



Creating the future of transport

TRL RESEARCH ALERT

SUMMARIES OF TRL PUBLICATIONS

December 2012

Reports Published – December 2012

PUBLISHED PROJECT REPORTS

PPR634 [Tampering prevention in L-category vehicle approval legislation: Impact assessment on powertrain tampering prevention with recommendations for cost effective measures](#)

A Nathanson, M McCarthy, R Cuerden, B Lawton, I Knight, and P Morgan

PPR627 [Durability of pollution control measures for L-category vehicles](#)

R Cuerden, A Nathanson, O Goodacre, M McCarthy, I Knight, M Muirhead and T Barlow

PPR636 [A83 Rest and be Thankful: Ecological and Related Landslide Mitigation Options](#)

M G Winter and A Corby

PPR638 [Literature review of interventions to improve the conspicuity of motorcyclists and help avoid 'looked but failed to see' accidents](#)

S Helman, A Weare, M Palmer, and K Fernandez-Medina

PPR630 [Integrated monitoring system for drains and other tubular structures](#)

M Harrington and J Iaquina

Please note:

From 1st December 2012, all TRL published reports are available free of charge from the TRL website.

Library Services (*Enquiries*)

Fax: 01344 770356

Tel: 01344 770203

Web: www.trl.co.uk

Tampering prevention in L-category vehicle approval legislation: Impact assessment on powertrain tampering prevention with recommendations for cost effective measures

As part of proposed revisions to the type approval requirements for L-category vehicles (mopeds, motorcycles, tricycles and quadricycles), TRL was contracted by the European Commission to investigate possible measures to prevent or restrict 'harmful tampering' to the powertrain of L-category vehicles and how this could be verified in service. Via literature, stakeholder consultation, and engineering knowledge, TRL identified and prioritised harmful tampering events using objective analysis based on the same principals as a Failure Modes and Effects Analysis (FMEA). This estimated prioritisation was verified and adjusted by quantifying actual effects on emissions, safety and noise measured through physical testing. This was achieved by a paired comparison between 'untampered' and 'tampered' L-category vehicles and tested at the scientific and technical research laboratory, the Joint Research Centre (JRC). The test programme involved 16 different vehicles, covering the broad range of L-category vehicles. A benefit estimate used the test results to value the effects and a basic break-even analysis was conducted with the aim of scoping the likely break-even value of tampering control measures. This analysis identified areas of vehicle design which, based on the information from the test programme and the assumptions made in the analysis, are candidates for the development of cost-effective anti-tampering measures. In addition to measures aimed at combating specific tampering types, a range of further options were identified which have the potential to improve the effectiveness of anti-tampering regulation, as well as potential methods to measure and verify vehicle performance.

Author A Nathanson, M McCarthy, R Cuerden, B Lawton, I Knight, and P Morgan
Pages 359
Date 18/12/2012 Reference PPR634
ISBN x ISSN 0968-4093

Durability of pollution control measures for L-category vehicles

As part of proposed revisions to the type approval requirements for L-category vehicles (mopeds, motorcycles, tricycles and quadricycles), TRL was commissioned by the European Commission to define a mileage accumulation methodology that would appropriately test the durability of emission relevant components and systems to ensure that the tailpipe emissions of regulated pollutants remain below the required Euro stage limits over the vehicle's typical life. An in-depth review of existing international durability mileage accumulation cycles found that none were ideal for L-category vehicles in Europe; a new durability cycle, the SRC-LeCV, was developed because the US EPA AMA durability cycle for cars and cycles was outdated in regards to the technologies it tasked and the SRC durability cycle for cars was found to not fully cater for the characteristics and performance of the entire L-category fleet. Literature study and stakeholder consultations identified key degradation mechanisms of: thermal ageing of the pollution control devices (such as the catalytic converter and lambda sensor) via thermal cycling and deceleration fuel cut-off, poisoning of the pollution control devices, carbon deposits and mechanical wear, shocks and vibrations. These were investigated in a test programme at the EU's scientific and technical research laboratory, the Joint Research Centre (JRC). Four cost-effective durability cycles which invoked the intended ageing mechanisms were developed and validated using a range of L-category vehicles. The categorisation system was aligned with UN GTR No. 2 (WMTC) and improvements to the instructions were made to simplify the execution of the test.

Author R Cuerden, A Nathanson, O Goodacre, M McCarthy, I Knight, M Muirhead and T Barlow Pages 330
Date 18/12/2012 Reference PPR627
ISBN x ISSN 0968-4093

A83 Rest and be Thankful: Ecological and Related Landslide Mitigation Options

In recent years a number of debris flow events have closed the A83 trunk road in the vicinity of the Rest and be Thankful. The damage caused has been both difficult and costly to repair, and the associated closures have caused traffic delays with attendant socio-economic impacts. This report examines the merits of a number of ecological and related landslide mitigation options for the south-west facing slopes of Beinn Luibhean in Glen Croe above the A83 trunk road. The use of explosives, and issues related to livestock and vegetation planting are discussed and an outline scheme for planting, developed by Forestry Commission Scotland and others in collaboration with the Authors, is briefly described. The planting scheme has the potential to reduce instability in the long-term but must be considered as part of a broader strategy that incorporates other aspects of land management, including stock control, and appropriate engineering measures.

Author M G Winter and A Corby Pages 26
Date 18/12/2012 Reference PPR636
ISBN x ISSN 0968-4093

Literature review of interventions to improve the conspicuity of motorcyclists and help avoid 'looked but failed to see' accidents

Road collisions involving motorcyclists continue to represent a serious public health concern worldwide, including in New Zealand. It is widely accepted that one key factor in motorcyclist crashes around the world is the difficulty other road users have in detecting an approaching motorcyclist or correctly appraising their speed and position (typically at junctions). The Motorcycle Safety Advisory Council commissioned TRL to review the international literature on motorcycle conspicuity, to establish those treatments that might be most suitable for use or further validation work in New Zealand. The review used a systematic methodology for searching, inclusion, and assessing the quality of studies of treatments designed to improve motorcyclist conspicuity. The review concluded that, even when considering only the best quality studies, it has generally been shown that high visibility and reflective clothing, and headlights or daytime running lights on motorcycles, have been effective in increasing motorcyclist conspicuity. In addition, novel lighting configurations can be effective (especially at night), if for example they are designed to make motorcycles 'stand out' against other vehicles with lights, or to accentuate the visual profile of motorcycles and provide drivers with more visual information to judge time to arrival. There are limitations to all interventions, not least because conspicuity typically depends on a high visual contrast with the background, and this can vary from situation to situation. The review recommends that validation work on novel lighting configurations is defined and then taken forward in New Zealand, and that work continues to raise awareness among bikers as to the benefits (and limitations) of high visibility and reflective clothing.

Author S Helman, A Weare, M Palmer, and K Fernandez-Medina Pages 55

Date 14/12/2012 Reference PPR638
ISBN 978-1-908855-27-5 ISSN 0968-4093

Integrated monitoring system for drains and other tubular structures

The project investigated technologies suitable for continuous monitoring of non-pressurised tubular structures, with a particular focus on surface water highway drainage systems. Failures on the motorway and trunk road networks often resulting from heavy rainfall occur because drains are not able to cope with the large volume of water they suddenly have to evacuate. Currently the assessment of these drains is carried out every 10 years using visual (closed circuit television - CCTV) or manual (mandrel) techniques to identify structural failures, with additional reactive assessments undertaken if issues (blockages or build-up of debris) requiring immediate treatment arise. It is thought that the routine assessments aimed at identifying structural failures will always be necessary to some extent; however the reactive approach to dealing with emergencies is less than ideal. Hence, there is a potential need for continuous monitoring that would be able to provide real-time or near real-time information about the state of a drainage network. Research was therefore carried out into a drain condition monitoring system which could be permanently installed and left in operation unattended.

Author M Harrington and J Iaquina Pages 22
Date 05/12/2012 Reference PPR630
ISBN 978-1-908855-26-8 ISSN 0968-4093