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November 2011

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Summary**November 2011****Published Project Report PPR553**

The Potential Impact of Increasing the Maximum Length of Trailers Towed by Light Vehicles (Gross Vehicle Weight of 3500kg or Less)

B J Robinson and W Hulshofn

Pages: 43, ISBN: 978-1-84608-984-8

Regulation 7 of the Road Vehicles Construction and Use Regulations (C&U) 1986, as amended, limits some (not applicable to semi-trailers) trailer lengths in GB to 7m (body length) when being towed by a vehicle with gross weight no more than 3,500kg (about 8-8.5m overall length including the towing attachment). European Directive 97/27/EC covers trailers up to 12 metres in overall length. The GB regulations apply to both domestic and visiting traffic.

The main objective of the study was to provide the Department for Transport with evidence and information relating to the current regulations and the implications of any future changes to the current provisions (e.g. for safety and/or competitiveness). The various potential risks (e.g. road safety impacts, effects on GB manufacturers) and benefits (e.g. free movement of goods, additional sales) of changes to the regulations have also been studied.

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Summary**November 2011****Published Project Report PPR561**

Air Quality Assessment: Harlesden town centre and A406 junction with Brentfield Road

K Turpin and J Price

Pages: 46, ISBN: 978-1-84608-978-7

The London Borough of Brent commissioned the Transport Research Laboratory (TRL) to undertake air quality assessments in three parts of the borough: Wembley town centre, Harlesden town centre and the A406 junction with Brentfield Road. A previous air quality assessment using average-speed emissions functions had concluded that the model approach underestimated concentrations of nitrogen dioxide (NO₂) and particulate matter (PM₁₀) at roadside monitoring sites when compared to measured data. Reasons for the underestimation were considered to be a combination of site-specific and generic reasons, for example, limitations of emissions factors to represent traffic queuing (or stop start traffic activity) in the model setup.

This report constitutes a reassessment of air quality concentrations at two of the three original sites: Harlesden and the A406. The objective was to determine whether emission rates derived from recording transient vehicle operations are more representative than emission rates derived from average speed functions. The results showed that the model under-predicted the road contribution to NO_x and PM₁₀ at both sites using the average-speed emissions approach. At Harlesden, modelling with the instantaneous emissions approach over-predicted the road contribution of NO_x and slightly over-predicted the road contribution of PM₁₀. At the A406, modelling with instantaneous emissions has slightly under-predicted the road contribution of NO_x and under-predicted the road PM₁₀ contribution. Further work is required to understand the robustness of background contributions. Overall, the instantaneous emission approach, to assessing air quality, has shown itself to be appropriate for air quality assessment and, theoretically, should offer an improvement over average-speed emissions calculations.

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Summary**November 2011****Published Project Report PPR577**

Rock engineering Restraint system safety diversity in frontal impact accidents

D Hynd, J A Carroll, D Richards, R Wood, and O Goodacre

Pages: 249, ISBN: 978-1-84608-983-1

The frontal impact safety of cars sold in Europe is regulated by the performance requirements of UNECE Regulation 94. This car crash test procedure includes two crash test dummies that represent an average sized (50th percentile) male driver and front seat passenger. However, recent research has indicated that vehicles and occupant restraint systems may be optimised to protect the average sized male at this collision severity.

This study was undertaken to identify the possible casualty gains that might be achieved for female, older or small stature occupants if the legislative test was altered to use a 5th percentile (small) female dummy or a 95th percentile (large) male. The potential gains that could be realised by using injury criteria or performance requirements that better represent older occupants were also evaluated, as well as the potential disbenefits for currently well protected occupants that might occur as a result of these changes. Finally, the effect on casualty numbers that might be achieved through the introduction of advanced "smart" restraint systems was considered.

A programme of crash tests was undertaken in collaboration with a Tier 1 restraint system supplier. The information from this test programme, as well as from a state of the-art review, was used to determine the potential effects that different restraint options may have on different occupants in frontal impact collisions. This was further used to define the potential benefits and disbenefits that may result from the following possible changes to the Regulation 94 test procedure.

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Summary**November 2011****Published Project Report PPR579**

Advanced Safety System Priorities: Final Report

M McCarthy, R Cookson, R Cuerden and W Hulshof

Pages: 144, ISBN: 978-1-84608-985-5

In recent years the UK Department for Transport (DfT) has been considering their policy towards the permitted masses and dimensions of heavy goods vehicles (HGVs). The masses and dimensions that can be permitted for goods vehicles within national traffic are partially constrained by European Directive 96/53/EC and previous studies of the likely effects of changes have been based on the presumption that the UK would work within the existing EU legislation. However, the European Commission has also been reviewing its policy on the control of goods vehicle weights and dimensions and has commissioned several studies. The most recent study is still ongoing but has reported (Knight et al, 2010a) that the study will analyse the potential effects of permitting heavier 44 tonne articulated vehicles on 5 axles and longer articulated vehicles of up to 19.4m length as well as three different variants of the European Modular System (EMS). The main objective of the study reported here was to investigate the likely technical implications in the UK, if the EU Directive was amended to permit the first two changes listed above in terms of vehicle specifications, performance, safety, infrastructure and emissions.

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Summary**November 2011****Published Project Report PPR580**

Infrastructure and cyclist safety

S Reid and S Adams

Pages: 50, ISBN: 978-1-84608-989-3

This literature review considers the role of infrastructure in relation to the safety of cyclists and their interaction with other road users. It was undertaken as part of the wider research programme, Road User Safety and Cycling, being led by TRL. The paper identifies the influence of infrastructure on intermediate, behavioural, outcomes which may influence casualty risk, such as the speed of motorised traffic, cyclist route choice and manoeuvres etc. Of all interventions to increase cycle safety, the strongest evidence is for the benefits resulting from reduction in the general speed of motorised traffic. This may be achieved through a variety of methods including physical traffic calming; urban design that changes the appearance and pedestrian use of a street; and, possibly, the wider use of 20mph speed limits. The literature review also identifies the potential benefits of treating junctions, particularly interventions that slow the speed of motorised traffic through them. The review identifies the potential benefits of segregated networks for cyclists but notes evidence that cyclists may be exposed to heightened risk where cycle networks intersect the general highway network. The review also identifies a number of techniques to improve cyclist safety that are in use in overseas but which have not been commonly applied in the UK. Given the limitations of many existing types and approaches to infrastructure, more innovation and experimentation, supported by appropriate monitoring, is recommended.

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Summary**November 2011****Published Project Report PPR582**

Investigation Into Regenerative Braking Systems

B J Robinson, C Visvikis, T Gibson and I Knight

Pages: 31, ISBN: 978-1-84608-977-0

The United Nations Economic Commission for Europe (UNECE) Regulation for the type-approval of braking systems, Regulation 13-H, sets out the technical requirements, test methods and limit values for the braking systems of all vehicles of category M1 and N1 (passenger cars and light commercial vehicles).

The numbers of electric, hybrid and plug-in hybrid vehicles in production are rapidly increasing. In recent years, the braking regulation has been amended to incorporate provisions relating to regenerative braking systems, which are commonly fitted to such vehicles. The main aim of this study was to establish whether or not the existing regulatory requirements, test methods and limit values for regenerative braking systems could still be considered adequate in light of the first few years of experience with such systems and any development of new technology likely to be implemented in the foreseeable future.

This involved a desktop study intended to identify the most likely issues, supplemented by a short programme of dynamic vehicle testing to further explore those issues and inform an assessment of the suitability of the current 13-H test procedures. This report describes the project methodology, results and conclusions in full.

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Summary**November 2011****Published Project Report PPR585**

The Vehicle and Operator Services Agency accident database. Phase IV: Final Report

D Richards and B Watterson

Pages: 55, ISBN: 978-1-84608-986-2

The development of the Vehicle and Operator Services accident database: Phase IV started in September 2008, and ran for a three-year period.

The work has built on previous projects which compiled a database of vehicle examinations carried out by the then-existing Vehicle Inspectorate (VI, now the Vehicle and Operator Services Agency – VOSA). The remit for the project was to enter the vehicle defect data gathered by VOSA into a quality-assured database and to undertake analysis of the data to identify where vehicle defects may have had an influence on road safety, and to understand better their specific role in the accidents.

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Summary**November 2011****Published Project Report PPR586**

Cost Benefit Evaluation of Advanced Primary Safety Systems: Final Report

B Robinson, W Hulsof, R Cookson, R Cuerden, R Hutchins and E Delmonte

Pages: 71, ISBN: 978-1-84608-987-9

Intelligent vehicles and advanced safety technologies have been the subject of discussion for many years and there is now a large range of production and near-production systems that claim to have significant safety benefits. The Evaluation of Safety System Technologies project took a 'bottom-up' approach, starting with small number of specific safety systems and estimating the target population of casualties and cost benefit information for these systems. This was achieved using primarily in-depth accident data, with the results being scaled up to national level (adjusting for under-reporting). The analyses carried out as part of this study have evaluated the potential casualty benefits, and compared those to the likely system fitment costs, for four separate advanced primary safety technologies:

- Advanced Emergency Brake Systems (AEBS) for passenger cars;
AEBS1 – potentially able to mitigate/avoid all moving target rear shunts but those with stationary targets only if closing speed 40 mile/h or less;
AEBS2 – potentially able to mitigate/avoid all rear shunt impacts regardless of whether target (shunted) vehicle is stationary or not;
- Pedestrian capable AEBS for passenger cars;
0.6s/1s/2s systems – applies full braking 0.6s/1s/2s before a detected, imminent impact with a pedestrian;
- Lane Departure Warning Systems for passenger cars;
- Youth/Family key.

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Summary**November 2011****Published Project Report PPR675**

Performance Assessment of E-Spott Ground Penetrating Radar System

A Cook

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In May 2011 TRL acquired an E-Spott device, a Ground Penetrating Radar (GPR) system which can provide in the field spot depth measurements of total bound material thickness. A testing programme has been undertaken to assess the performance of this equipment and to determine possible applications.

Three E-Spott devices were used to assess the following on test sites at TRL and on local and trunk road networks: repeatability of an individual device; reproducibility of multiple E-Spott devices; coverage assessment; accuracy compared with coring and core calibrated GPR.

The experimental assessment has shown that E-Spott is quite repeatable and accuracy was reasonable. Best practice suggests that three repeat readings should be carried out. Direct comparisons with cores taken on site on the same day showed that, on average, E-Spott readings were within 10% of the core measurement for flexible pavements with thicknesses greater than 70mm.

E-Spott compares reasonably well with "traditional" GPR data that has been calibrated by coring. To make it sufficiently robust, E-Spott should not be used without the support of core data. Its accuracy is insufficient to negate the need for coring, but it can be used alongside targeted coring to improve efficiency and coverage. As a result, many more reinstatements could be checked for compliance and verification soon after construction. The data can also be used to target coring resources to confirm the status of reinstatements that the E-Spott data shows to be questionable.

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