Authors: this report was drawn up by CEDR’s TG Road Safety

Group leader: Günter Breyer

With contributions from the following countries:

<table>
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<tr>
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<td>Denmark</td>
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<td>Estonia</td>
<td>Reigo Ude</td>
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<td>Finland</td>
<td>Auli Forsberg</td>
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<td>Latvia</td>
<td>Ainars Morozs</td>
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<td>Lithuania</td>
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<td>Luxembourg</td>
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<td>Netherlands</td>
<td>Herman Moning</td>
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<td>Norway</td>
<td>Richard Muskaug</td>
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<td>Poland</td>
<td>Robert Marszalek</td>
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<td>Portugal</td>
<td>Paulo Marques</td>
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Shoulder and median rumble strips
Practices in CEDR member states and relevant literature

This report is: FOR INFORMATION PURPOSES ONLY

1 General
A review of literature on rumble strips was performed in 2007 by the members of CEDR’s TG Road Safety.
Member states were asked to answer the following questions:

- Does your country have any experience with rumble strips (noisy strips along the road to warn drowsy or inattentive drivers)?
- What is the main source of information on rumble strips in the context of their impact on road safety, technology, efficiency, cost etc.?

This paper sums up the answers received from CEDR’s member states. It focuses on longitudinal shoulder or median rumble strips only; it does not deal with the transversal rumble strips put on the pavement to get drivers to reduce their speed or as a warning, e.g. on big slopes or before a junction.

Rumble strips can be milled, rolled, or raised.
2 Practices in CEDR member states

Austria
Rumble strips are used in conjunction with tunnel safety. Since 2003, rumble strips have been used at the entrance to tunnels and along the central road marking in counter flow tunnels. The rumble strips are generally made by grooving the asphalt or concrete pavement. In recent years, rumble strips have been applied on some rural roads and on some selected stretches of motorways; they have proven very cost-effective to reduce run-off accidents and will be used on motorways even more often in the future.

Estonia
Rumble strips are not used along the road with the exception of the so called ‘comb-marking’ (a thermoplastic roadside marking). Scandinavian examples are used for this kind of marking; rumble strips are not yet included in the Estonian standards.

Finland
Rumble strips have been in use for several years. It is a relatively cheap and effective measure. However, it has been observed that on older pavements, the strips cause the pavement to break up faster, thereby reducing the life-time of older pavements.

France
The guidebook “Equipements des routes interurbaines”, Sétra, 1998, states on p. 98 that ‘driving on motorways can make drivers drowsy and reduce their attention span; noisy transverse strips can wake them up’. Rumble strips are not in widespread use in France, except as ‘night visible markings’ on the right-hand shoulder line of some motorways. One motorway company is currently testing milled rumble strips.

Germany
Milled rumble strips were tested along a 36-km section of motorway over a period of four years. The resulting study is very interesting and its results are very positive. The effects of these milled rumble strips on motorcyclists are currently being investigated.

Iceland
Rumble strips were tested in the summer of 2007. In autumn 2007, 70 km of rumble strips were applied to national roads in the south western corner of Iceland. There did not seem to be any problems regarding winter maintenance. The effects on road safety have not yet been studied because the test period was too short.
Ireland
Rumble strips (vibroline usually) are applied in the direction of travel along an edge or median line to alert drivers when they drift from their lane. They are used quite commonly on the Irish motorway, dual carriageway and 2-plus-1 network, as well as an edge treatment on some single carriageway roads.

Italy
Some experimental work has been carried out with raised rumble strips (in relief) in tunnels.

Luxemburg
Only marked rumble strips are used. The effects are very positive.

The Netherlands
Median and lateral rumble strips are not generally applied on motorways as a result of Dutch noise legislation.

Sweden
A pilot project is currently underway to investigate if rumble strips have a positive effect on road safety and speed; so far, rumble strips seem to have a positive impact on road safety. The number of people killed and severely injured has been reduced by 10–15%. Motorcyclists are satisfied with the rumble strips as the Swedish motorcycle organisation was involved in the working group and was able to influence the design. Sweden has a long-term strategy to equip different types of roads with rumble strips.
The aim with rumble strips in the middle of the road is to increase drivers' alertness and observance and thus reduce the number of accidents.
Rumble strips should not be used within a distance under 100 m to areas where a maximum of 70dBA is not allowed to be exceeded.
The Road Administration is of the opinion that it is not recommended to have rumble strips on roads that are narrower than 7.5 m because of the discomfort created to drivers of buses and heavy goods vehicles.

UK
The edge of carriageway markings are referred to as ‘raised profile edge lines’. They consist of a continuous line marking with ribs across the line at regular intervals. The vertical edges of the raised ribs stand clear of the water film in wet conditions, improving the retro-reflective performance under headlight illumination. The ribs also provide an audible vibratory warning to drivers should they stray from the carriageway and run onto the marking.
Raised profile edge lines are used on motorways and all-purpose roads.
3 Relevant literature

Most of the relevant literature was published in the USA and in northern European countries. The following documents are deemed to be very relevant to this subject:

[8] NCHRP “Crash reduction factors for traffic engineering and intelligent transportation system (ITS) improvements: state-of-knowledge report” Research Results Digest 299, November 2005


[18] Harwood, D.W. "Use of Rumble Strips to enhance road safety" NCHRP Stnthesis 191, National Cooperative Highway research program, TRB, 1993


[26] TRB STATE OF THE ART REPORT N.1 "The Influence of Roadway Surface Discontinuities on Safety" Chapter 4 Positive Effects of Road Surface Discontinuities
4 Conclusion

Of the literature reviewed, the references [13] and [24] contain most of the present knowledge on rumble strips.

Some potential difficulties with the use of rumble strips have been identified:

- The problem of noise near inhabited areas (solutions are being tested),
- Acceptability by motorcyclists, and safety for cyclists;
- Misuse of rumble strips by lorries.