



February 2002

EUROPEAN ROAD ASSESSMENT PROGRAMME

ROAD DESIGN FACTORS AFFECTING DEATH AND SERIOUS INJURY

Road design factors affecting death and serious injury – February 2002

EuroRAP rates roads outside built-up areas for the risk of traffic accidents that cause death and serious injury. It also highlights improvements that could be made to the road to reduce the likelihood of an accident, or make those that do happen survivable.

- EuroRAP does this by showing where these accidents happen and the design factors associated with them.
- Most deaths occur outside built up areas, and most of these on single carriageways;
- Roads with high accident rates are single carriageways, those with junctions joining the major road at the same level, low traffic flow and national roads;
- There are similarities between accident distributions on British roads outside built-up areas and those in the Netherlands and Sweden;
- High-risk sections of the British primary route network have been identified and it has been shown that 2400 fatal and serious injury accidents (6 per cent of the national total) could be saved if below-standard sections of road are brought up to the standard of the average.

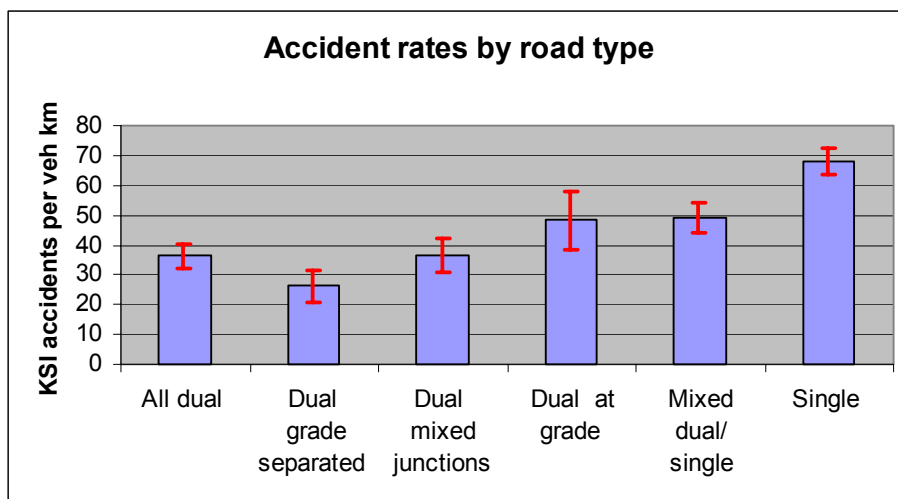
1 Where do fatal and serious injury road accidents occur?

- The majority of road deaths in Europe occur outside built-up areas;
- The majority of deaths on roads outside built-up areas are on single carriageway roads;
- In Britain, 9 per cent of deaths on major roads outside built-up areas are on the motorways, 19 per cent are on dual carriageways, 38 per cent are on single carriageways of national and regional importance and 34 per cent are on other single carriageways;
- The best indicator of overall risk for an individual traveller is the number of accidents per unit of traffic (accidents per billion vehicle kilometres). On this measure, the fatal and serious accident rate of the “A” road network in Britain is about four times that of the national motorway network;

- In overall terms the average fatal and serious accident rate on the British national “A” road network is significantly lower (about 13 per cent lower) than that on the regional (local authority) “A” road network.

2 What road features are associated with high accident rates?

- **Single carriageways** – there is significant difference between the fatal and serious accident rates for British dual, single and mixed dual-single road sections, with the dual carriageway rate averaging about half that of single carriageways, and mixed sections (having both single and dual carriageway) about three-quarters of the single carriageway rate;
- **Junctions at the same level as major roads** – British dual carriageways with split-level junctions have significantly lower fatal and serious accident rates than those with same-level junctions, averaging about half the rate for the latter sections;
- **Low traffic flow roads** – there are significant differences in fatal and serious accident rate between roads with less than 10,000 Average Annual Daily Traffic (AADT), roads with 10,000 to 20,000 AADT, and roads with more than 20,000 AADT. (The ratio of these differences is about 2.3:1.8:1);
- **Many national A-level roads** – lower-flow roads in Britain, regional “A” roads and Scottish “A” roads may have lower fatal and serious accident rates than the national A roads. (More research will examine why this should be so. It will take into account features such as spacing between junctions, level of conflicting flows, and the quality of road protection and layout.)



3 How does the picture in Britain compare with elsewhere in Europe?

EuroRAP has made a detailed analysis of accidents on roads in Britain and a preliminary analysis of the accident rates and distributions on different types of road in the Netherlands and Sweden. The findings to date show that, where comparisons can be made, the same general results are to be found in the Netherlands and Sweden, although the detail may differ;

Research for the OECD has shown that most death and serious injury accidents on European inter-urban routes can be explained by defining impacts as just four main types: "head to head"; those at junctions; impacts with objects close to the road; and impacts involving vulnerable road-users. Subsequent parts of the EuroRAP programme will provide detailed analysis in each country of accident type by standard of road, but the table below shows the protection different roads provide.

Protection from four accidents types afforded by different roads

	Motorway	Dual carriageway, junct's grade-separated	Dual carriageway, at-grade junctions	Mixed dual and single carriageway	Single carriageway
Head-to-head	High	High	High	Medium	Low
Junctions	High	High	Low	Low	Low
Roadside objects	High	High	High	Medium	Low
Vulnerable road-users	High	High	Medium	Low	Low
GB Fatal and serious/bvkm	26.4	36.6	48.2	49.1	68.0

4 Where are the British road sections with high accident rates?

- Sections of non-motorway roads in Britain with higher than average fatal and serious accident rates for the amount of traffic that they carry (although not all necessarily have a large number of fatal and serious accidents) are to be found as No-star and 1-star roads in the “GB Risk Rate ranking spreadsheet”
- Motorway sections in Britain with higher than average rates included the southern section of M1, and part of the M4, M6, M11, M20 and M25.

5 How much of the British road network needs to be brought up to the standard of the average?

- Class-A road sections in Britain with higher than average rates are distributed throughout the national and regional networks. About 600kms of regional road and 650kms of national road have rates at least twice the average rate, representing 7.5 per cent and 5.6 per cent of the network lengths respectively.
- About 131kms of motorway sections have rates about twice the average rate for motorways, representing 4.5 per cent of the motorway network.
- The potential for fatal and serious accident reduction from improvements in road network design and management can be identified. If those road sections with accident rates above the group average were improved to the group average, an annual total of some 2400 fatal and serious accidents (ie, 6 per cent of the national total) would be prevented.

