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RISER - roadside infrastructure for safer European roads

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RISER – Roadside Infrastructure for Safer European Roads

A new resource exists for anyone who has responsibility for making our roadside infrastructure safer. New guidelines, drawn up as a result of the RISER project, are publicly available and provide a rich source of information on the design and maintenance of a safer road environment.

Despite the fact that up to 40% of traffic fatalities are single vehicle, off-road collisions, there has been, until now, no European consensus on the appropriate design, implementation and operation of road safety devices. Given the focus at European level on road safety, this was clearly an omission and one which the European Commission sought to put right through RISER.

The RISER project, (Roadside Infrastructure for Safer European Roads) was funded through the European Commission's 5th Framework's competitive and sustainable growth programme and ran from 2003 to 2006. It brought together ten partners from across Eu-

rope under the leadership of Chalmers University in Sweden and included the Vehicle Safety Research Centre at Loughborough University. Julian Hill is a Research Fellow at the VSRC and he gave a presentation at the Passive Safety seminar in Manchester in October, explaining what RISER was about and, more importantly perhaps, how people can plug into the results of the research through a number of guideline documents which are now publicly available.

He tells TEC that RISER had a number of objectives. The first was to collect performance data for the roadside environment. The second was to understand the connections between service

and test conditions to guide road designers. And the third objective was to identify the design and maintenance practice being deployed today in order to build up better guidelines based on the whole life cycle of the infrastructure.

The project had three main components. One was to examine current guidelines where they existed. As an example of what this meant, a comparison of the guidelines for the dimensions of safety zones across participating countries shows that while in Finland and Sweden, road type is not considered in the guidelines, it is in France, Germany, the UK, Netherlands and Spain. On the other hand side-slopes are covered in Finland, France,



Julian Hill,
Research Fellow
at the Vehicle
Research Centre
at Loughborough
University.

Germany, Netherlands, Spain and Sweden but not in the UK. In fact, says Julian Hill, a very mixed picture emerges with no consistency in approach. Indeed, for all the criteria examined to do with safety zone dimensions the only one which registered in every set of guidelines was speed. And this picture is mirrored across a whole range of elements from hazard classifications to criteria for selecting safety equipment.

Another part of the project focused on in-depth accident data which was work led by the VSRC. The VSRC, which was set up in 1982, is part of Ergonomics & Safety Research Institute (ESRI), one of the world's leading centres for independent vehicle safety and human factors scientific expertise.

The Vehicle Safety Research Centre is involved in a wide range of projects connected to road safety working for government, the Highways Agency and the EC as well as auto manufacturers and its research has led to many improvements in regulation and the design of cars. One of its specialties is on-scene accident investigation and The On The Spot initiative, which is operated in conjunction with the Nottinghamshire Police, has an investigation team attending road traffic accidents alongside the police.

The VSRC were most heavily involved in the package of RISER that was to build an accident database, or in-

deed two databases. The first of these was a statistical database which gathered information on 265,000 cases over the period 1992 to 2002 from seven countries. This used the national data available, so from the UK the accident data compiled by the police. The data is comprehensive in that it is reasonable complete, but the data for each accident is fairly minimal. Only single vehicle accidents were included from inter-urban roads – so no urban or minor rural roads. The data covered all severities of accidents but excluded those with pedestrian involvement. Some analysis of this database is shown in Table 1.

A second database was built and this is the detailed database and this was based on the information coming from teams such as the On The Spot investigators attached to the VSRC. The selection criteria were similar to those used for the statistical database but focused on passenger cars, and in particular those which had been in contact with objects in the roadside such as barriers, poles, slopes, trees etc. Detailed information on the roadside infrastructure and also vehicle damage and injuries was sought for 211 cases from seven countries.

The database was based on existing software but with additional data elements, for instance details about the roadside area where the accident took place, information about the struck roadside object which caused vehicle damage, causation - was it the driver, vehicle or environmental issues? The final element to be added was vehicle sketches and photographs.

Analysis of the detailed database focused on impacts with hazards, in other words trees, walls, rocks, fences etc, impacts with safety barriers and finally highway layout. From this emerges a picture of the potential hazards on the roadside. These are described as 'point hazards', for instance tree, poles and posts, safety barrier end treatment, and 'distributed hazards' which range from slopes and embankments through to poorly designed safety barriers and parallel roads, railways or even forests.

Another element of RISER was accident reconstructions and simulations. This work was done by team that specialise in accident reconstructions and looked at the phases of the accidents and then at the results. Impacts with safety barriers and other passive safety features were given special attention to determine vehicle speeds and angles for both impacts and departures from with the road side devices. In that way standard crash test configurations

could be compared with the real-world results. In addition it was possible to reproduce real-world scenarios in the computer.

In the laboratory simulations a team of volunteers drove the various scenarios which the researchers wanted to explore. They looked at, as an example, what happened when a concrete barrier was placed close to the roadway and found that drivers tended to put extra distance between themselves and the barrier, but speed was not affected in any of the trials. Julian Hill says that the RISER team were able to move the barrier nearer and closer to the carriageway to find out how drivers reacted. 'The simulations enabled us to look how drivers reacted to having an emergency lane, and then not having it and to assess what impact this had on their position on the road. Strangely, he says, drivers proved to be relatively unconcerned about driving along tree-lined roads, despite the fact that trees are involved in 12% of vehicle-only accidents.

Interestingly, he adds, there was evidence that drivers quickly became accustomed to road conditions and reacted less positively during further drives.

RISER deliverables

The final RISER report is with the Commission and it may become the basis of some future European directive but if that is the case, it is certainly still some way off. In the meantime, RISER produced a number of important documents all of which are publicly available and can be used now by anyone who has responsibility for creating a safer roadside environment.

These documents come under two categories. The first is design guidelines. This starts by identifying the hazard and then takes the reader through a series of actions including evaluating the action needed to make the roadside safer. A lot of emphasis, says Julian, is put on the safety zone. 'This come through as a very important aspect of road safety. The RISER guidelines contain recommended dimensions for the safety zones needed for a particular hazard based on the speed or setback findings that came out of the research.

'And the other aspect that we believe is important is the recovery zone, a paved area within the safety zone at the side of the road that is free of hazards such as lamps, rocks or bollards, and which enables a driver who, for some reason has left the carriageway, to recover and be guided back to the road.'

Maintenance is an often overlooked aspect of road safety and provides important data for design engineers.



The guidelines cover the treatment of hazard which are located within the safety zone and the use of passive safety road equipment, and make recommendations about how accident data should be collected.

And finally, the guidelines look at the human factors, including the propensity that Julian commented on earlier for drivers to quickly adapt their behaviour to the surrounding roadside.

The other key set of documents to come out of RISER are the maintenance and operations guidelines. Julian says that this is a very important, but often overlooked aspect of road safety and adds that the UK stood out as a beacon of good practice. 'The way we train people in the UK and have different levels of qualifications is not widespread in Europe and, in fact, we have recommended that the UK protocol be adopted throughout Europe.' He adds that maintenance is a vital aspect of

road safety. 'It is important to inspect sites carefully, train people well and have a repair strategy. Good practice in this area can provide important data, for instance if a particular section of a safety barrier keeps having to be repaired, this should prompt the question why. In too many cases, the maintenance people are not talking to the engineers.'

He adds that a lot of very useful information has come out of RISER and it is important that it is disseminated as widely as possible. 'This is a very valuable resource. All the documents are publicly available. The ERF, the European Union Road Federation, are responsible for publicising the results and can supply copies of the documents, alternatively you can download documents from the Loughborough University website. Or people can email me direct. Loughborough are happy to answer questions and to pro-



vide information.' You can email Julian Hill at j.r.hill@lboro.ac.uk. Visit the ERF website at www.erf.be/section/ep/riser. or download RISER reports directly from Loughborough University by selecting the Institutional Repository at www.lboro.ac.uk/research/esri/publications.htm and entering 'RISER'.

The On The Spot initiative has an investigation team attending road accidents alongside the police.

New design standards for minor structures

A number of design standards which previously were the subject of individual manuals have been consolidated in one document, BD94.

One of the presentations at the recent Designing Safer roadside seminar in Manchester was about the new Highways Agency Departmental Standard, BD94 - Design of Minor Structures. This consolidates in one document, a number of design standards which previously were the subject of individual manuals and covers lighting columns, cantilever masts, CCTV masts and road traffic sign/signal posts. John Rees of consulting engineers, Flint & Neill Partnership, explains that there are a number of reasons for the new look.

The first is that British Standards are in the process of being withdrawn and replaced by Eurocodes. In future all design guidance must provide complementary and non-contradictory information and this has meant rewriting some of the existing guidance notes. The changes, says John, are not substantial. 'Essentially, it has been necessary to temper the guidance that is pro-

vided because there were some instances where the information given could have been thought to contradict the Eurocode. But I would stress that the changes involved are not fundamental.'

In fact, he says that a lot of effort has gone into making the new document as familiar to users as possible. 'We want people to pick up this document and for it to feel familiar and for them to know where it comes from.'

Flint & Neill Partnership, who were responsible for writing the new manual on behalf of the Highways Agency, have a long association with the design criteria for minor structures. John Rees explains that they first became involved in this area about 15 years ago when some lighting columns in Glasgow unexpectedly collapsed. Flint & Neill were called in to investigate the failure and became involved in preparing a series of fatigue studies which resulted in fatigue design rules published

in BD26/99 etc. It was the start of an involvement that has seen the consultancy provide advice to the Highways Agency over many years and culminated in the preparation of the BD94.

John says that the need to bring existing design information in line with the new Eurocodes gave the opportu-

Covered in the new document are cantilevered masts . . .





... and CCTV masts.

nity to bring some order to what, until now, has been something of a minefield. 'Previously, most of the design guidance incorporated in BD94 was published in separate documents, for instance for lighting columns the engineer had to turn to BD26 or to BD83 for CCTV masts. We believe that a single document will be much easier for people to use and also, looking ahead, will be easier to alter when changes come through.' The exception to this is road traffic sign/signal posts which have not been previously been the subject of a design guidance note but are the subject of a separate standard, BS EN 12899-1. Design guidance for traffic sign and signal posts is included in BD94.

Is the industry ready for Eurocodes? Some parts are more ready than others, says John. The lighting industry, he believes, will have a fairly easy ride, mainly because the Eurocode, EN 40, is largely agreed and widely accepted. 'The lighting industry knows what is coming and is already, largely, working to EN40 standards. But in other parts of the industry there is less awareness of the implications of the change from

British Standards to Eurocodes. This is why the Highways Agency has been very keen to get this document out into the industry so that everyone can see how Eurocodes will be implemented across the road network.'

Who needs to know about the changes? The list includes manufacturers of structures and designers who deal with roadside furniture. And, although the design guidance only applies to the Highway Agency's road network, John Rees says that these documents tend to percolate down to local authority level and the wider road network.

So what implications does this new design guide have for the implementation of passively safe minor structures? The important thing to grasp, says John, is that BD94 and TA89, the advice note issued by the Highways Agency on passively safe structures, go hand in hand. 'The point I wanted to make is that where the decision is made to install passively safe lighting columns or sign posts, the design of the structure must also comply with BD94.' Essentially, he says, BD94 tells you whether the structure that you are planning will be strong enough, how

to build a sufficiently strong foundation, or prevent undue deflection which may impact on performance. TA89, on the other hand, talks about the performance of the structure when it is hit. And they are not the same thing.

One of the points made during the presentation was that the new BD94 would be easier to alter should Eurocodes change. Is that likely? John says that all Eurocodes are subject to review after five years. 'I know, for instance, that the Eurocode for Wind Actions will introduce a new wind map for the UK because I have been on the BSI Working Group drafting the National Annex to this Standard. EN40 refers to the Eurocodes for wind speed information and this will impact on the wind speed that designers will choose when designing a minor structure.'

John Rees's presentation, which provides detailed explanation of a whole range of complex issues such as wind speeds, fatigue strengths, exposed sites and buffeting from high sided vehicles, can be found at www.thepassiverevolution.co.uk