



# THE ROAD TO SUCCESS

improving motorcyclists' safety  
by improving crash barriers



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## INTRODUCTION

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In 2000 the Federation of European Motorcyclists' Associations (FEMA) published the 'Final report of the motorcyclists and crash barriers project'. This project aimed to develop recommendations to road authorities for reducing injuries to motorcyclists in collision with crash barriers. The project was supported by the Directorate General for Energy and Transport of the European Commission.

Since the report was published, several national FEMA member organisations have been working with road authorities to improve existing crash barriers and adapting them to the safety needs of motorcyclists.

As an addition to the FEMA report, this booklet aims to give an overview of the projects that have been successfully carried out in a number of European countries, but it will also describe the difficulties and obstacles that motorcyclists' organisations encounter.

Finally we will list conclusions and recommendations to assist politicians, road authorities and motorcyclists' organizations in order to implement successful policies with the aim of improving the safety of motorcyclists by improving crash barriers.

This booklet has been written and compiled by a working group of representatives from three FEMA member organisations, using information and data provided by all 22 member organisations. The authors wish to thank all those involved, for their help and for their efforts to improve road safety for motorcyclists.

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## MOTORCYCLISTS & CRASH BARRIERS

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Crash barriers are typically designed to guide and restrain errant vehicles, ranging from small cars to heavy goods vehicles. Under the current European Standard crash barriers are not designed (or tested) to restrain motorcycles or motorcyclists.



A motorcyclist involved in an accident or a fall will come away from the motorcycle and slide along the road surface, with an initial speed equal to the speed of the motorcycle. During this sliding motion, the motorcyclist is at risk of impacting with 'roadside furniture', such as lamp-posts, sign-posts or crash barriers.

Existing regular crash barriers are made of steel beams, mounted on supporting steel posts. The major cause of (fatal) injuries to motorcyclists coming into contact with a crash barrier is the fact that the sliding motorcyclist hits one or more of the supporting posts of the crash barrier.

Over the years several solutions to this problem have been developed by manufacturers of crash barriers and installed by road authorities. The system most used today exists of a secondary rail, fitted to the existing barrier system.



It is widely accepted that the risk of (fatal) injuries to motorcyclists can be easily and significantly reduced by covering the supporting posts of the crash barrier.

In the absence of clear (European) regulations, that also require crash barriers to meet the needs of motorcyclists, riders are dependent on the good will of

local, regional and national road authorities to adapt existing crash barriers to a standard that would protect motorcyclists. In several European countries projects are being undertaken to improve motorcycle safety by improving crash barriers. These actions are frequently due to the efforts of campaigns by national riders' rights organisations. On the next pages we describe some of these projects.

## EXISTING PROJECTS

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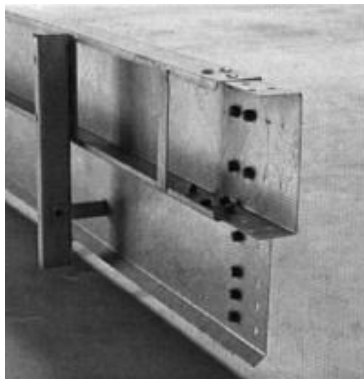
### France

Since the early 80s, a device made of a metal plate fixed under the rail to prevent contact with the barrier posts has been designed and is used in France (sold by company SEC-Envel). Nearly 100 km of motorway have been equipped with such devices in the Paris region in 1997.



A new device has been recently developed by the French 'Sodilor' company in the context of the French competition for innovative design of motorcycle friendly crash barriers. Its aims to combine the energy absorption property of the CBP with the impact spreading property of the metal sheet. It consists of soft plastic fence covering barrier posts. It is adaptable to existing crash barrier system.

Adopting a similar approach as the above 'Plastrail', but comprising 70% recycled material, Mototub is presumably also adaptable to a cable barrier. The company selling this product is Sodirel.



An integrated solution with a built in secondary rail, and minimal aggressive shapes, turned in edges, etc... This device has been designed and is sold by the company Solosar.

These four devices have been homologated and approved for use on the French territory following the procedure described. A programme of equipment of such devices has been launched in France, with annual budget of €3,000,000. The directives given to regional road authorities by

the French Minister of Transport summarise the areas to be equipped with motorcycle friendly devices as a priority.

- On motorways in curves with a radius less than 400m on the exterior.
- On normal roads, in curves with a radius less than 250m.
- On all roads, where there is banking in the road

This applies to new installations.

For existing installations, an annual budget of €2.3 million has been allocated to fitting MFD in black spots areas. A programme aiming to fit existing crash barriers with MFD in areas of regular motorcycle meetings has also been launched



with an annual budget of €760,000. It is noted that according to the Road Safety Department of the French Transport Ministry, 15% of crash barrier are useless and it would be better if they were removed completely (i.e. it would be safer to exit the road into a field than to crash into the barrier).

### **The Netherlands**

In 2003 the first Dutch motorcycle-friendly crash barrier was installed in the province of Utrecht, in a location where a standard crash barrier had already been installed by the provincial authorities. This was due to the fact that there were big trees along the verge of the road. The province agreed with the motorcyclists' organisation MAG (Motorcyclists' Action Group) that this crash barrier was at least as dangerous to riders as the trees were and within weeks, the Utrecht provincial authorities were prepared to improve the safety of the rail.

After the installation of the first motorcycle-friendly rail, MAG worked together with the Utrecht authorities to investigate all the existing crash barriers and compiled a list of 16 locations where the existing crash barriers could be dangerous to riders. These locations were discussed at a political level in the province and everybody amicably agreed that this was a life saving project. The crash barrier would be upgraded at all the 16 locations to motorcycle friendly crash barriers. The Utrecht authorities immediately started to work on these guardrails and had a system developed by the Dutch crash barrier company Prins Dokkum. This company developed a very simple system which is a metal board that could be used on existing crash barriers to protect the rider from hitting the posts. Furthermore, this barrier could be fitted within a short period of time (thus reducing the amount of time the road has to be closed for traffic).



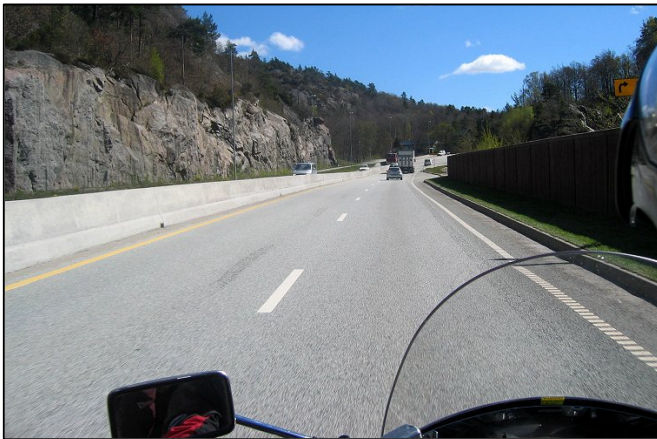
In total more than 3,000 metres of crash barriers were fitted with a protective board. The total cost for this project was €100,000 (including tax). A decision was made by the Provincial Council of Utrecht that it would now only use the motorcycle-friendly barrier when new crash barriers are constructed.

So far one motorcycle-friendly crashbarrier has been placed on a national road (junction A1/A6 near Muiderberg). The Dutch national road authorities estimate the cost for a 'regular' crash barrier at €60 to €100 per metre (depending on the type of barrier). The additional cost for a motorcycle-friendly device fitted to the barrier is €25 per metre.



## Norway

*Concrete Barriers* - Slide-cast, concrete barriers, are used far more frequently in Norway, both as traditional roadside barrier and as a barrier between opposite traffic lanes. This is the result of lobbying by the NMCU (Norwegian Motorcycle Union). The smooth concrete barrier is in itself 'motorcycle-friendly'. The objection against concrete barriers has been due to the high cost. However, with the slide-cast technology, price per metre is nearly halved compared to concrete block barriers of similar strength and quality. An advantage of the Safetybaer® concrete barrier used in Norway is that it is designed to contain heavy vehicles. Alternatives like steel beam or cable barriers are merely classed to contain passenger.



Another advantage of the Safetybaer® concrete barrier are the almost non-existent maintenance costs. A concrete barrier is not an improvement to existing barrier systems, but should be considered an alternative when new roads are built and where the replacement of old barrier systems on existing roads is needed.

The price per metre is approximately €80, depending on the fluctuating price of concrete. Installing the Safetybaer® concrete barrier on a typical 500 meter curved motorway off-ramp would cost approximately €39.500. This installation could be completed in approximately 15 hours. The Safetybaer® concrete barrier used in Norway is tested and approved under EN 1317.

*Plastic secondary rail* - On the E 16, near Sollihoegda, 50 km north-west of Oslo a test section of 100 metres has been set up, using a plastic secondary rail fitted to the existing steel beam barrier. The 'motorcycle-friendly' secondary rail is made of three, four or five plastic (polyethylene) tubes, welded together. This system is primarily designed to be installed as a secondary rail to corrugated steel beam barriers, using wooden posts. The project is in its initial phase, and further testing and evaluation remains to be done. The test project is carried out in cooperation with the Norwegian National Public Roads Administration. The exact price is not yet available, but is estimated at €17 to €20 per metre (installation costs included).

## Germany

In Germany the so called 'Euskirchener Model' is much more than a crash barrier project. It is the result of an integrated accident research and safety improvement project called 'Safety Outside Build-Up Areas', aimed at reducing fatally injuries of motorcyclists.

The 'Euskirchener Model' is about:

- Accident and safety research concentrated in the project 'Safety Outside Build-Up areas';
- Fundamental Conditions for Road Planning and quality/safety audit during this phase;
- Investigating methods and systematics (i.e. special inquiry 'Motorcycle Accidents');
- Investigating problem areas (black spot management);
- Investigating obtained results (counter checking with the 'Fundamental Conditions for Road Planning').

This includes the following measures:

- Intervention with selective road construction measures;
- Fitting the existing crash barriers with a second, flat rail, called 'Unterfahrerschutz Typ Euskirchen'. This product was first used in France and 'reimported' in to Germany and forwarded to type approval process;
- Mounting of 'Direction Panels' (Chevrons);
- Introduction of 'Double Line', separating the lanes;
- Creating a 'Forgiving Road Side';
- Solving problems about where to place roadside furniture, like reflector posts and direction panels. They must be in the field of vision of the rider as well as at a safe distance. Possible solutions are: flexible mountings and mounting outside the most likely crash area;
- Implementation of behavioural changes with motorcyclists.

The major step forward with this project in Germany is that it sought and received official testing and approval for this type of secondary rail. It has been referred by the Federal Ministry for Traffic (Bundesministerium für Verkehr, Bau- und Wohnungswesen) to be used by all road authorities in Germany. For the motorcyclist it gives almost complete protection of the rail support posts. The secondary rail is installed at a maximum of 5cm above the ground surface in order to prevent any body parts coming in contact with the posts. The secondary rail is not fitted to the posts, but is fitted with small girders to the upper (normal) rail. This rail does not touch the posts and has an elastic reaction on impact.

The described project has been carried out on the L165 from Münstereifel-Eicherscheid to Schuld (19 km), about 50 km south-west of Köln, in the Eifel region. All measures mentioned above have been implemented. Until now, more than 12.000 metres of the secondary rail have been installed in the district of this respective authority alone (Landesbetrieb Straßenbau - Niederlassung Euskirchen). Since type approval by the federal authorities, installation of the secondary rail is significantly on the rise in all federal states in Germany. The cost of fitting the secondary rail to the existing crash barrier is approximately €18 per metre.

The Euskirchen area is a very attractive landscape with rolling hills, close to the Nürburgring. All people from the highly populated Rhein-Ruhr Area have to pass the vicinity of Euskirchen, as do motorcyclists coming from Belgium and the Netherlands. This explains the history of particularly high



motorcycle accident rates in their territory. The here described project is a big success: since the implementation of the described measures on the L165, no motorcyclist has been fatally injured.

### Luxembourg

In Luxembourg so far 9.000 metres of crash barriers have been made motorcycle-friendly on the highways A1, A3, A4, A6, A13 (Petange-Hellange). Two more projects are being prepared for highways A7 (Mersch-Ingeldorf) and A13 (Hellange-Schengen). In 2005 a total of 10.000 metres will be made motorcycle-friendly. The cost of the improvement of existing crash barriers in Luxembourg lies between €22 an €25 per metre, depending on the ordered quantity. The project was carried out in co-operation with the national road authorities. In 1998 riders' rights organisation Lëtzebuerger Moto-Initiativ (LMI) started to fix styrophor



protections to the crash barriers, to show the Luxembourg government what to do. This was repeated in 1996 and since 2001 the government is working on improving crash barriers. In april 2005 the ministry of transport and the ministry for public works started a new campaign together with LMI.

### Portugal

In Portugal a law has been introduced on the placement of crash barrier systems that are safe for two wheeled vehicles. This law makes it compulsory for all crash barriers on public roads to include a safety perspective for two wheeled vehicles, especially in black spots.

According to the Portugese law "The crash barrier protections shall be placed on the black spots of roads or shoulders whose location, characteristics, grade, or existing fixed and rigid obstacles less than two meters away from the limits of the carriage way, are likely to generate greater damages than those occurred in an impact against the said crash barriers, namely bridge abutments, piles, walls, poles and large trees."



## United Kingdom

In 2004 the Highways Agency in the United Kingdom implemented a proposed scheme for provision of a motorcycle friendly barrier system to supplement an existing safety barrier, after several accidents which included fatalities, at the A2070 Cloverleaf Junction in Ashford, Kent.

In conjunction with InterRoute and installers Highway Care Ltd, the Highways Agency identified the 'Bikeguard' system from Germany as the system best suited for the scheme. Bikeguard, used extensively throughout Europe consists of an overlapping steel sheet system fixed to the existing safety barrier to prevent motorcyclists from colliding with the support posts. The main advantage is that the support posts do not project beyond the top of the existing safety barrier. The perceived safety benefit of the Bikeguard barrier retention system is in relation to the loss of control by a motorcyclist and collision with the barrier retention system. It is viewed that injuries with the Bikeguard system fitted would be less severe than from a collision with the safety barrier support posts.



Analysis of Accident Statistics since the installation of the Bikeguard barrier retention system has highlighted that no personal injury accidents have occurred. There is circumstantial evidence that a motorcycle impacted with the Bikeguard barrier retention system without damaging the original barrier though no accident report has been logged by Kent Police. Requests have now been received from other Highways Agency agents for details

about Bikeguard, with the view of further installation of the product at similar locations within the Highways Agency network.

Within the Highways Agency Area '4', the installation of the Bikeguard barrier retention system is being investigated for locations where there are substandard radius slip roads. The fitting of the Bikeguard system designed by SGGT in Germany (which has type approval under EN 1317) is a bold step in highway engineering terms and the system is similar to that fitted and produced in the Netherlands by Prins Dokkum BV and HIASA in Spain.

Although there are other designs of motorcycle friendly secondary rails, this type of secondary rail design appears to have been accepted by road authorities and is supported by the Motorcycle Action Group (MAG) UK.



## CEN NORM

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Crash barriers or safety barriers have to meet the specifications described in the European Standard EN 1317. This European Standard requires testing with cars and heavy good vehicles only and does not require testing with motorcycles.

The European motorcycling community strongly believes that the EN 1317 standard should include testing with motorcycles, so that crash barriers can be proven safe for *all* road users.

Alternatively, a new standard could be developed, parallel to EN 1317, focussing on motorcyclists' safety needs. Crash barrier systems would then have to meet the two standards.

At FEMA's request, the European Parliament (EP) in 2001 adopted in a resolution on the 'Priorities in EU road safety', a point on the importance of making crash barriers safer for motorcyclists. FEMA was concerned that within this report, safety barriers were advocated as a way to improve road safety, with no mention of the danger they cause to motorcyclists. Crash barriers are the cause of 10 to 15% of all fatal accidents of motorcycle riders in Europe, and also cause very severe injuries. FEMA reckons that crash barriers can be a benefit in terms of road safety for a majority of road users, but wants the risk they cause to motorcyclists to be recognised and some emphasis to be put on the existing secondary safety measures to address those risks.

The text adopted in the Resolution in 2001 is the following:

"Whereas such a policy might require major investment to plan and build a safe traffic system; but whereas low-cost road engineering measures, such as safety barriers, may be implemented quickly and, like the production and promotion of EU technical guidelines based on best practices, may significantly improve traffic safety; whereas, however, the safety barriers must meet the specific safety requirements of motorcyclists".

Despite of these good intentions, there is still no European standard for crash barrier systems that includes the specific needs of motorcycle riders.



## CABLE BARRIER

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In some European countries like the Netherlands and Norway, but mainly in Sweden, road authorities are putting up cable barriers, or wire rope safety fences. These cable barriers can be placed both on the sides and in the middle of the road.

Because of the relative low cost of the cable barrier (compared to the 'normal' crash barrier), more countries are considering the use of cable barriers.

However, some European countries, like Belgium, are strongly opposed to the use of cable barriers, and Denmark even removed several thousand metres of existing cable barriers because it was considered not safe!



Motorcyclists in general consider cable barriers to be the most dangerous of all existing Vehicle Restraint Systems. The exposed supporting posts stand so close together that post accident, a rider would inevitably collide with one or more of the posts which are frequently sharp edged. This would result in severe injuries. Furthermore, if colliding with the cables, a cutting effect may occur. It is not without reason that cable barriers are referred to as 'cheese cutters'. The motorcyclists' view on cable barriers are supported by results from full scale tests and computer simulations.



For these reasons, all motorcyclists' organisations in Europe are strongly opposed to the use of cable barriers.

### **Swedish motorcyclists on the cable barrier problem**

Vision Zero is the basis for all road safety work in Sweden since 1997. It is an image of a future where no one should be killed or seriously injured in road traffic. Since people makes mistakes, it is impossible to prevent traffic accidents altogether. It is possible to alleviate the consequences through making roads and vehicles safer. As a consequence, the road environment must be as forgiving as possible in case of an accident. One important strategy in Vision Zero is to separate the traffic through crash barriers to avoid collisions. The National Swedish Road Administration estimates that the crash barriers save 22 lives per year and 42 persons from getting seriously injured.

However, even in the official documents from The National Road Administration the only word used for crash barriers is cable barriers. No other barriers are installed anywhere. 1st January 2005 there were 950 km Swedish roads with cable barriers and every year another 150 -200 km are being installed. The National Swedish Road Administration says that there are another 1 000 km that can be rebuilt with cable barriers. The cable barriers are put up in the middle of the road to avoid collisions but also on the road sides to protect from obstacles on the road sides.

The Swedish Motorcyclists Association, SMC, has opposed the cable barriers since the very beginning. They are not the best solution for all road users, and definitely not for the motorcyclists. SMC are not against crash barriers that prevent collisions, but we want a barrier system that is also safe for motorcyclists. SMC has identified the unprotected poles as the main problem, not the cables. SMC has also complained about the way the cable barriers have been installed, directly at the road instead of as far away on the road side and from the road users as possible. SMC has also claimed that the barriers should not be there at all, if the barriers are a bigger threat than what they are supposed to protect the road users from. A forgiving road environment is a much better solution for motorcyclists than the cable barriers. This is an ongoing fight in Sweden, and a dark night in August 2001, SMC organised a cable barrier demo on the motorway outside the city of Eskilstuna. The demo caused a lot of media attention. But, unfortunately, there is still not one single meter of motorcycle-friendly crash barriers in Sweden.



## **CONCLUSIONS & RECOMMENDATIONS**

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Most 'road furniture' is designed with cars in mind and motorcyclists' safety needs are not taken into account. This becomes painfully clear by looking at the design and testing of conventional crash barriers. In our view roads and roadsides should be safe for all road users, including motorcyclists, and road authorities should advocate 'obstacle-free roadsides'.

When an obstacle-free roadside is not achievable and crash barriers have to be placed, it is the view of the European motorcycling community that motorcycle riders have the right to expect and demand safe vehicle restraint systems.

In several European countries motorcyclists' organisations have been successful in convincing local, regional or even national authorities to work together on improving the crash barrier systems to meet riders' needs. However, authorities that do not wish to adapt their crash barriers can today safely deny their co-operation, since they can state that their crash barriers meet the requirements of European Standard EN 1317. It is therefore crucial that the European Standard is changed or expanded to include testing with motorcycles.

On a national level politicians and motorcyclists' organisations should actively join forces in persuading their governments to adapt crash barrier systems to meet riders' needs.

National governments that claim to want to improve road safety and reduce the number of casualties, should not only work together with motorcyclists' organisations, but also demand the immediate inclusion of motorcycles in the European standards for crash barrier systems.

The Federation of European Motorcyclists' Associations (FEMA) will actively seek the support of members of the European parliament in order to help motorcyclists secure the adaptation or expansion of European standards for crash barrier systems, so that they will meet riders' needs as soon as possible.



## CONTACT

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For more information on national projects, or to find out how you can work together with motorcyclists on improving road safety, please contact us!

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