



Safe & Inclusive Road Designs in Central Asia

14 November 2024

United Nations Economic and Social Commission for Asia and the Pacific

Review of road design standards and practices – Part 2: Summary of the technical content

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Chapter 4 Initial planning and Feasibility Study

It is a key recommendation of our work that road safety must be addressed much more fully in the Feasibility Study stage of new road projects.

Leaving any assessment of road safety until a Road Safety Audit of the Final Design is **far too late**.



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Chapter 4 Initial planning and Feasibility Study

The key assessments in the Feasibility Study specific to road safety should be:

- **Road Safety Review.**
- **Road Safety Impact Assessment**
- **Road Safety Audit of the Feasibility Study** conclusions and recommendations

For discussion with local designers to identify effective guidance.



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Chapter 4 Initial planning and Feasibility Study: Road function

But also key decisions must be made as a basis for deciding design standards.

The road function must be decided unambiguously, a balance between serving:

- higher speed non-stopping, traffic movements, or
- slower speed turning and stopping traffic accessing local frontages on both sides of the road.





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Chapter 4 Initial planning and Feasibility Study: Road function

A road cannot meet both objectives efficiently and safely, at the same time along the same section. Higher speeds mean more restrictions on access. More access means lower speeds.





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Chapter 4 Initial planning and Feasibility Study: Road function

Choice of alternative routes, and whether to bypass villages and towns

New Class I and II roads of international and national importance should always bypass villages and towns. They carry significant volumes of through traffic, with substantial numbers of heavy vehicles, at higher speeds, with unacceptable impacts if routed through villages and towns.

The need for Class III roads to bypass is more marginal, to be assessed on the extent of the impacts of the traffic on the community. Communities gain economic benefits from providing services such as food, accommodation, and vehicle servicing and repairs. However any traffic diverted will require additional effective speed management.



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Chapter 4 Initial planning and Feasibility Study

As part of the process of deciding the design standards, key design parameters must be established for:

- **Speed management** – see Chapter 5
- **Safe accessibility for all** – see Chapter 6



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Chapter 5 Speed management: Strategy

Management of speed - and overtaking - are fundamental to road safety.

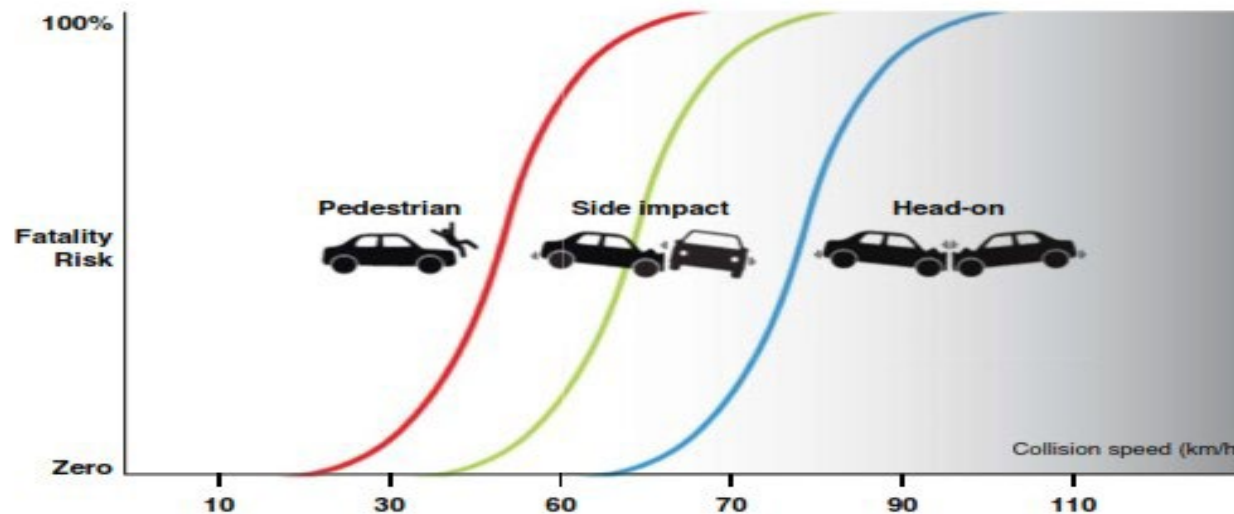


Figure 3: Crash types and indicative fatality risk at speeds (source: Wrangborg, 2005, p14)



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Chapter 5 Speed management: Strategy

(*) A Speed Management Strategy needs to be established before the design standards are chosen





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Chapter 5 Speed management: Definitions of speed

Three concepts/measures of speed

Maximum desirable operating speed

Speed limit

Design speed



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Chapter 5 Speed management: Desirable operating speeds





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Chapter 5 Speed management: Speed limits





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Chapter 5 Speed management: Speed limits

(*)





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Chapter 5 Speed management: Design speeds





Chapter 5 Speed management: Design speeds

Key road safety issues to be decided in the Feasibility Study stage are:

- (1) **Speed management strategy** including:
- desirable operating speeds,
 - speed limits.
 - design speeds,



Session II: Settlements

Nº	Name of Settlements	Beginning section	Ending section	Length, m
1	Chon-Jargylchak	145+100	146+200	1100
2	Kichi-Jargylchak	149+000	151+700	2700
3	Ak-Terek	152+500	155+900	3400
4	Chychkan	160+200	162+700	2500
5	Saruu	168+100	172+000	4100
6	Darhan	172+500	175+500	3000
7	Kyzyl-Suu	178+200	183+800	5600
8	Orgochor	185+000	186+100	1100
9	Shalba	195+900	199+000	3100
10	Jele-Dobo	199+800	201+600	1800
11	Kytai	204+900	205+100	200
12	Kyzyl-Dyikan	206+800	207+700	900
13	Kalinovka	208+000	208+700	700
14	Karakol	214+700	215+767	1067
				31267



■ Non-inhabited sections - 31.3 km

■ Populated sections – 43.9 km





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Chapter 5 Speed management: Infrastructure measures

Rumble strips





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Chapter 5 Speed management: Infrastructure measures

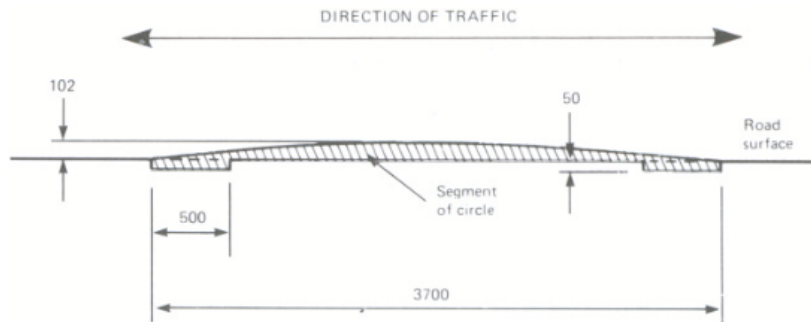


Fig.5.1. Road hump cross-section and dimensions
(Dimensions in mm)





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Chapter 5 Speed management: Infrastructure measures



(a)

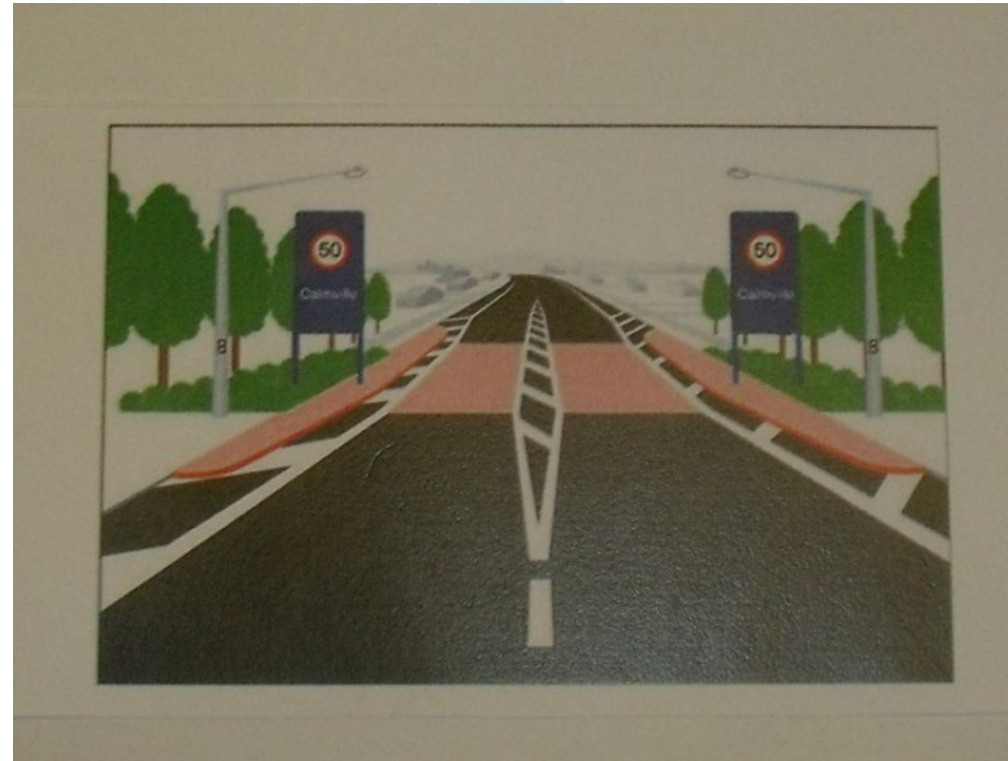


(b)



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Chapter 5 Speed management: Gateway treatments





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Chapter 5 Speed management: Speed camera enforcement





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Chapter 5 Speed management: Vehicle actuated warning signs





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Chapter 5 Speed management – Overtaking restrictions





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Chapter 6 Safe accessibility for all road users – All road users





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Chapter 6 Safe accessibility for all road users - Pedestrians

Footways

Crossings

Staggered pedestrian crossings

Pedestrian guardrailing and barriers

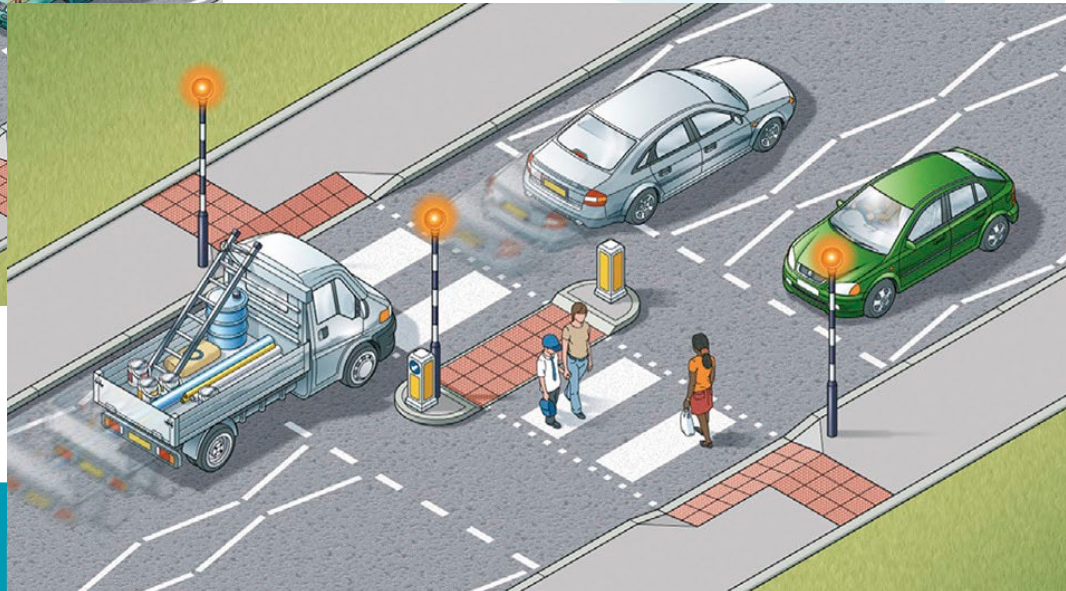
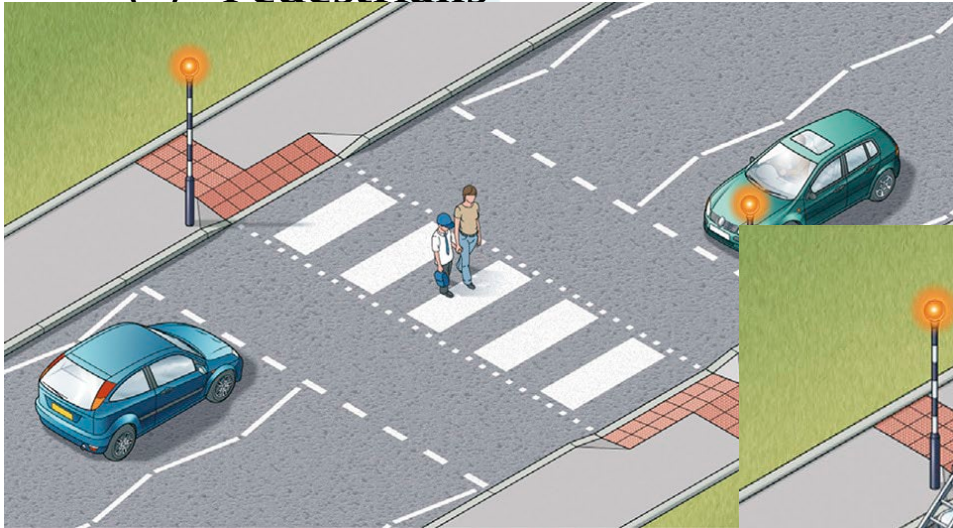




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Chapter 6 Safe Accessibility for all road users - Pedestrians

(*) Pedestrians





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Chapter 6 Safe Accessibility for all road users





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Chapter 6 Safe Accessibility for all road users - Cyclists

**Cyclists in rural areas
Crossings**

Cyclists in rural areas should be expected to use the paved hard shoulders, and dismount to share pedestrian crossing points .



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Chapter 6 Safe Accessibility for all road users – Rural bus stops

Rural bus stops, bays, and shelters

Rural bus services tend to stop at side roads, or adjacent to roadside sites.

This can typically be accommodated on a paved hard shoulder, without the need for a formal bay.

Shelters can be provided for convenience.

Pedestrian crossing facilities should be provided, without zebra markings as described above.



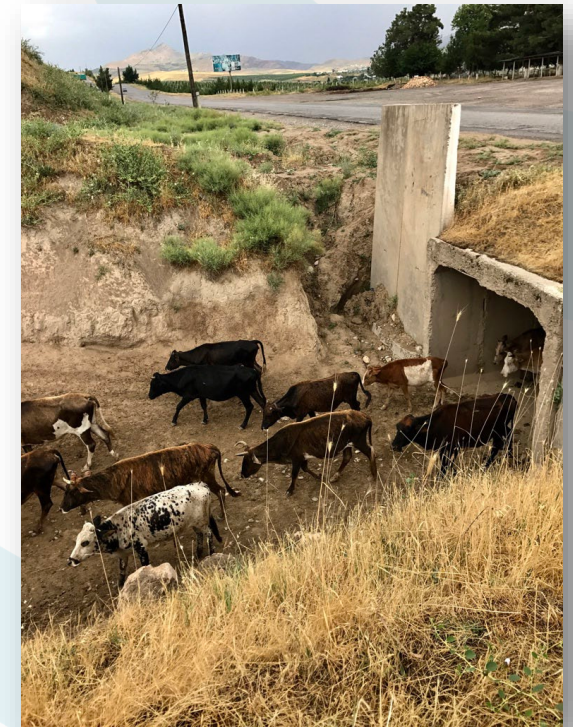
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Chapter 6 Safe Accessibility for all road users – Animals on roads

Four possible issues can be identified, typical to the central Asia region:

- Herds being driven along roads.
- Herds crossing the road at specific times of day
- Individual animals kept at home at night, but left to roam during the day.
- Wild animals crossing the road.

The Guidance makes practical proposals for each situation.





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Chapter 6 Safe Accessibility for all road users - Motorcyclists

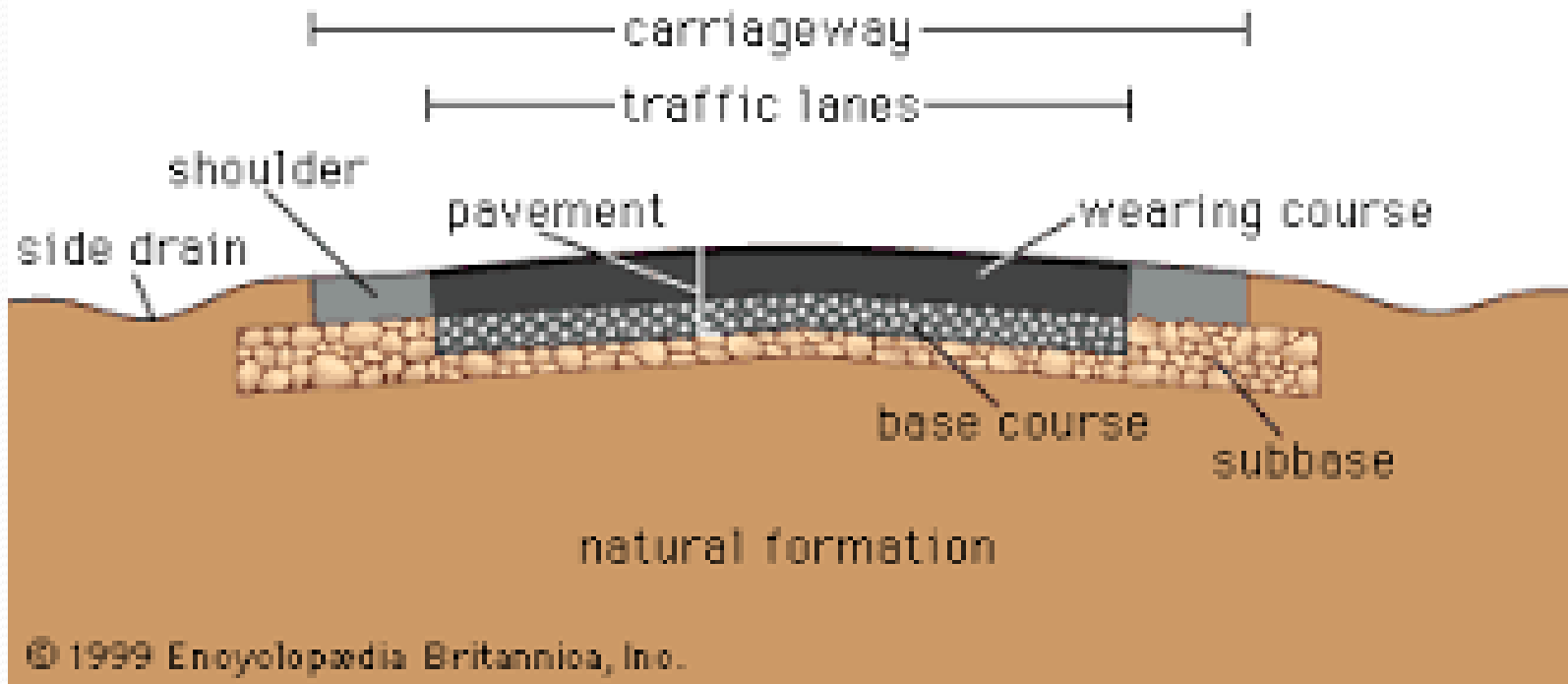
In general motorcyclists can be expected to use a paved hard shoulder.





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Chapter 7 Cross section: On-road elements





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Chapter 7 Cross section: On-road elements

The importance of side and height clearances





Chapter 7 Cross section: On-road elements

The importance of side and height clearances



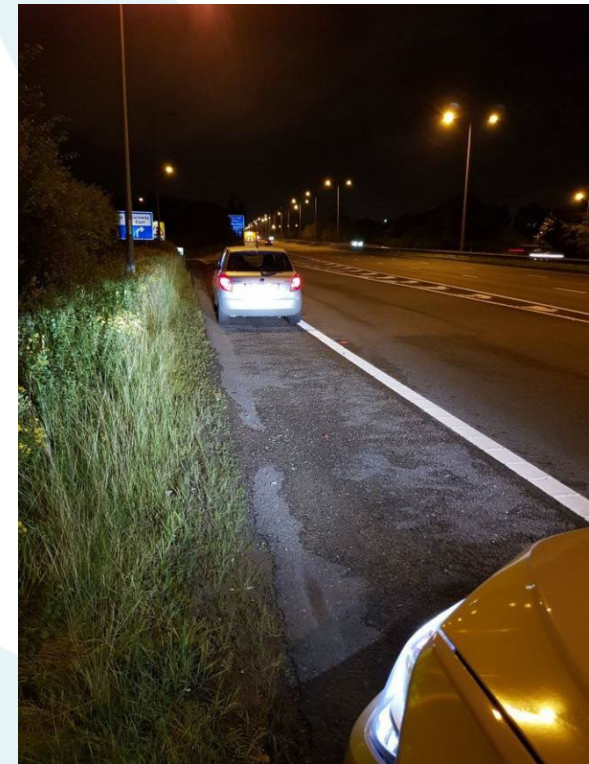


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Chapter 7 Cross section: On-road elements

Lane widths

Shoulders – width, paved?





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Chapter 7 Cross section: On-road elements

Crossfall: Continuation of crossfall across the shoulder, without change of level





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Chapter 7 Cross section: On-road elements

Medians

The main objective of a central median is to prevent head-on crashes.

Medians, 4 – 6m wide, are strongly recommended on all roads of 4 or more lanes of two-way traffic.

Medians block turning movements into and out of side roads and roadside sites, and require u-turns, conveniently located.



Chapter 8 Cross section: Roadside elements

(*) Key issues for edge of road and off-road elements

Addressing loss of control of a vehicle

Making the roadway and roadside infrastructure more forgiving:





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Chapter 8 Cross section: Roadside elements – Edge delineation

Edge of carriageway white lining
Road studs



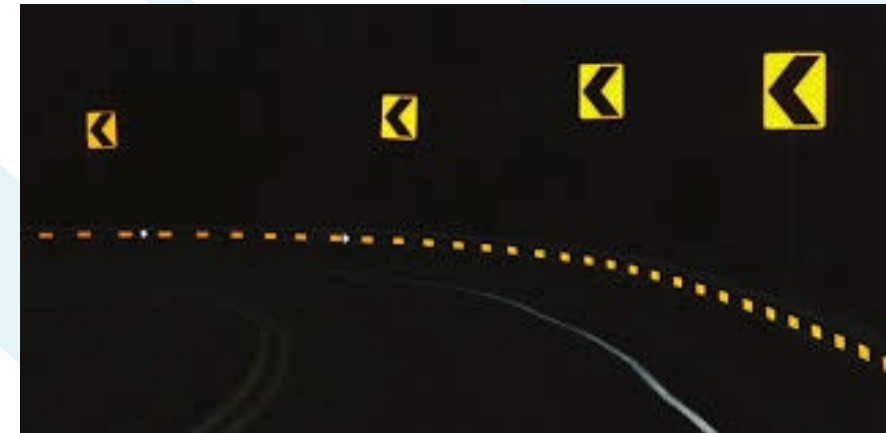


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Chapter 8 Cross section: Roadside elements

Delineator posts

Chevron alignment markers





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Chapter 8 Cross section: Roadside elements

Embankment side slopes





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Chapter 8 Cross section: Roadside elements

Drainage channel profiles and covers





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Chapter 8 Cross section: Roadside elements - Crash barriers

Tensioned wire rope fences
Steel guardrails
Concrete barriers





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Chapter 8 Cross section: Roadside elements

Crash barriers



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Chapter 8 Cross section: Roadside elements

Crash barrier end treatments





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Chapter 9 Cross section: Off-road elements - Clear Zone

Deciding the width of a Clear Zone





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Chapter 9 Cross section: Off-road elements – Clear Zone

Deciding the width of a Clear Zone

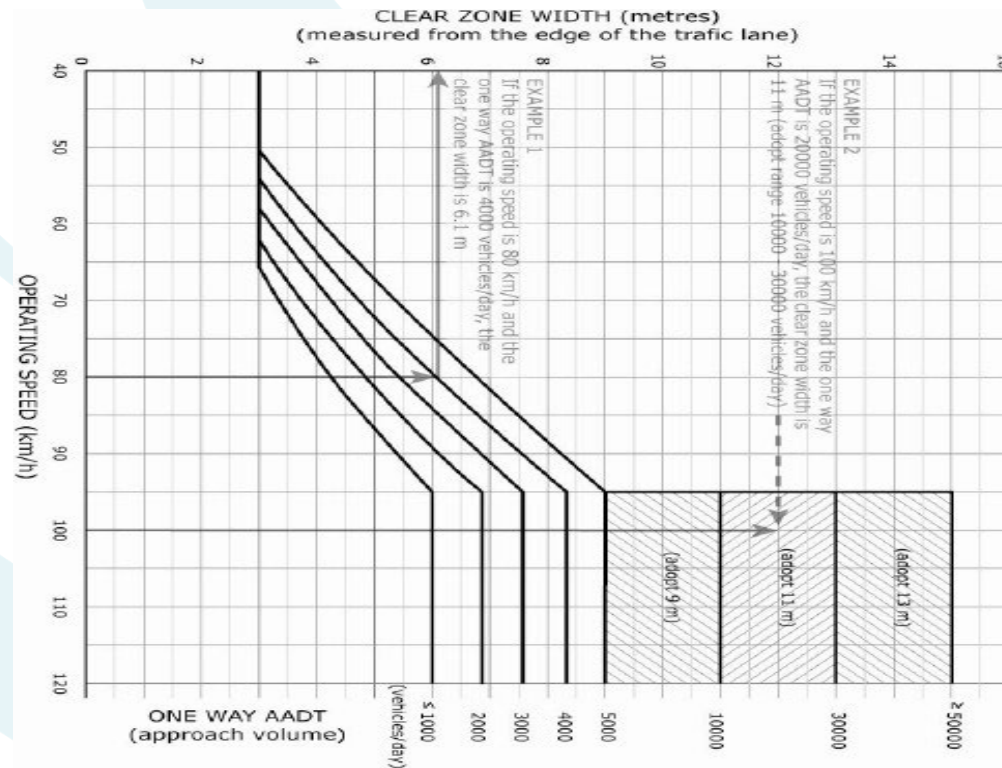


Figure V4.1: Basic Clear Zone Widths on Straights – All Roads



Chapter 9 Cross section: Off-road hazards

- road sign poles and gantries, lighting columns.
- trees
- bridge abutments, culverts, open concrete drains, other structures (often illegal).
- streams and rivers, ponds.
- utility poles and electricity lines, gas and other pipelines, telephone lines.
- railway lines.
- advertising hoardings.
- unprotected safety barrier end terminals.





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Chapter 9 Cross section: Off-road elements

Clear Zones are created by:

- a) Either **eliminating** the hazard.
- b) Or **moving** the hazard.
- c) Or **modifying** or marking the hazard to make it more “forgiving”, visible, avoidable, or less rigid.
- d) Or - **the last option - shielding** the hazard with crash barriers.



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Chapter 9 Cross section: Off-road hazards

Mature trees are an environmental benefit to be preserved if at all possible, and their removal must be the last option. Strong delineation, coupled with safety barriers in selected areas, will likely be an acceptable option.





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Chapter 10 Longitudinal alignment

This Chapter addresses:

(*) **Sight distances**
Passing
Stopping

(*) **Gradient, and climbing lanes**

(*) **Passing places on single lane roads**



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Chapter 11 Bridges and culverts

This Chapter addresses:

- (*) Standard design layout which maintains cross-section dimensions, and provides protected footways across rural bridges
- (*) Standard safety provisions for culverts
- (*) Protection of bridge structures and approaches





Chapter 12 At-grade intersections

- (*) Key road safety issues at rural at-grade junctions and intersections
- (*) Need for numerical count and crash data





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Chapter 12 At-grade intersections

(*) Choices for type of control of priority

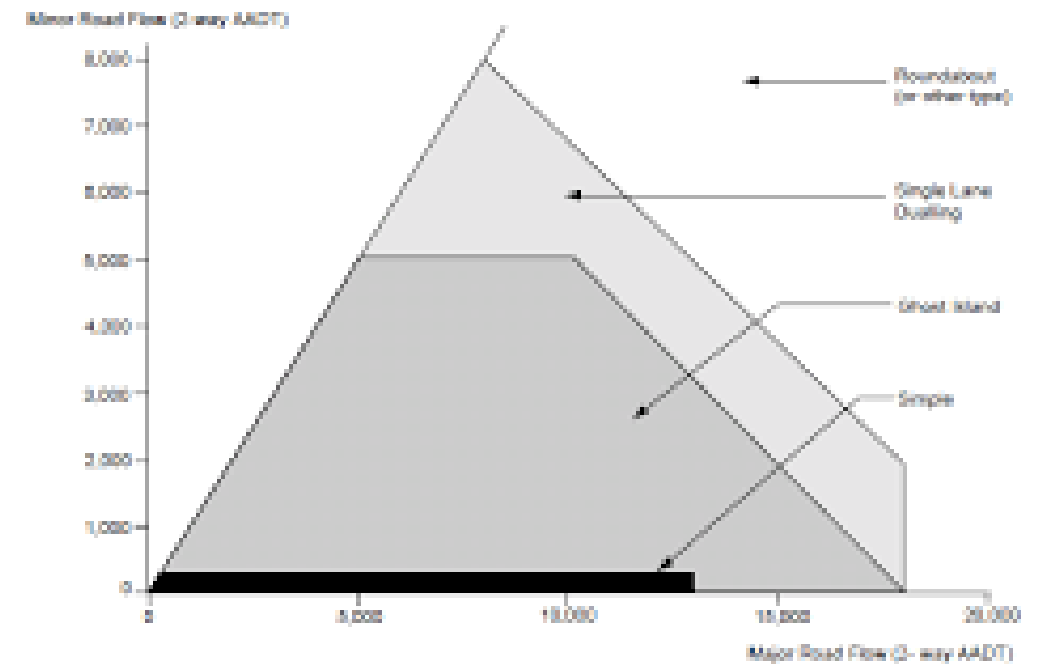


Figure 2/2 : Approximate Level of Provision of T-junctions on New Single Carriageway Roads for Various Major and Minor Road Design Year Traffic Flows (paras 2.2, 2.14)



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Chapter 12 At-grade intersections

(*) Detailed design choices for major/minor junctions and intersections

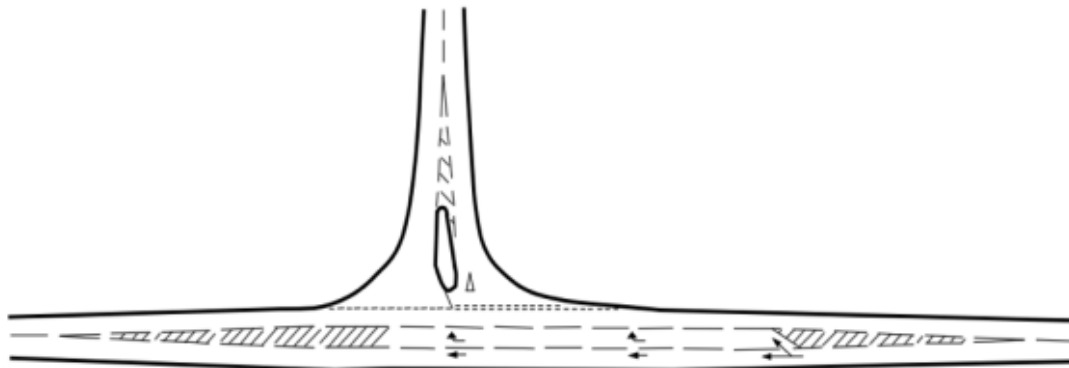
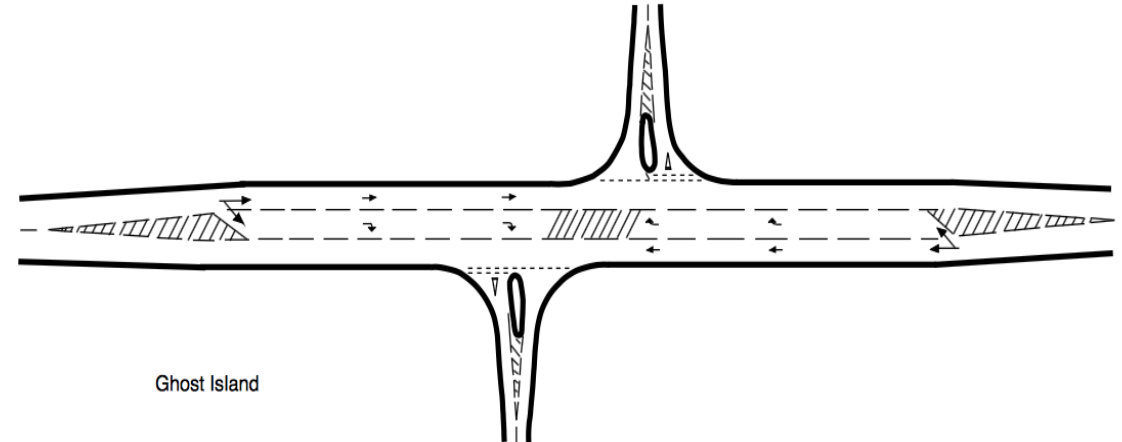


Figure 1 / 2 : Ghost Island Junction (para 1.15)



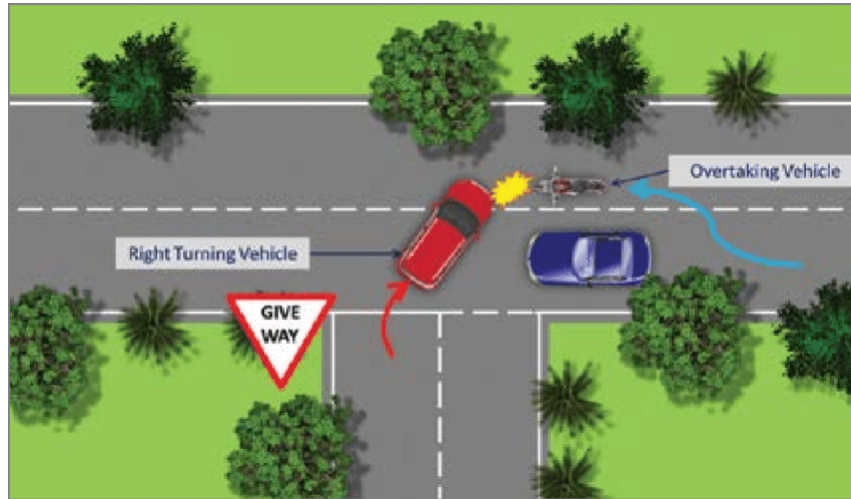
Ghost Island



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Chapter 12 At-grade intersections

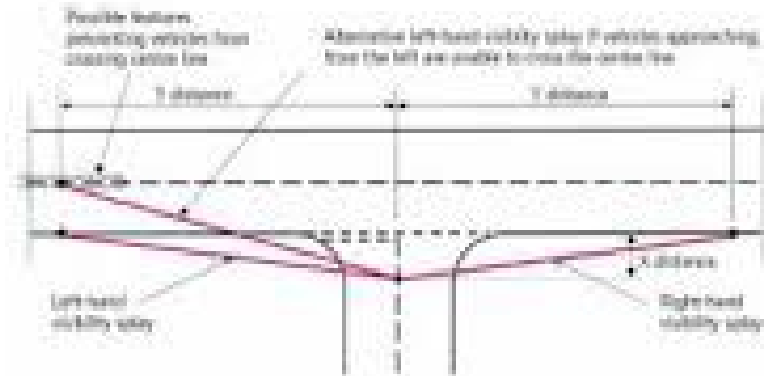
(*) Detailed design choices for major/minor junctions and intersections





Chapter 12 At-grade intersections

(*) Visibility



Source: Manual for Streets (2003), Fig 2.11b

Speed (mph)	20	25	30	37	43*	53	60
SSD adjusted for bonnet length	25	33	43	59	120	160	215
Source of National Guidelines	Manual for Streets				Design Manual for Roads and Bridges		

*Greater than 37mph less than 43mph

Table 1. Typical visibility requirements for a highway priority junction.



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Chapter 12 At-grade intersections

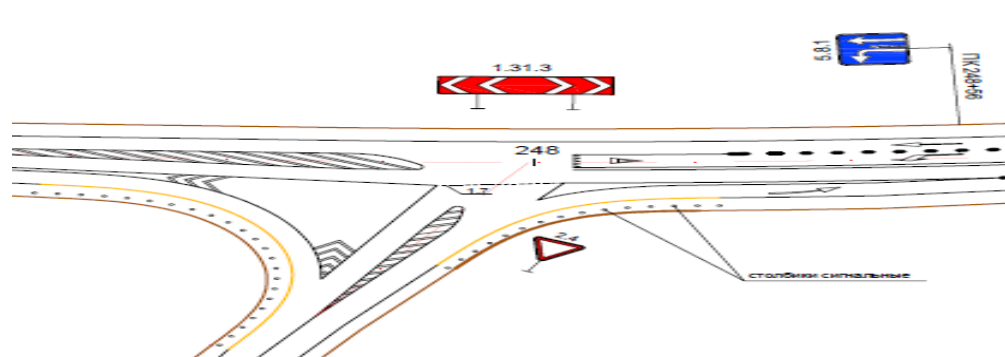
Corner radii kept low to discourage high speeds.

Channelisation.

Straight through (faster moving) movements must be separated from left-turning.

All road user needs must be considered.

or discussion with local designers to identify effective guidance.





Chapter 12 At-grade intersections - Roundabouts

Roundabouts are a versatile form of intersection control, appropriate for use on high-speed roads (design speeds higher than 80 km/h) in rural areas. In addition to operating as an intersection a roundabout can also:

- facilitate changes in road standard, for example, between dual and single carriageways.
- emphasise the transition between rural and urban environments.
- allow U-turns.
- manage large turning flows.
- bring an alignment through a sharp or sudden change of direction.





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Chapter 12 At-grade intersections - Roundabouts

On high-speed road approaches, speed reduction measures must be provided, with:

- highly visible advance warning signs.
- speed limits, appropriate signs, and roundels on the road surface
- rumble strips.

For discussion with local designers to identify effective guidance.



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Chapter 12 At-grade intersections: Traffic signals

Traffic signal control is not generally recommended on high speed roads, because of the danger of drivers failing to stop, and either going through a red signal, or running into the rear of the vehicle in front which has stopped.

In the UK “high-speed” is defined for traffic signal controls as an 85th percentile approach speed of 56 km/h.

Traffic signal control at higher speeds is possible if specific technology is used for the detection of higher approach speeds, which modifies the traffic signal timing appropriately.

For discussion with local designers to identify effective guidance.



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Chapter 12 At-grade intersections – U-turns

For discussion with local designers to identify effective guidance.



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Chapter 13 Grade separated intersections

For discussion with local designers to identify effective guidance.

Further references

UK DMRB CD 122 Geometric design of grade separated junctions



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Chapter 14 Road signs and markings

Based on the Vienna Convention on Road Signs and Markings.

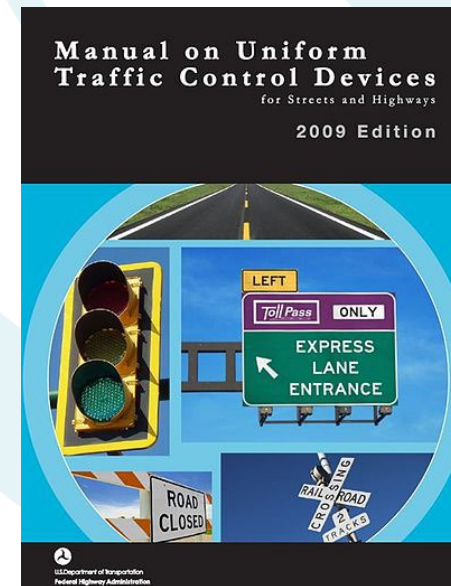
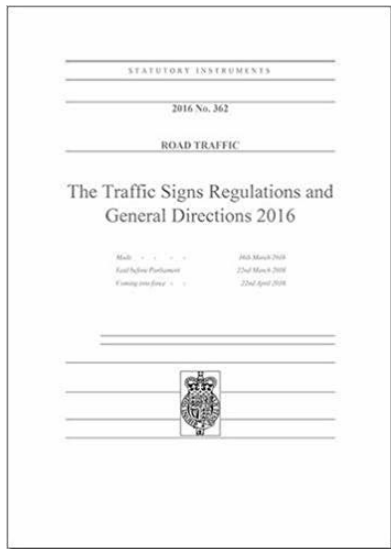




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Chapter 14 Road signs and markings

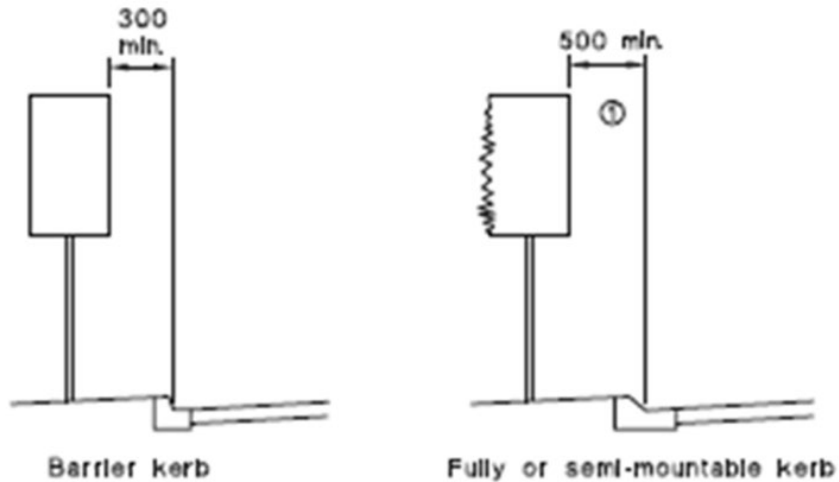
Each country produces its own laws and technical guidance, controlling the appearance of road signs and markings, , broadly following the Vienna Convention



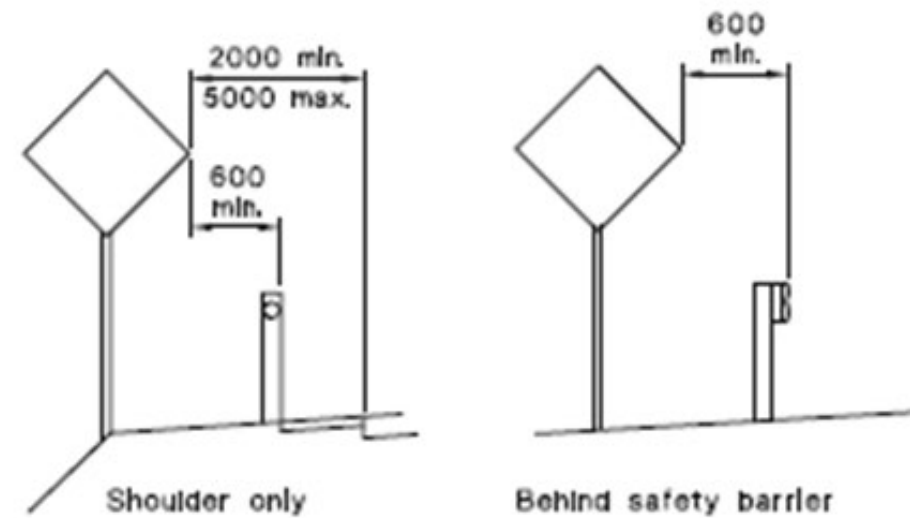


Chapter 14 Road signs and markings

(*) Height and side clearances must be achieved



(a) Side mount-kerbed roads (urban)



(b) Side mount-unkerbed roads (rural)



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Chapter 14 Road signs and markings

Location of signs at the hazard, and in advance

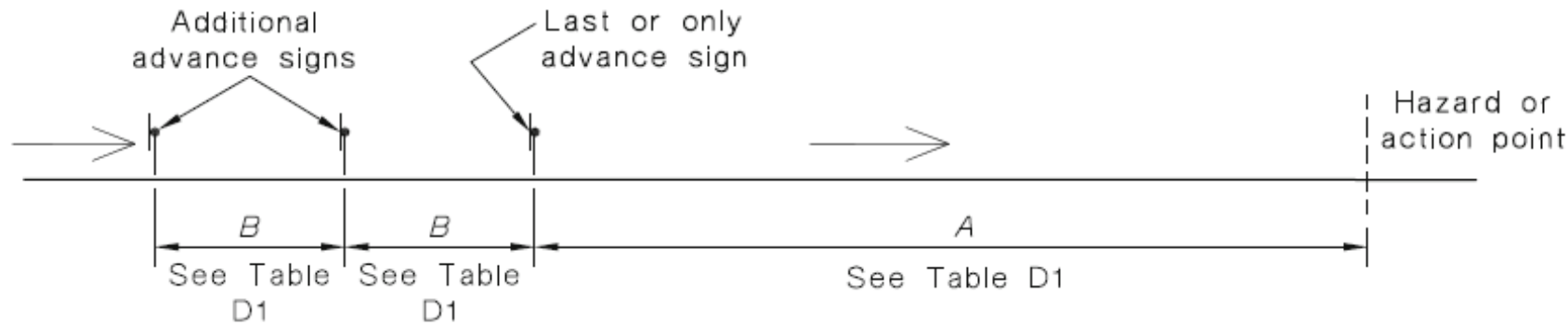


FIGURE D1 ADVANCE SIGN DISTANCES



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Chapter 14 Road signs and markings

Materials and specifications should be high quality, in particular:

- reflective in accordance with specified standards.
- durable, in particular road markings.

Higher initial cost is balanced by longer life and lower maintenance.



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Chapter 14 Road signs and markings

Sign clutter must be avoided





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Chapter 15 Street lighting - Where

Street lighting should be provided routinely in urban areas, not only for roads, but also for footways.
Street lighting should also be considered for all major intersections and tunnels on major inter-urban roads.
Street lighting should be brighter at key conflict points, major intersections, and busy pedestrian crossings.





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Chapter 15 Street lighting – Location of poles

- not placed in road shoulders, but set back as far as possible from the outer edge of shoulder - or back of the kerb.
- not placed immediately in front of crash barriers.
- not placed in medians less than 2.0m wide, except where the pole is protected by concrete crash barrier, or operating speeds are less than 80km/h.





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Chapter 15 Street lighting – Pole types

Street lighting poles are either **rigid**, or “**frangible**”.

Frangible poles are either **slip base** or **impact absorbing**.

Impact absorbing frangible poles crumple to absorb impact energy.

The area of damage is minimised, reducing danger to anyone nearby.





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Chapter 16 Construction Traffic Management

(1) Temporary traffic management through work zones

Submission of a TMP

Checking of on-site installed temporary traffic management

Recording and responding to workzone traffic crashes and injuries

(2) Design changes from the agreed and approved Final Design, during construction.



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Chapter 17 Miscellaneous other issues

- (*) **Tunnels**
- (*) **Roadside Advertisements**
- (*) **Road surface conditions,**
Friction, and skid resistance, installation of anti-skid surfacing construction and winter maintenance, snow protection?
- (*) **Lay-bys and rest areas**
- (*) **Arrester Beds**
- (*) **Railway crossings**
Pedestrian Features at Level Crossings





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Next steps

All issues are open to discussion both during and after this seminar.

The current proposed next steps are:

- by the end of November: to produce the next Working Draft Guidelines to reflect the current discussions with local stakeholders, and circulate to the Working Group for comments, and addition of illustrations.
- by mid-January: to finalise edit.
- by end of January: to finalise presentation.
- subsequently to produce individual country versions.



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Review of CAREC road design standards and practices

