First results of a major study on safety at Queensland roadworks

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Introduction

The Centre for Accident Research and Road Safety – Queensland (CARRS-Q) is conducting a 3-year program of research, titled Integrating Technological and Organisational Approaches to Enhance the Safety of Roadworkers. The program is funded by the Australian Research Council (ARC), with support from industry partners Leighton Contractors, GHD, Queensland Transport and Main Roads (TMR), and the Australian Workers Union (AWU). This multidisciplinary project involves working together to enhance roadworker safety by:

- Investigating the real and perceived dangers at roadworks.
- Strengthening organisational policies and practices for roadworker safety.
- Testing innovative initiatives to improve driver behaviour at roadworks.
- Developing safety management models spanning different regulatory frameworks.

The project outcomes will include the following benefits:

- Practical and theoretical contributions at industry and academic levels for developing effective interventions/strategies to improve safety in road construction.
- Development of new measures to evaluate effectiveness of policy and organisational interventions to produce behavioural change among organisations involved in roadworks.
- Improved safety and productivity in urban and rural areas of Australia as a result of facilitating the delivery of road improvements.

This paper presents an overview of the research conducted to date as part of the overall program. The paper concentrates on issues relevant to moving vehicles, although the research recognises the importance of other hazards and risks associated with roadworks and construction projects generally.

Background

Roadworks are hazardous to workers operating in close proximity to traffic, as well as to the motorists passing though them. As roadworks are essential for maintaining and improving the safety and mobility of road users, construction and maintenance needs to be managed to minimise the associated risks and hazards. Reports from highly motorised countries including the Netherlands, United States and Great Britain show that around 1-2% of road fatalities occur at roadworks (NWZSCI, 2012a, 2012b; SWOV, 2010). Numerous studies have found that crash rates increase significantly during roadworks compared with pre-work periods, while roadwork crashes are also reportedly more severe than other crashes (Doege & Levy, 1977; Garber & Zhao, 2002; Khattak, Khattak et al., 2002; Pigman & Agent, 1990; SWOV, 2010; Whitmire II, Morgan et al., 2011).

Compared to some other countries, relatively little is known about roadwork crashes in Australia, due primarily to difficulties in identifying such crashes in official records (Haworth, Symmons et al., 2002). Police-reported crashes are recorded in a database maintained by TMR, in which crashes at roadworks are identifiable if ‘roadworks’ was reported as a contributing circumstance. The TMR-
managed database apparently excludes crashes within work zones (e.g. collision between two work vehicles). Crashes at roadworks are therefore unidentifiable if roadworks were not considered a factor in crash causation, or if they involved only workers; the number of such cases is likely to be considerable. In addition, there may also be significant underreporting of incidents where a public vehicle is not involved (whether inside or outside a work zone) or the severity level is low.

As it is difficult to even estimate the number of crashes resulting in injury at roadwork sites, it is also difficult to compare crash rates, crash severity and other variables of interest with findings from elsewhere. A crude estimate based on New South Wales (NSW) data showed that nationally each year at least 50 deaths and 750 injuries occur in crashes at roadworks with a cost of more than $400 million (Debnath, Blackman et al., 2012).

As with road crashes generally, work zone crashes are most often attributed to human error, including driver inattention and excessive speed (Arnold Jr, 2003; Bai & Li, 2011). These major factors in work zone crash causation are clearly interrelated as driver inattention (e.g. failure to notice road signs) may lead to noncompliance with reduced speed limits typically applied in work zones. Numerous studies report that poor speed limit compliance is a major contributing factor in work zone crashes. In Victoria, more than 40% of cars and 70% of trucks were found to exceed roadwork speed limits (Haworth et al., 2002). Another Victorian study (VicRoads, 1990) found that over 60% of drivers exceeded a 60 km/h work zone speed limit, with 10% of drivers exceeding the limit by 15 km/h. Consistent with these statistics, a state-wide survey of truck drivers in the US found that half of the respondents admitted to exceeding work zone speed limits. Interestingly, 90% of the respondents also considered work zones to be more hazardous than regular road sections, though this did not necessarily translate to compliant behaviour (Benekohal & Shim, 1999). This finding supports assertions that drivers are likely to drive at speeds they perceive to be suitable, or with which they are comfortable, regardless of the posted limits (Brewer, Pesti et al., 2006; Haworth et al., 2002). It is also consistent with the observation that speeding behaviour depends on the actual location of active work area in a work zone, where the lowest speeds are usually observed (Benekohal & Wang, 1993).

To address the issues of speeding and driver distraction, a wide variety of safety measures exist which can be broadly categorized as Informational, Physical, Enforcement, and Educational measures based on their functional characteristics. These measures are described and their effectiveness reviewed in the following paper available on QUT ePrints:


**Findings to date**

**Driver speed profiles and pilot car operation**

As part of the current research, traffic volumes and vehicle speeds were measured at three long term roadwork sites in Queensland during 2013. Sites 1 and 2 were single lane undivided rural roads operating under 80/60/40 km/h reduced speed limits during working hours, while site 3 was a divided rural road with 2 lanes in each direction (one westbound lane closed) under reduced speed limits of 80/60 km/h (working hours).

The effects of pilot car operation at one of these three sites are described in the following paper available on QUT ePrints: http://eprints.qut.edu.au/66894/ (Debnath, Blackman et al., 2014). Findings of the analysis of driver speed profiles across all three sites are currently being prepared for publication.
Survey of drivers

A survey was administered online to Queensland drivers from November 2013 to February 2014 to examine factors influencing driver behaviour at roadworks. Analysis of the survey data is ongoing, with only some preliminary findings currently available.

Survey participants were presented with 12 photographic images of actual roadwork sites and asked to nominate a speed at which they would drive through each of the 12 sections (speed limit signs were edited out). The mean speeds nominated by participants were compliant with the actual limits for 7 out of the 12 scenarios. This crude preliminary finding is not entirely consistent with the objective speed observations at the three sites mentioned above. Further investigation will examine the particular characteristics in each scenario that may or may not influence speed choice.

The credibility of roadwork speed limits may be undermined by apparent lack of activity and associated hazards at designated sites. Drivers appear to feel that they are being regularly misinformed and thus they become complacent, or in extreme cases resentful, toward work zone traffic controls. Roadwork signage alone has limited effect on driver speed choice, as demonstrated in the literature. Accordingly, survey participants reported that they were most likely to slow down because of the presence of workers on road, visible police presence and seeing a speed feedback display.

Interviews with workers

The lack of reliable safety records and consequent poor understanding of roadwork hazards motivated examination of workers' experiences and perceptions of the causes of roadwork incidents. The findings of this phase of the research project are presented in the following paper available on QUT ePrints: http://eprints.qut.edu.au/62540/ (Debnath, Blackman et al., 2013).

Conclusion

The multidisciplinary approach of the overall research project aims to provide a comprehensive assessment of roadwork risks and hazards in the context of Queensland. Several publications have been produced on specific aspects of the research to date (Debnath et al., 2013; Debnath et al., 2014; Debnath et al., 2012), while several more are currently under peer review or in preparation. Current and future stages of the research involve comprehensive analysis of the survey data introduced above, analysis of workplace health and safety data supplied by TMR, workshops with road authorities and police on the feasibility of testing new and unevaluated interventions, and the testing and evaluation of such measures.

References


