



1965 - 2005

I H I E

**INSTITUTE OF HIGHWAY
INCORPORATED ENGINEERS**



IHIE GUIDELINES FOR MOTORCYCLING

**improving safety through
engineering and integration**

version 1.1

1.1 The Scope of these Guidelines

1.1.1.1 Motorcycles have been a feature of our roads for well over a hundred years. During that time they have served as a basic mode of transport, an economical alternative to the car, a workhorse and even a lifestyle icon. Their popularity has risen and fallen in concert with a number of diverse social and economic factors. Recent years have seen an upturn in the popularity of motorcycling, bringing the advantages and disadvantages of the mode into sharp relief, the most obvious of the latter being safety. Although motorcycles were able to exceed their year 2000 road safety targets, progress since then has been poor. Against the 2010 casualty reduction targets, motorcycle casualty numbers have not improved to the same extent as other modes. By the end of 2006 Motorcycle rider KSIs were only 1% below the 1994-98 baseline. Currently, motorcycles are the only mode of transport that is showing an increase rather than a decrease in casualty numbers. However, it is important to remember that those services provided by the motorcycle for over a century are still valid and that being a vulnerable mode is not the same as being an undesirable one.

Motorcycles and policy

1.1.2 All modes of transport have strengths and weaknesses; good practice demands the framing and implementation of policies to maximise the strengths and minimise the weaknesses. Motorcycles have long provided a cost-effective and relatively low-polluting form of transport for commuting, work or leisure purposes. Despite riders being susceptible to serious injury even in low-speed collisions, the specific safety needs of motorcycles with their reliance on an adequate and consistent friction between their tyres and the road surface are frequently overlooked by policy makers, planners, road designers and maintenance engineers.

Motorcycles and Travel Plans

1.1.3 A Travel Plan is an access strategy used to manage multi-modal access to the workplace. Travel Plans focus on encouraging modal shift from single-occupancy private cars by improving options for travel to the workplace and encourage wider use of sustainable transport. This is often achieved by introducing a combination of incentives and disincentives to persuade and support people using alternative commuter modes. Motorcycles are an affordable alternative mode of transport where public transport provision is lacking or non-existent and where distance dictates that walking and cycling are unrealistic. For these reasons they will be a common feature of many Travel Plans.

Motorcycles and traffic engineering

1.1.4 The requirements for safe use by motorcycles demand special consideration by the traffic engineer. Some features, benign to other road users, can present a hazard to motorcycles. The issue of motorcycle access to bus lanes and advanced stop lines at traffic signals is contentious but a number of existing schemes and trials

would suggest that motorcyclists can use such facilities without disadvantaging other vulnerable road users. More trials are needed, especially in the shared use of Advanced Stop Lines.

Motorcycles and parking

1.1.5 Parking provision is an important tool in local transport policies as well as traffic management and crime reduction. It is also a fundamental requirement for any motorcycle user. Motorcycle parking can be provided on-street or off-street, in surface parking or multi-storey parking, by commercial site operators as well as local authorities, employers, retailers, and colleges.

Motorcycles and maintenance

1.1.6 A good quality surface gives a safer, more pleasant experience for all road users, but it is an essential requirement for motorcyclists. Factors affecting motorcycle stability include: skid resistance, surface contamination and debris, drainage gullies, utility covers, road markings and road studs all of which should be considered from a motorcycle-inclusive viewpoint.

Motorcycles and road safety campaigns

1.1.7 Road safety campaigns are a vital ingredient in the mix of initiatives needed to improve the safety record of motorcyclists. Rider attitudes play a major role in determining rider behaviour, irrespective of age or trip purpose. Any measure designed to modify behaviour must address these attitudes and take account of the individuality often expressed in choosing a motorcycle as the travel mode. Riders respond better to messages related to their own perspective and are likely to ignore “must do” or “must not do” approaches.

Motorcycles and traffic calming

1.1.8 Traffic calming measures are very effective in reducing numbers of injury accidents, especially in residential areas, and polarising public opinion about their desirability. Motorcyclists are no more exempt from the intended effects of traffic calming devices than any other road user, but they can suffer disproportionately from unintended effects, often safety-related, which then undermine the casualty-reducing purpose of installing traffic calming measures in the first place.

Motorcycles and Road Safety Audit

1.1.9 Road Safety Audit has existed in the UK since the late 1980s. Audits of trunk road and motorway schemes have been mandatory since 1991. Many local authorities voluntarily carry out such design-independent audits using the trunk road standard as a reference. Highway design and traffic engineering practice in England and Wales usually separates safety auditing and user auditing. The latter focuses on encouraging better infrastructure provision for sustainable and often vulnerable modes to encourage modal shift. However, it has always been good practice for safety auditors to take a multi-modal approach to the process, taking special care

with safety implications for vulnerable road users; equestrians, cyclists and pedestrians. While not being completely overlooked, motorcyclists have had a lower profile in this “special care” regime, perhaps because the higher speeds of motorcycles push them, almost intuitively, into the same camp as twin-track motor vehicles. This is a serious misapprehension. The dynamics of motorcycles and the vulnerability of their riders make motorcycling a unique mode in the traffic mix, demanding separate, informed consideration by designers and auditors alike.

1.2 Naming Conventions

1.2.1 Throughout the Guidelines the term “motorcycle” is used to cover all forms of powered two wheelers (PTW) from the smallest mopeds, through scooters to the largest sports and touring machines. The terms “twin track vehicle” and “single track vehicle” are also used in the Guidelines. Although the terms are far from elegant, they do focus on the fundamental design differences between motorcycles and other motor vehicles that often lead to the misunderstanding at policy, design and operational levels with consequent under-performance of the road environment.



Standard or Naked.
Triumph Motorcycles Ltd.



Custom.
Triumph Motorcycles Ltd.



Trail/Enduro/Adventure sport.
Honda (UK).



Touring.
Honda (UK).

1.3 Types of Motorcycle

1.3.1 There are a wide variety of machines available today all of which have their own characteristics covering design, typical engine size, handling and style. Similarly, the riders of a given type of machine may be very diverse. In law, a motorcycle is a two-wheeled vehicle that is not a moped (see below); riders must be aged 17 or over.

Standard or Naked

1.3.2 These vehicles cover a wide range of the performance spectrum of power, handling and braking. Sometimes called “retro” machines they are typically used as practical transport, but with no fairing (or a small handlebar fairing) and have an upright riding position.

Custom

1.3.3 Also known as “cruisers” or “choppers” they are long with a low saddle height and typically have high handlebars with forward footrests. The emphasis is on appearance, and style, with polished chrome much in evidence.

Trail/Enduro/Adventure sport

1.3.4 Also known as “Dual-Sport” bikes, they combine features needed to ride on or off road. Larger machines are often similar to those included in the ‘touring’ category, for example fairings and larger luggage compartments.

Touring

1.3.5 These machines generally have large engines and are designed for relaxed, long-distance riding. Typical features include a



Sports.
Yamaha UK.



Scooters.
Piaggio Ltd.

more comfortable seating position for rider and pillion, luggage capacity and weather protection, such as fairings with a fixed or adjustable windscreen.

Sports

1.3.6 These machines may be designed to mimic racing motorcycles, with full fairings and low handlebars, or may have partial fairings and more practical rider and pillion seating, with medium-rise handlebars for longer distance travel. They tend to have medium to large capacity engines.

Scooters

1.3.7 Representing about 25% of motorcycles on the road, scooters differ significantly from most other motorcycles because of their bodywork and "step-through" chassis design. Engines are usually small to medium capacity, integral to the rear suspension and normally with automatic transmission.

Mopeds

1.3.8 In law, mopeds are motorised two-wheel vehicles with an engine capacity of less than 50cc and a maximum speed of 30mph. Riders must be aged 16 or over. Most electric-powered machines (not to be confused with electrically-assisted bicycles) are akin to mopeds.

1.4 Increasing Motorcycle Use

1.4.1.1 Motorcycle use has continued to grow over the last decade by all relevant measures. Motorcycle usage is far more seasonal than most other motorised modes. The standard measure of vehicles in use is taken from an end-of-year DVLA census; typically a time of year when significant numbers of motorcycles are out of use and untaxed. This does not give an accurate picture of all

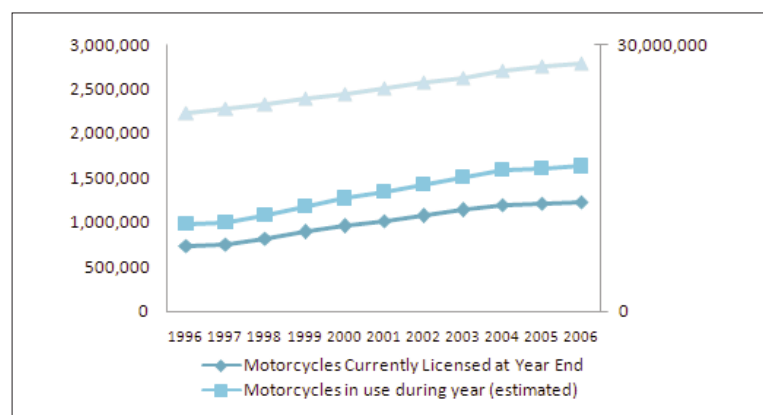


Figure 1: Motorcycles in use 1996-2006 (DfT 2007).

motorcycles in use, which is thought to be around 1/3 higher, as shown in the chart at figure 1 (this is explored more fully in the DfT Compendium of Motorcycle Statistics).

1.4.2 The growing number of motorcycles has meant a significant

rise in the level of motorcycle traffic; *Road Statistics 2006: Traffic, Speeds and Congestion* (DfT 2007) shows how motorcycle traffic has grown more than that of other vehicle types at 37% between 1996 and 2006 (figure 2). This rise compares with an increase in all motor

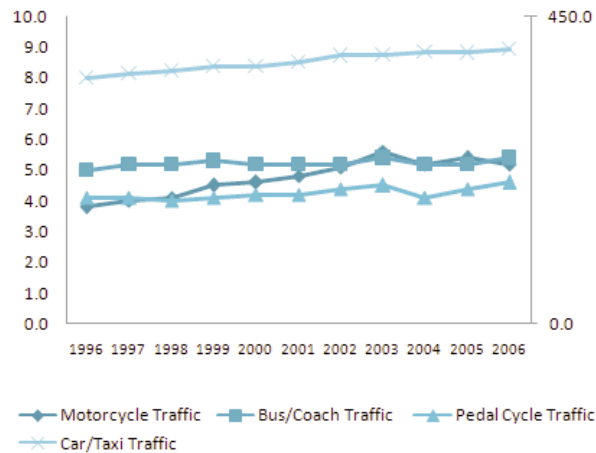


Figure 2: Motorcycle Traffic (billion kilometres) 1996-2006 (DfT 2007).

vehicle traffic of 15% and an increase in road-length of 2.9% over the same period. The increase in motorcycle use may be a response to traffic congestion, as is the greater use of bicycles and public transport, the *Compendium of Motorcycle Statistics* (DfT 2006) indicates the majority of motorcycle use is for commuting.

1.4.3 The rise in all modes suggests that, where growth in motorcycling has resulted from modal switch, motorcycles have replaced car use, with most motorcycle users also having access to a car.

1.5 Motorcycle Safety

1.5.1.1 Safety is without doubt the single issue most commonly associated with motorcycle use among transport professionals and the wider public. Although fatal accidents are still rare events in absolute terms - one rider is killed every nine million kilometres travelled by motorcycle - riders are many times more likely to be killed than occupants of enclosed, "twin-track" vehicles which offer far more protection in the event of a collision.

1.5.2.1 In 2005, of 569 motorcycle users killed, 75% died after collision with a larger vehicle (*Road Casualties Gt Britain 2005 DfT 2006*). The single largest grouping of such collisions was the 43% in collision with a single car. In terms of danger to other road users, figures for 2005 show 3.6% (n=20) of pedestrian road deaths and 2.7% (n=4) of cyclist deaths followed collision with a motorcycle.

1.5.3.1 There is also concern over the 23% (n=133) of riders killed in accidents where no other road-user was recorded as being involved. However, this figure is low compared with occupants of cars where 37% (n=613) died in such accidents during 2003 and even higher proportions for other larger vehicles.

Motorcycle casualty rates

1.5.4.1 While there is no place for complacency when dealing with those killed or injured on our roads, it is important to recognise that a key measure of safety, the rider casualty rate per kilometre (a proxy for rider exposure to risk), has shown year-on-year improvement, falling by 28% over the 1994-98 baseline years for casualty reduction targets (figure 3, below). It should be noted there are no disaggregated targets for motorcycles. A number of improvements in motorcycle design and rider training have taken

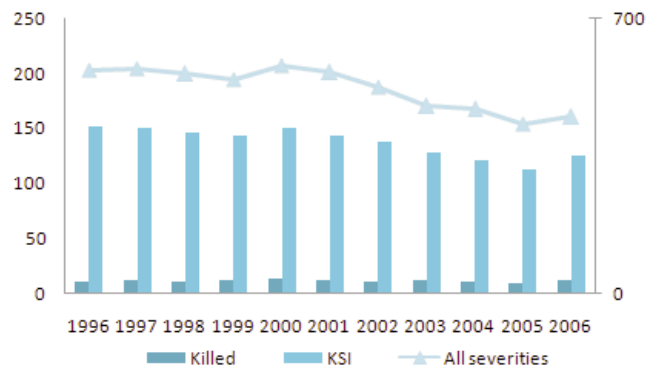


Figure 3: Motorcycle rider casualty rates 1996-2006 (DfT 2006; DfT2007).

place over the last decade and the overall casualty rate for motorcycles has generally improved, despite the largely urban nature of motorcycle use and greater volume of larger vehicles within the same road space. Unfortunately the fatality rate has remained more or less constant at around 11 to 12 rider deaths per hundred million vehicle kilometres.

Motorcycle accidents - urban and rural

1.5.5.1 Urban and rural areas see different patterns of motorcycle accidents. The severity of these accidents also tends to vary with the kinds of hazards encountered, and the impact speed of the vehicles involved. While the rural accident involvement rate (per 100 million Km ridden) was 38% lower than for urban roads in 2005, the motorcycle user fatality rate was three times higher on rural roads.

1.5.6 There is a public focus on rural casualties; but as accidents occur on both urban and rural roads so strategies need to be targeted in both areas. Motorcycling is playing an increasingly important role as an alternative to the car in congested areas and rider vulnerability in towns and cities needs to be addressed with similar vigour to strategies to reduce casualties in rural areas where motorcycle safety has a higher profile.

1.5.7 Broadly speaking, motorcycle traffic is split 60:40 between

	Built Up Roads		Non Built Up Roads		All Roads All Casualties
	Killed	KSI	Killed	KSI	
2001	218	4374	349	2792	28810
2002	242	4529	347	2811	28353
2003	245	4502	448	3986	28411
2004	259	4511	353	2543	29633
2005	239	4356	352	2475	28814

Table 1: Motorcycle KSI casualties by road environment – 2001 to 2005 (DfT 2006).

urban and rural roads and this is reflected in a similar split for non-fatal rider casualties. The situation is reversed for fatalities, where 60% occur outside built-up areas.

The number of motorcycle user deaths in rural areas has been relatively stable in recent years, but rose by 28% in 2003, perhaps

- ▼ **Junctions:** 66% of all motorcycles involved in accidents during 2005 were reported as “at a junction”, making junctions the most common accident location and, according to studies, these are most likely to be precipitated by another road user. Many collisions take place at junctions where the driver of a motor vehicle may have “looked but did not see”. There are also a minority of riders who ride inappropriately, exposing themselves to higher risk.
- ▼ **Overtaking:** 14% of motorcycle accidents involve overtaking a moving or stationary vehicle.
- ▼ **Bends:** 11% of motorcycles involved in accidents were reported as “going ahead on bend”. In rural areas a significant proportion of these are involved in single vehicle accidents with speed and lack of rider skill playing a major role.
- ▼ **Time of year:** Motorcycle casualty numbers also vary according to time of year (see figure 4). As noted above, motorcycle activity rises between spring and autumn, and the number of KSI rider casualties also rises, but the casualty rate falls because motorcycle traffic volume also rises. The rise in absolute casualty numbers in better weather can shift the focus away from the particular hazards faced by all-year/all-weather riders during winter months.

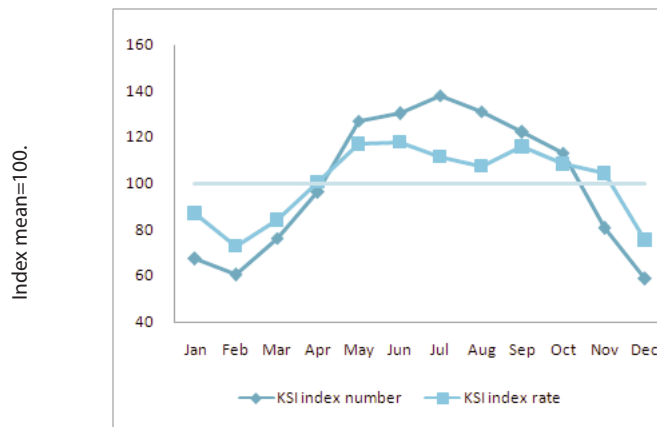
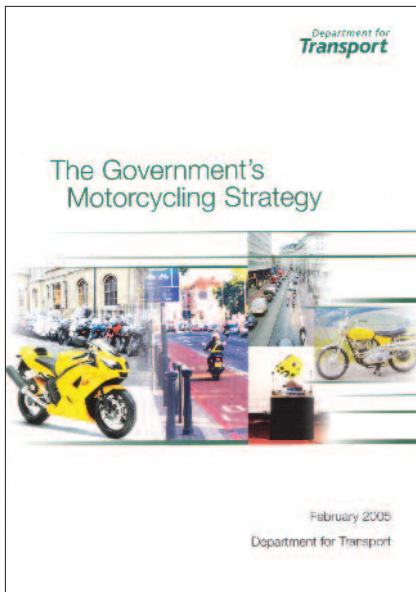


Figure 4: Motorcyclist KSI casualties: number and rate by month of year (indexed), 2005 (DfT 2004b).



The Government's Motorcycling Strategy. DfT.

linked to the significant rise in motorcycling during the unusually long, fine-weather riding season of that year (see table 1).

Motorcycle accidents in context

1.5.8.1 National data from Road Casualties Great Britain 2005 (DfT 2006) shows that motorcycle accidents occur in three broad contexts and have a seasonal element.

1.6 Taking action

1.6.1 In both rural and urban areas, motorcycle casualties are linked to a variety of factors involving engineering and planning, behaviour, levels of skill and attitudes between motorcyclists and other road users. Compared to car users, motorcyclists are vulnerable mainly due to their physical exposure.

1.6.2 Appropriate action could take the form of individual schemes through to an extensive package of measures that integrate to form an overall local motorcycle strategy, with clear targets, not only to reduce casualties, but also to implement measures which mitigate vulnerability and change rider and driver attitudes. It is helpful to adopt a partnership approach with motorcycling stakeholders, including the motorcycle industry, users and businesses.

1.7 The Government's Motorcycling Strategy

1.7.1 *The Government's Motorcycling Strategy* is a key development in government thinking on this mode of transport and represents the first strategy of its kind to be produced in Europe. The strategy effectively "mainstreams" motorcycling into core transport policy and underpins other work which has already been done to incorporate motorcycling into guidance for Local Transport Plans. Other government resources can now be linked with *The Government's Motorcycling Strategy*, for example *TAL 2/02 Motorcycle Parking* and the relevant sections of *PPG13: Transport*.

1.7.2 *The Government's Motorcycling Strategy* builds on the work of the Advisory Group on Motorcycling whose final report was published in August 2004. It covers a number of aspects of motorcycling including rider safety, training, vehicle safety and security. These Guidelines extend on the *The Government's Motorcycling Strategy* in the relevant sections that deal with policy and planning, parking provision, traffic engineering, road design, maintenance, road safety and road safety audit.



Sponsors

