ACRS Submission on AS7531 Lighting and Visibility

About the Australasian College of Road Safety

The Australasian College of Road Safety was established in 1988 and is the region's peak organisation for road safety professionals and members of the public who are focused on saving lives and serious injuries on our roads.

The College Patron is His Excellency General the Honourable David John Hurley AC DSC (Retd), Governor-General of the Commonwealth of Australia.

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Table of Contents

Introduction

The Australasian College of Road Safety is the region's peak membership association for road safety with a vision of eliminating death and serious injury on the road. Our members include experts from all areas of road safety including policy makers, health and transport professionals, academics, community organisations, researchers, federal, state and local government agencies, private companies and members of the public. The purpose of the College is to support our members in their efforts to eliminate serious road trauma through knowledge sharing, professional development, networking and advocacy. Our objectives include the promotion of road safety as a critical organisational objective within government, business and the community; the promotion and advocacy of policies and practices that support harm elimination; the improvement of relative safety outcomes for vulnerable demographic and user groups within the community; the promotion of post-crash policies and practices; and the promotion of a collegiate climate amongst all those with responsibilities for and working in road safety.

The College believes that we should prevent all fatal and serious injuries on our roads; the road traffic system must be made safe for all road users; system designers should aim to prevent human error and mitigate its consequences; life and health are not exchangeable for other benefits in society; and that all College policy positions must be evidence based.

Background

According to the Australian Rail Track Corporation (ARTC), there are more than 23,500 railway level crossings in Australia, of which approximately 80% do not have lights or boom gates.[i] In contrast to more heavily trafficked active crossings, passive crossings provide less protection to road users, significantly increasing risk to the road users who cross them due to a lack of physical protection and lighting. Seventy-nine per cent of level crossings in Australia are passive rather than active, meaning that road users need to check for trains themselves and rely on lighting, line marking and signage to reduce the risk of error. This type of level crossing is common in regional areas throughout Australia, for example the Western Australian wheatbelt.

The aim of the National Road Safety Strategy 2021-2030 (NRSS) is to eliminate deaths and serious injuries on our roads by 2050[ii]. The current target is to reduce this trauma by 50% by 2030, just seven years away. For such targets to be achieved, all crash types need to be reduced, including those at level crossings. All elements of our road transport system need to be strengthened through improvements under three key Safe System themes underpinning the NRSS: Safe Roads, Safe Vehicles and Safe Road User. Speed management is embedded within all three themes and it is important to highlight the first principle of the Safe System approach to road safety" that being that people will always make errors. The opportunity to make errors should not be introduced by less adequate infrastructure or vehicles, including trains. Train visibility is one such weakness in the system that facilitates errors.

The draft National Level Crossing Safety Strategy 2023-2032 (NLCSS) is also underpinned by the current Safe System approach for road safety, which recognises the same key road safety principles as the road network.

People by nature will make mistakes, which happens frequently even when they are not being irresponsible. When mistakes occur on the road, they can lead to crashes with serious outcomes such as death and serious injury. Road trauma will not be eradicated just by improving road user behaviour. A safe transport system must accommodate and compensate for people making mistakes. The transport system needs to eliminate the opportunity for errors to have serious consequences and enable system users to be successful.

The human body can only tolerate limited transfer of kinetic energy before being injured or dying. The human body is vulnerable and not built to withstand impact forces greater than 30kn/hr. For a right-angle crash between motor vehicles, this increases to impact forces greater than 50 km/hr[iii]. Given the transfer of kinetic energy in a train collision far exceeds that of a car, a 'safe speed' for a crash with a train must be less than 50 km/hr.

The Safe System approach includes transport safety being a shared responsibility. Whilst everyone has a part to play the greatest onus should not be placed upon the system users who have the least control over the system. Infrastructure providers and asset owners, such as train and rolling stock owners have the greatest control over major parts of the system and therefore the onus for providing a safe transport system should be greater for them, in comparison to individual users such as individual citizens who are expected to user the system without error.

One of the NLCSS's guiding principles is share responsibility using a cooperative approach between road and rail transport networks, and the collaboration required between relevant authorities. It is important that all levels of government and the relevant rail and road authorities, owners and operators agree on the guiding principles underpinning AS7531 Lighting and Visibility which is an important part of improving level crossing safety.

Layered protection around people keeps them safe from death and serious injuries on the road. If one part of the system fails, the other parts should compensate and still protect people from harm. The transport system must be designed to be safe and forgiving so that, even if a driver makes an error like not seeing the side of a train during the night, the layers of protection built into the system prevent or reduce the impact of crashes which cause death and serious injury. Given train speeds are unlikely to be reduced to a safe level, the system must be better designed so that fatalities and serious injuries are eliminated through other means. In particular with the rail network, reducing the opportunity for errors such as misjudgements due to inadequate lighting. It is crucial that AS7531 specifies the highest standards of train lighting and visibility that are possible to ensure people are protected, particularly at passive level crossings, which have fewer layers of protection.

From a human factors' perspective, negotiating level crossings involves a serious of complex elements, including hazards, situations and tasks, different contexts, as well as human capabilities and individual differences. Organisations like TrackSAFE Foundation[iv] illustrate that rail operators expect road users to respond correctly to the train as a hazard without providing the necessary information and visual cues that are relevant to vehicle drivers and other road users, such as colours and lighting according to their experience in roads.

Humans cannot reasonably be expected to respond to information that is uncommon or unexpected if they are not adequately informed by measures such as lighting to illuminate a significant hazard. The 'triangle of light', a United States of America standard of 'visibility' lighting adopted in Australia whereby lamps are installed on the train in a triangular arrangement, is one example that is likely to be meaningless to drivers, particularly if they don't often drive in regional areas and it is not used on passenger trains.

Light and weather conditions, including night and day, dawn and dusk, fog, snow, rain and other conditions can also visibility and perception. Given trains operate in all locations around Australia, the AS7531 must be applicable for all visual contexts such as the outback, agricultural areas, towns and cities, forests and natural environments. For example, road drivers may have difficulties identifying a train or estimating its approach speed or distance in poor light conditions where a single headlight, or closely spaced pair, can be easily confused with other lights. This scenario does not provide good information about speed or distance.

Train wagons are also dark, often impossible to see at night or in other poor lighting conditions. This is particularly problematic when the wagons get dirty, reflectors are not well maintained or are defaced. Therefore, wagon visibility needs to be improved beyond the recommendations in the Standard.

Reflectorised tape does not work at acute angles and is placed too far apart on the wagons to accommodate road user visibility. Reflectorised tape is also an inferior product compared with the best reflectors available on the market. For example, Aurizon road vehicles have flashing lights on the roof and full length 'green-yellow' coloured reflector strips along the side of the vehicle, which has good reflectivity and is more conspicuous in poor light conditions. Some mining companies also use full length 'green-yellow' coloured reflector strips, outlining the entire side profile of their heavy vehicles for better visibility.

Given the many complex factors involved in negotiating level crossings which impact drivers' visual perception, a high standard of visibility must be mandatory for freight and passenger operations.

The standards for the transport network, including crossing design, level crossing technology and regulation for both road and rail needs to improve. However, these are beyond the scope of AS7531 and therefore not described further here.

There is no road safety or road user organisation on the Development Group. The Australasian College of Road Safety (ACRS) is a peak road safety body and is often directly contacted for such consultations; however, this has not occurred for AS7531. This is a disappointing oversight given that a primary aim of AS7531 is to improve the safety of road users. The ACRS notes that while road users should be a primary beneficiary of improved level crossing safety, there are many others who would also benefit from reduced road trauma, including train drivers, affected families, emergency services personnel, cleanup crews and many more.

ACRS response to the Consultation Draft

The current 2006 AS7531 is well out of date and the improvements in the current draft are valuable. Based on the information and guidance described in the introduction, several improvements should be made to the current draft AS7531.

Firstly, AS7531 should be regarded as a minimum. A hazard analysis indicates that the draft AS7531 may suit low volume train operations crossing lightly trafficked roads during daylight. However, it should be considerably improved for high-risk operations, such as high volumes, often crossing roads that are regularly used, especially during hazardous conditions, such as rain or fog or dawn, dusk and night.

The draft AS7531 needs to be improved with respect to requiring:

- flashing lights on the front of trains, when approaching level crossings;
- lighting on the sides of locomotives, and wagons in higher hazard situations;
- hazard marking patterns and colours on the front of trains; and
- higher standard and more reflectors on wagons.

Flashing lights are very commonly used for many indications of hazards for road users, including oversize or over-mass trucks, emergency vehicles and road works. They are commonly used in transport and other industries to warn of safety hazards. A train is the largest moving object that a road driver will ever encounter, but it can't stop quickly or change direction to avoid a crash.

The sides of locomotives should be lit to provide the best visibility, especially for the many crossings which are at an angle. All large road vehicles, including trucks and trailers, are required to have outline lighting and side lighting. Wagons should be lit when they are a high hazard, such as frequent use at crossing that are not fitted with flashing lights or boom gates, and operate in poor light conditions or at night.

During daytime, the visibility colours need to be as obvious as possible on the front and sides of trains. The colours proposed in the draft AS7531 are much improved, however they need to specify a description of contrast and they need to be larger. This is consistent with markings on large road vehicles, road works and road signs, which is what road drivers are familiar with and expect.

The use of Class 400 or Class 1100 reflectors on wagons should be regarded as an absolute minimum. Higher standards of reflectors, which are commercially available should be specified for high-risk operations. More reflectors should be applied to wagons and outline reflectors should be commended, as is starting to occur for road vehicles.

Conclusion and Recommendations

The proposed updates to AS7531 Lighting and Visibility that improve the visibility of trains at level crossings is supported.

It is recommended that the draft AS7531 be improved to require the following measures, based on information available, the NRSS and the NLCSS:

- Flashing lights on the front of trains, when approaching level crossings,
- Lighting on the sides of locomotives and wagons in higher hazard situations,

- Hazard marking patterns and colours on the front of trains, and
- Higher standard and more reflectors on wagons.

It is recommended that the draft AS7531 is implemented immediately and to the highest standard possible, especially for high-risk operations, in addition to being mandatory and enforceable to ensure high compliance in freight and passenger operations. AS7531 should be regarded as a minimum.

ACRS appreciates the opportunity to comment on the proposed standard and contribute to improving road safety. The ACRS can assist with developing and implementing Standards, strategies and plans to improve level crossing safety. Please do not hesitate to contact me should you require any further information.

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CEO
Australasian College of Road Safety

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References

[i] https://www.artc.com.au/community/safety-around-level-crossings/?doing_wp_cron=1697102790.4743089675903320312500#:~:text=Level%20Crossing%20Safety&text=The%20remaining%2079%25%20of%20level,private%20and%20maintenance%20level%20crossings

[ii] https://www.roadsafety.gov.au

[iii] Wramborg, P. (2005). *A new approach to a safe and sustainable road structure and street design for urban areas*. Road Safety on Four Continents Conference, 2005, Warsaw, Poland. Swedish National Road and Transport Research Institute (VTI), Linkoeping, Sweden.

[iv] TrackSAFE Foundation is an educational charity wholly owned by railways. www.tracksafefoundation.com.au