

# Railway level crossing safety

- In Australia between the period of 2002-2012, there were 601 collisions between trains and vehicles and 92 collisions between trains and pedestrians at level crossings.<sup>1</sup>
- Collisions at railway level crossings are the single largest cause of loss of life on the rail network.<sup>2</sup>
- 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.<sup>3</sup>

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

### THE FACTS

- There are approximately 70 collisions at level crossings per year in Australia. Such collisions are rare but have the potential to be catastrophic.
- While the number of collisions at level crossings has decreased in the 2002-2012 period, the number of fatalities and serious injuries are stagnating.<sup>1</sup>
- Out of the 35 rail-related fatalities per year, 11 are the result of a collision between a vehicle and a train at a level crossing.<sup>1</sup>
- The annual cost of level crossing crashes to society has been estimated as approximately \$116 million in 2010 in a study conducted for the Railway Industry Safety and Standards Board (RISSB).<sup>4</sup>
- There are two main types of level crossings in Australia: level crossings with (i) active and (ii) passive controls. Active level crossings have flashing lights with or without boom gates, where the signal is activated prior to and during the passage of a train at the level crossing. Passive level crossings use stop or give way signs, and do not provide any information about the approach of a train. It is for the road user to observe and detect the presence of the train.<sup>3</sup>

### Who is most at-risk?

- All road users are at risk at railway level crossings if they do not follow the rules. Together, pedestrians and occupants of vehicles comprise more than 90% of those who lose their lives at level crossings. Pedestrians are the most common fatalities, and occupants of motor vehicles are the next most frequent group of fatalities.<sup>5</sup>

- Examination of fatality data shows that collisions between light vehicles (e.g. cars) and trains are the most common (64% of fatal collisions), followed by collisions with heavy vehicles (e.g. road trains and B-doubles; 23% of fatal collisions).
- Almost all fatalities associated with level crossing collisions between light vehicles and trains are road vehicle occupants. Collisions with heavy vehicles increase the likelihood of fatalities, due to the higher chance of having fatalities among train passengers.<sup>5</sup>
- Research has found train drivers perceive a general disregard by motorists for the laws and warning systems at level crossings as the predominant cause of danger. High risk motorist behaviour identified by train drivers included (from highest to lowest risk):<sup>6</sup>
  - trying to “beat the train” across a crossing;
  - crossing with undue haste;
  - crossing in poor visibility situations;
  - ignoring warning devices; and
  - crossing without due attention to the conditions in front of them.

### How and why do level crossing collisions occur?

- Railway level crossing crashes are amongst the most complex of road safety issues, due to the addition of the rail infrastructure, trains and train operations.
- Trains cannot be stopped as easily as cars, and they need large distances (the order of magnitude is up to two kilometres, even though it depends on a lot of parameters such as the weight of the train, the slope

of the rail track and the weather) to come to a stop.

- If a road user is present on the crossing while a train is approaching, the train driver can only sound its horn to alert the road user and apply emergency braking. Though the train driver can see the road user on the crossing, most of the time it is already too late to stop the train before impact.
- In high traffic areas, “short-stacking” is also a common issue that can result in collisions. This occurs when drivers misjudge or do not consider the space they need to fully clear the crossing. The vehicle can subsequently be trapped on the crossing when the flashing lights become activated and a train approaches the crossing.
- 1 person is killed every 10 days on the Australian rail network. Every year, there are 1,000 near misses.<sup>7</sup>

## The rule is simple: road users and pedestrian must give way to trains.

### Crash situations

- Across the Australian rail network, there are more than 23,500 level crossings, in which roads and railway tracks intersect.<sup>7</sup>
- 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).<sup>8</sup> The remainder utilise passive protective measures, such as stop and give-way signs.



- Collisions occur at all types of level crossings. The greatest proportion of fatal crashes between vehicles and trains occur at crossings protected by stop signs, followed by flashing lights without boom gates. Adjusted for rail and road traffic, 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.<sup>5</sup>
- Most crashes occur where the driver has a local understanding of the railway level crossing.<sup>9</sup>
- 70% of vehicle crashes at railway level crossings occur during the daytime.<sup>9</sup>
- Over many years, increases in freight and passenger demand, the size and speed of trains, the size of trucks, train quietness and motor vehicle speed and sound proofing could be expected to increase the likelihood and severity of crashes.

#### Major factors

The following factors are the most common factors in driver error and deliberate violations at level crossings:<sup>3,10</sup>

- Drivers' difficulty in gauging the time and space required to cross safely;
- Risk-taking behaviours such as trying to "beat the train" to avoid frustrating 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.

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.<sup>3</sup>

**Be vigilant! Obey the signs. Stop, listen, look - and look again!**

**Never be tempted to go around boom gates or ignore flashing lights. They are operating for your safety. A second train may be coming and a train cannot swerve to miss you.**

#### TIPS FOR STAYING SAFE

Safety at railway level crossings **depends on road users** to take the appropriate actions depending on the control system displayed on the approach of and at the crossing. **You must obey signs**, warning lights and alarms. If you are not following the road signs, you are putting yourself, other road users, railway passengers and staff at danger. **You must give way to trains** in any circumstances.

#### For motor vehicles:

- **Be vigilant** every time you approach a crossing, regardless of how familiar you are with the crossing.
- Always approach a level crossing carefully and **be prepared to stop**.
- If you **see or hear a train, then stop** (don't proceed through the crossing). Never race a train to a crossing.
- Remember that trains can come from both sides and can be hidden by another train.
- **Never enter a crossing** (i.e. never go beyond the stop line on the road) **if you cannot exit the crossing** at the time you enter it. **Never stop** or park on a level crossing.
- **Never reverse** onto or over the crossing. It is illegal to stop on the level crossing, even for level crossings without yellow box marking.
- If your vehicle gets stuck on a level crossing get every passenger out of the vehicle and off the crossing immediately.
- Contact the phone number displayed on the road signage at the crossing, and follow instructions you are given.

- Only move the vehicle off the crossing if there is time to do so before a train arrives. If flashing lights activate or the bells sound, then leave the vehicle and get off the crossing immediately.

*For level crossings with flashing lights/boom gates:*

- **NEVER enter a crossing when the flashing lights are activated.** If the flashing lights do not deactivate, it can be due to the approach of another train. If the lights are activated for a prolonged period of time and do not deactivate, contact the phone number that is displayed on the road signage, and do not proceed through the crossing.
- Never drive under or around ascending or descending boom gates. An oncoming train is in the vicinity or a second train may be approaching.
- Do not cross until the gates are fully raised and the lights stop flashing.

*For level crossings with passive signage:*

- **You are responsible to detect the presence of a train** through direct observations. **If unsure, then STOP.**
- Be aware of optical illusions and problems with visibility. Trains in the distance are **often closer and travelling faster** than they appear. Don't gamble at s-bend roads, in glare or when roadside objects obscure your view.
- For level crossing with a **give way sign, the sighting distance during the approach of the crossing is sufficient** for you to stop in time if you can see a train. While approaching, if you can see or hear a train, come to a complete stop and do not proceed through the crossing.
- For level crossings with a **stop sign, the sighting distance is not sufficient** to make a decision before reaching the crossing. **You are required to come to a complete stop** at the crossing, visually search for trains in both directions and, if no train can be seen or heard, proceed through the crossing. If a train is seen or heard, you should remain stationary until it is safe to proceed.

*For other road users (e.g. pedestrians, cyclists):*

- **Cross railway lines at marked crossings only** and obey all warning signs and signals. Never jump or push through fences, gates or barriers.
- **Stop, look and listen. If you see or hear a train, do not cross.** If lights are flashing, gates are closed or closing, bells are ringing, then do not proceed through the crossing. It is illegal to cross level crossings if any warnings are in effect (bells ringing, light flashings and gates closing/opening). Breaking these rules can result in a fine from police or transit officers, both of which may be undercover patrolling level crossings. **If unsure, then do not cross.**

- **If it is safe** to cross, **look again** before you cross and **make sure the exit of the crossing is clear** at the moment you start crossing; **cross quickly**, taking care not to slip, trip or fall on the crossing. **Do not stop.**
- Be aware that the surface of the crossing might not be smooth. **Take care if using a wheelchair, mobility aid, or pram**, Make sure that the wheels do not get trapped in the gap between the rail and the walkway.
- Do not only rely on what you see: the visibility at the crossing can be obscured by bushes, trees, infrastructures, curves etc. Try to also hear the train. Remember that modern trains are quiet, and that trains will not always sound their horn (e.g. at night).
- Be aware that you overestimate the time you have before the train reaches the crossing: **trains are approaching a lot faster than you think.** If you see a train, do not proceed through the crossing.
- **Be vigilant** every time you approach a crossing. Inattention is the largest cause of mistakes at level crossings.<sup>11</sup> Before you reach the crossing, stop using devices that may distract you or reduce your ability to hear or see a train: stop using smartphones, remove headsets, earphones and hoods.
- **Be aware of second trains**, often pedestrians will cross the tracks after a train has passed, without waiting for warning signals to stop. However, the presence of a second train is a common factor in pedestrian fatalities.<sup>12</sup> Remember that trains can come from both sides and can be hidden by another train.
- If warning signals start while you are on the crossing, always go to the emergency escape gate **ahead** of you and **not back** to where you entered the crossing.

- **Supervise children** at all times around public transport and hold the hand of children up to 5 years of age when crossing railway lines.
- When in a group, **do not follow the person in front** of you. Stop, look and listen - and decide for yourself if it is safe to cross.
- Keep pet dogs on a leash.
- For **cyclists** using the pedestrian crossing, **dismount.**
- Consider road users that may need help for going through the crossing: young, elderly or disabled people.

**Never rush to beat a train. Trains are approaching much faster than you think and it can take a fully loaded freight train up to 2km to stop.<sup>7</sup>**

#### **CARRS-Q'S WORK IN THIS AREA**

- 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.<sup>13</sup>
- Several level crossing research projects with the CRC for Rail Innovation. These projects include a national level crossing warning system trial program, where new technologies are used to warn road users of an approaching train at low-exposure level crossings.
- 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.



- Investigation of pedestrian behaviour at level crossings<sup>11</sup>, 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.<sup>14</sup>

**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:<sup>9</sup>

- The National Railway Level Crossing Safety Strategy (2010-2020), which provides a nationally coordinated approach to significantly improve safety at railway level crossings. It adopted and integrated the Safe System approach of the National Road Safety Strategy as a core principle. Its objective is to reduce the likelihood of crashes and near misses at Australian railway level crossings. This objective will be met through improved consistency

of practice nationwide and coordination amongst the different stakeholders, from government agencies to the rail industry and the community.

- 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 development of strategy to rapidly adopt and integrate intelligent transport systems and emerging technologies.
- Further research into human factors for railway level crossing perception and cognitive processes.

- Education and enforcement: increase in the level of awareness by the community, as well as an increase of compliance at level crossings.
- Focus not only on fatal but also near-miss occurrences, in order to better understand factors leading to crashes at railway level crossings.
- The development of targeted countermeasures for heavy vehicles. These should be two-fold focussing on driver behaviour and the risk factors associated with size and mass.
- Increased effective application and consistency of enforcement and penalties.

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