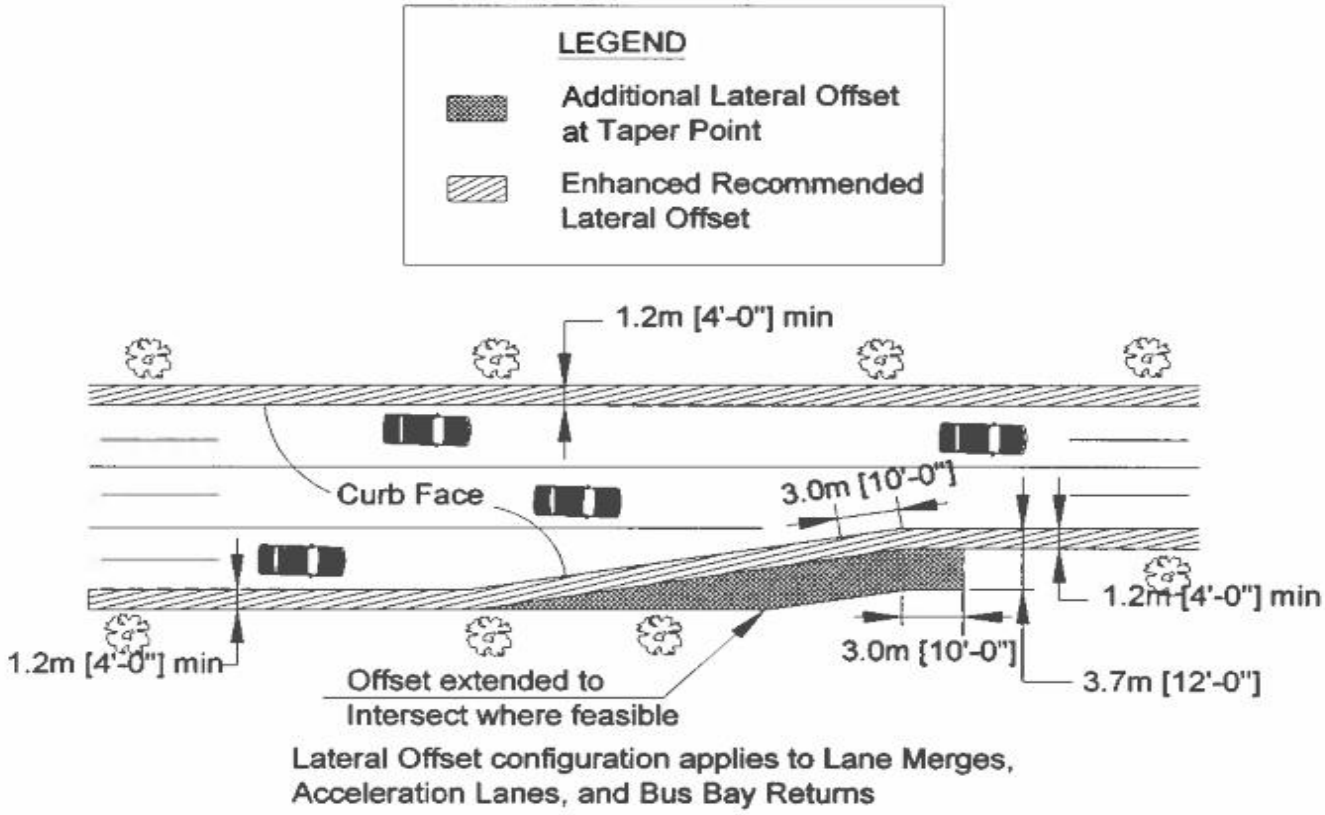


Figure 10-2. Enhanced Lateral Offsets at Merge Points

Roadside Design Guide
Figure 10-3
(HOT SPOT)

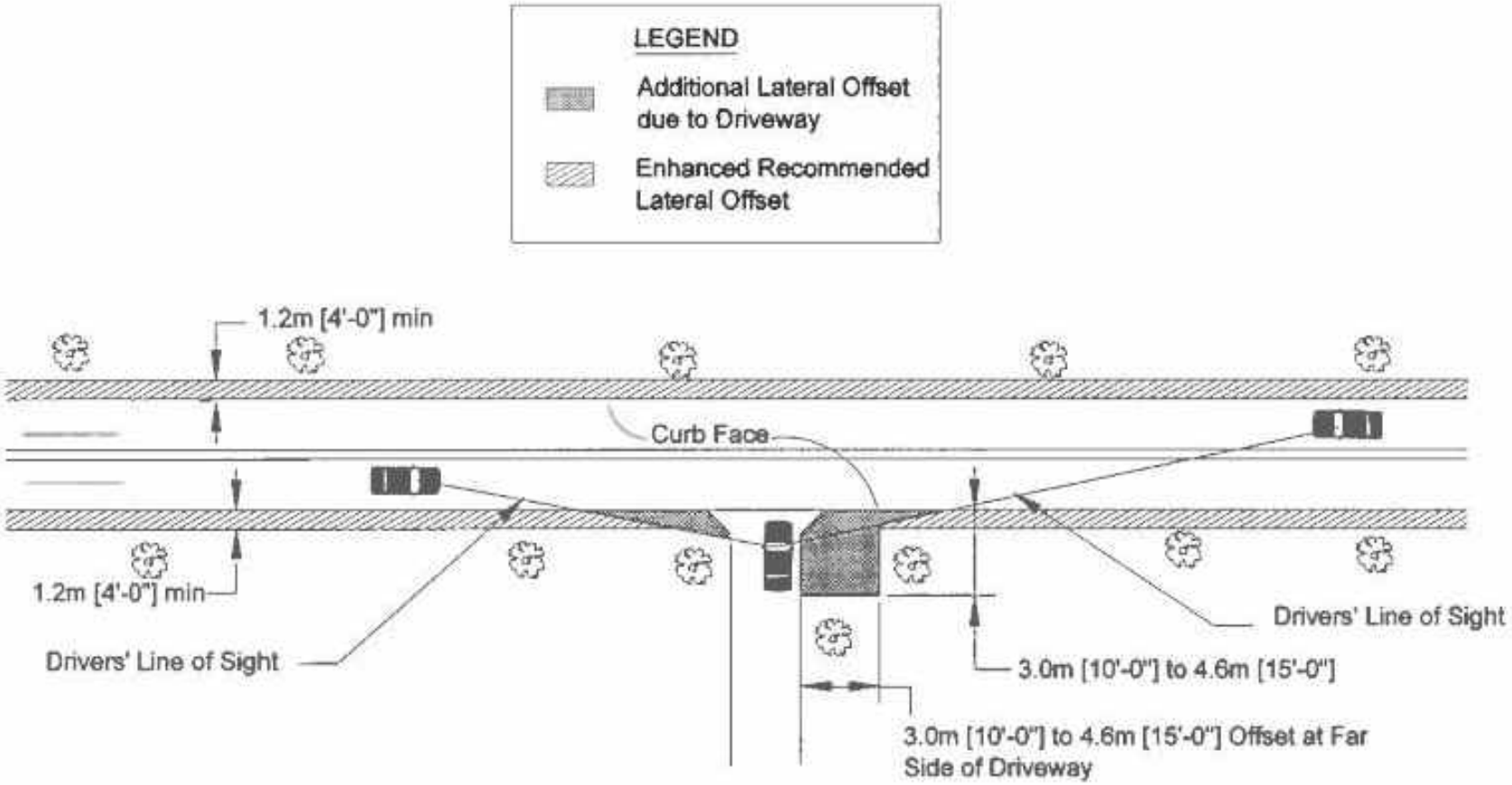
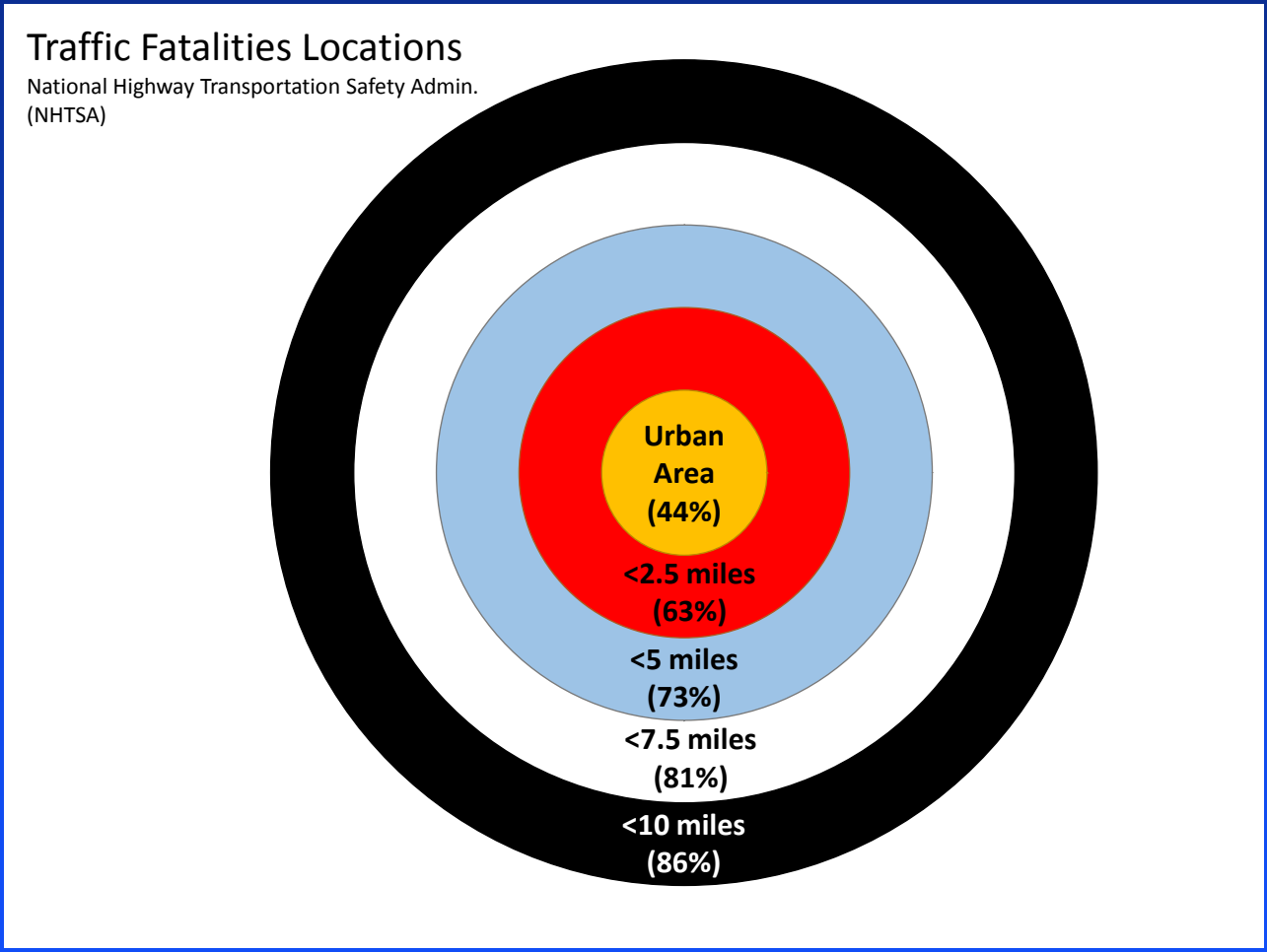


Figure 10-3. Enhanced Lateral Offsets at Driveways


CENTER FOR
KENTUCKY
HISTORY
MON–FRI
8am–5pm


VICTORIAN SQUARE
421
25

BULLSEYE


Traffic Fatalities Locations
National Highway Transportation Safety Admin. (NHTSA)
Urban Area (44%)
<2.5 miles (63%)
<5 miles (73%)
<7.5 miles (81%)
<10 miles (86%)


JOYLAND
BOWL
FOR SALE
4.7± ACRES
COMMERCIAL
POTENTIAL


Johnston

YTC GUIDANCE

FOR URBAN CLEAR ZONES

(Chapter 10 – Roadside Design Guide)

With Curbs:

1.5 ft. minimum lateral offset
[3.0 ft. at intersections]

4.0 ft. minimum clear zone
6.0 ft. desirable
[8.0 ft. & 12.0 ft. at “hot spots”]

Place guardrail and other barriers at the back of the berm.

IN CLOSING…

Rural –

Roadside Design Guide - Chapter 3 (chart 3-1)

Low Speed/Low Volume –

Barrier Guide for Low Volume and Low Speed Roads

Urban –

Roadside Design Guide – Chapter 10
NCHRP Report 612

References

- AASHTO. *A Policy on Geometric Design of Highways and Streets*. 5th ed. American Association of State Highway and Transportation Officials, Washington, DC., 2011.

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- FHWA. *Barrier Guide for Low Volume and Low Speed Roads.* FHWA/TD-05-009. Federal Highway Administration, Washington, DC., 2005.

- FHWA. *Manual on Uniform Traffic Control Devices (*MUTCD). Federal Highway Administration, U.S. Department of Transportation, Washington, DC., 2009.

- KYTC. *Highway Design Manual.* Kentucky Department of Transportation, Frankfort, KY, 2006.

Questions about Clear Zones??

THANK YOU

Review

1. If curb is present there is no need for a clear zone. (True/False)

Review

2. Principles of roadside safety design should not be ignored on urban streets. (True/False)

Review

3. Safety should be an objective of CSS. (True/False)


Fresh coat
of coverage.
Allstate.


Fresh coat
of coverage.
Allstate
ONLY