Railway level crossing safety

- In Australia, from 2014-2019, there were 194 collisions between trains and vehicles, and 27 collisions between trains and pedestrians at level crossings[1].
- Fatalities are most likely to be the road user, not train passengers[2].
- Level crossings are governed by a simple rule: the road user must give way to trains. Almost all collisions are the result of the road user failing to obey this rule[3].

State of the Road A Fact Sheet of the Centre for Accident Research & Road Safety - Queensland (CARRS-Q)

THE FACTS

- Across the Australian rail network, there are more than 23,500 level crossings, in which roads and railway tracks intersect[4].
- Collisions at railway level crossings are the single largest cause of loss of life on the rail network[5].
- Most crashes occur where the driver has a local understanding of the railway level crossing[6].
- 70% of vehicle crashes at railway level crossings occur during the daytime[6].
- Whilst collisions are rare, they have the potential to be catastrophic and costly. In 2010, the annual cost of level crossing crashes to the community was estimated as approximately $116 million[7].
- In Queensland between 2016-2017, there were 185 near misses with road vehicles and 87 near misses with pedestrians reported at level crossings[8].
- In Queensland between 2009-2016, there were 74 level crossing collisions: 69 between trains and road vehicles, and the remaining five between trains and pedestrians[8].
- Across the rest of the country, in the financial year 2016/2017, there were 30 level railway crossing collisions: 27 between trains and road vehicles and three between trains and pedestrians, resulting in four fatalities. The majority of collisions involved heavy rail passenger trains[2].
- Crash history shows that the most effective control for avoiding collisions at level crossings is boom gates, and that level crossings equipped with flashing lights are much safer than stop sign and give way controlled crossings.
- At present, approximately 20% of Australian level crossings are equipped with active protection systems (i.e. flashing lights and sometimes boom gates and auditory warning tones)[6]. The remainder utilise passive protective measures, such as stop and give-way signs.

The rule is simple: **road users and pedestrians must give way** to trains.

Who is most at-risk?

- All road users are at risk at railway level crossings if they do not follow the rules.
- Pedestrians are the most common fatalities, and occupants of motor vehicles are the next most frequent group of fatalities.
- At urban railway crossings it was found that pedestrians were responsible for the most violations (e.g. going through the crossing when activated, going around the No Entry gate), followed by motorists (e.g. stopping on the crossing, ignoring flashing lights), and cyclists (e.g. entering the level crossing before boom gates had completely risen[9].
- Collisions occur most often between light vehicles (i.e. cars) and trains (64% of fatal collisions), followed by collisions with heavy vehicles (e.g. road trains and B-doubles; 23% of fatal collisions). Heavy vehicles are over-represented, meaning that truck drivers may be at higher risk at level crossings.
- In a collision with a light vehicle, the vehicle occupants are most at risk of fatality. However, in a collision with a heavy vehicle, train passengers are most at risk of fatality[10].

How and why do level crossing collisions occur?

- Research has documented that the majority of risky behavior at railway crossings is a result of violations of road rules[9].
- The following are the most common factors in driver error at level crossings[3,11]:
  - Drivers' difficulty in gauging the time and space required to cross safely;
  - Risk-taking behaviours such as trying to "beat the train" to avoid delays and meet unrealistic delivery schedules;
  - Driver complacency due to familiarity with the travel route;
  - Not driving according to the conditions;
  - Distraction;
  - Sighting limitations;
  - Operational aspects of heavy road vehicles;
  - Fatigue, which has profound effects on driver performance (e.g. longer reaction times, reduced ability to judge distances, speed and time); and
  - Driver impairment.
- Trains cannot stop as quickly as cars, and require long distances up to 2kms or more, depending on the environment, to come to a stop. Research has shown that most drivers underestimate the travelling speed of trains by at least 30%[12].
- If a vehicle or pedestrian is present on the crossing while a train is approaching, the train driver can only sound the horn and apply emergency braking. However, it

could already be too late to stop the train before impact.

- In high traffic areas, drivers can misjudge or do not consider the space they need to fully clear the crossing leading to "short stacking" or queuing across a crossing. The vehicle can subsequently be trapped on the crossing when the flashing lights become activated.
- Unlike other fatal road crashes, crashes at railway crossings are less likely to involve fatigue, speeding, drugs or alcohol, and more likely to be attributed to errors in driver behaviour[3].

Never **rush to beat a train**. Trains approach much faster than you think and it can take a fully loaded freight train up to 2km to stop[4].

CARRS-Q WORK IN THIS AREA

- Evaluation of an advanced Active 'Expect Trains' sign for passive level crossings.
- Investigation of the efficacy and safety benefits of train horn use as a warning device at level crossings.
- Evaluation of the effectiveness of in-ground LED warning lights at level crossings to attract the attention of pedestrians distracted by mobile phone devices or headphones.
- Investigation of driver interactions with passive crossings particularly the ability of drivers to estimate the travelling speed of trains[11].
- Investigation of pedestrian behaviour at level crossings[9,13], examining the prevalence of intentional rule breaking and mistake making in the general population, the reasons for this and interventions which may be effective at reducing these behaviours.
- Evaluation of driver behaviour changes with the introduction of new in-vehicle and road-based technologies for level crossings increasing driver awareness during the approach of level crossings[14].
- Evaluation of the effects of increased train and road traffic on congestion at level crossings, as well as its consequences on drivers' violations at railway level crossings[15].
- Validation of the CARRS-Q simulator to study driver behavior at passive crossings confirming that our driving simulator research findings are transferable to actual road behaviours[16].
- Evaluation of adequate sighting distances for stop sign level crossings as part of the revision of the Australian Standard AS1742 Part 7 for railway level crossings.

Never **enter a crossing if the exit is blocked**. If you do get stuck on a level crossing, get every passenger out of the vehicle and off the crossing immediately.

FUTURE DIRECTIONS

Anticipated future directions include:[9]

- The removal of dangerous and congested level crossings around Melbourne.
- The Australian government Boom Gates for Rail Crossings program, which aims to upgrade level crossings with flashing lights, stop sign and give way sign, to boom gates protection.
- The National Railway Level Crossing Safety Strategy (2017-2020), provides a nationally coordinated approach which aims to reduce the likelihood of incidents and near misses at Australian railway level crossings. It has adopted and integrated the Safe System approach of the National Road Safety Strategy as a core principle.

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