CONSTRUCTION LOGISTICS AND COMMUNITY SAFETY - AUSTRALIA (CLOCS-A)

DRAFT GUIDANCE DOCUMENT

Construction Logistics and Community Safety – Australia (CLOCS-A) – a practical guide – July 2020

What is CLOCS-A?

CLOCS-A or Construction Logistics and Community Safety – Australia, is a national good practice approach for managing the risks and impacts associated with a construction project’s on-road transport and logistics activities to community road safety. It was developed to provide a consistent framework for industry to achieve and has been inspired by the success of the CLOCS Program established in the United Kingdom in reducing road trauma associated with construction logistics.[1] The primary goal of CLOCS-A, is that a similar reduction in lives lost and serious injuries can be achieved locally on our roads in Australia.

Purpose of the document

The purpose of this document is to provide government and industry with a practical framework for the management of risks and impacts to community road safety associated with a construction project's road transport and logistics activities. Primarily an engineering and policy document, it is based on the Safe System approach to improving road safety.

This document has been developed with input from a range of stakeholders including representatives from government, industry, and the community with the aim to go beyond legal minimums in Australia’s efforts to improve the safety of pedestrians, cyclists and motorcyclists (collectively known as Vulnerable Road Users (VRU)) around trucks.[2] The ultimate objectives are to:

- Eliminate collisions between heavy vehicles and the community
- Improve efficiencies through fewer vehicle journeys
- Establish a single national standard for industry to meet
- Reduce reputational risk

Image of construction heavy vehicle traffic in Sydney CBD

As a nationally consistent construction logistics safety guideline based on emerging local[3] good practice and international[4] best practice, it is especially relevant to:

- **Government** where it can be used to inform a project's planning requirements and included in procurement contracts to embed community safety metrics in future construction projects
- **Industry** as it can be referred to as guidance on good practice transport safety risk management and inform future investment decisions

Authors of this document would like to thank all those who contributed to the development of this guide. A full list of contributors is located in Appendix A.

Scope of the document

The scope of this document is relevant to regulators, asset managers, clients, principal contractors and fleet operators. It relates to improving the safety of on-road and logistics related activities.

Document status

This version is a draft only. It is intended to start a conversation and is a work in progress. The themes covered here focus on managing risks associated with increased likelihood of interactions between construction heavy vehicles and vulnerable road users. Regulatory compliance requirements which relate to heavy vehicles, such as those under the Heavy Vehicle National Law (HVNL) and Regulations are not covered in detail in this document. Relevant industry resources and regulatory guidance should be referred to for such matters.

To ensure that this document can remain relevant and reflect progress in industry, it should be subject to periodic review by a group of suitably qualified practitioners and subject matter experts in the construction, transport and logistics, road safety and community safety areas, and be kept up to date by the release of revised versions as necessary.

It is important that users of this document ensure that they are in possession of the latest released version of this document, which can be accessed via the CLOCS-A website www.clocs-a.com.au

Disclaimer: The information in this document is intended as a guide only, and is not legal advice. If you or your organisation has a specific legal issue, you should seek advice before making a decision about what to do.

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1 THE CHALLENGE: WHAT PROBLEM ARE WE TRYING TO SOLVE?

Context

Australia has more than $80 billion worth of infrastructure projects in the pipeline. This is an unprecedented infrastructure build with many of the projects centred in major cities. Sydney, Melbourne and Brisbane each have major rail and road projects under construction through the heart of their central business districts and inner-urban areas. Most of these projects will be constructed over five or more years and whilst they may be a rail, airport, freeway expansion, light rail, or other infrastructure build, each project will generate significant heavy vehicle movements during their build life.

Sydney Metro, for example, will require over half a million truck movements to transport excavated material over the life of its City and Southwest Project. Melbourne Metro will move a truck every three and half minutes through the heart of Melbourne for five years.

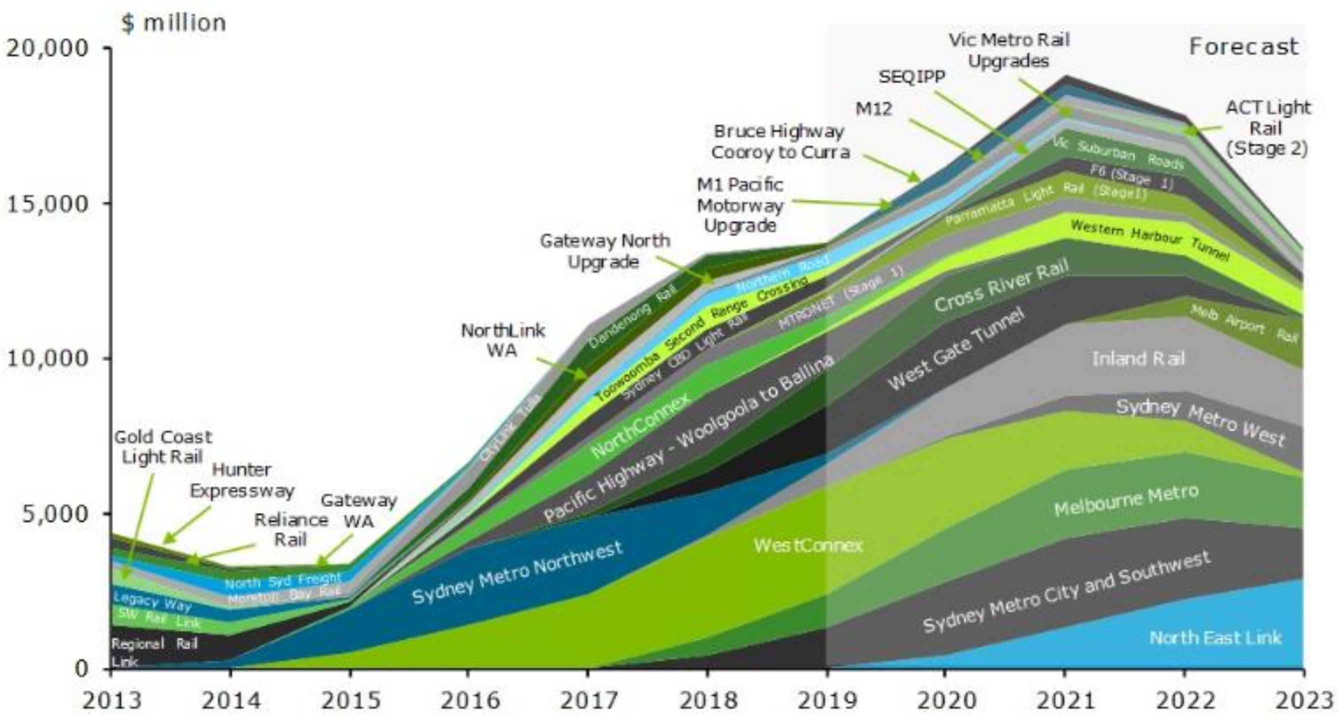


Figure 1.1 Major road and rail projects Australia[5]

Every truck movement in relation to these projects will place additional pressure on an already congested road network and increase the risk for fatal or serious injuries to other road users, in particular VRUs. The long lifespan of these projects also provides opportunity for long-term work certainty for road transport operators and suppliers which secure contracts with them. For industry though, this can be complicated with each project having varying heavy vehicle contract standards in relation to reducing its road related risks.

RISK OF CRASHES INVOLVING HEAVY VEHICLES AND VULNERABLE ROAD USERS

Crashes involving heavy vehicles and vulnerable road users are likely:

In 2018 alone 21 pedestrians were killed in crashes involving heavy vehicles.[6] This represents 12% of all fatalities involving heavy vehicles in 2018.[7]

The consequences should a crash occur are severe:

'Pedestrians, cyclists and motorcyclists are likely to be seriously injured or killed even if struck at the default urban speed limit. The mass difference between heavy vehicles and all other vehicles and unprotected road users means that any collision has a high likelihood of severe injury or death.'[8]

1.1 ROAD SAFETY INVOLVING HEAVY VEHICLES MANAGED LESS PROACTIVELY THAN WORKPLACE HEALTH AND SAFETY

1.1.1 NATIONALLY CONSISTENT GUIDANCE AND A SYSTEMATIC APPROACH TO HEAVY VEHICLE ROAD SAFETY IS NEEDED

The Inquiry into the National Road Safety Strategy 2011-2020 emphasised the importance of prioritising implementation of interventions which are suited to their geographical location, whether that be across all of Australia, metropolitan areas or regional and remote areas. Protection for vulnerable road users was included as an example of a particularly impactful key intervention for both the safe roads and safe vehicle pillars in metropolitan areas.[9]

However, without standardised requirements and mechanisms to monitor performance, opportunities for widespread safety outcomes are limited.

'The importance of managing construction vehicle safety once the vehicle has left the construction site needs to be communicated within the construction industry, and guidance should be produced to assist with this.'[10]

Given the extent of construction activities across most Australian capital cities, without consistent guidance or a standard which industry can refer to and abide by, there is limited potential for an industry-wide commitment to step up and go beyond the status quo. This was also highlighted by the Inquiry into the National Road Safety Strategy 2011-2020:

'The inquiry has identified many dedicated, knowledgeable and capable people who help "nudge" organisations and the community towards better safety outcomes. The efforts of these individuals should not be underestimated; they often operate in constrained environments and compete for the resources, attention and cultural change required for the road safety transformation that is desired. A national response must rise above these constraints with realistic expectations on what individual organisations can contribute, and a better understanding of what else might be needed to create a lasting step-change in road safety performance.

Accountability for road safety has been a shared responsibility between the various layers of Australian governments and to a lesser extent corporations and organisations. Frequently, there is still an overarching view that road users are entirely to blame.'[11]

Stakeholders involved in Road Safety for Heavy Vehicles are described in Section 2 along with specific recommended actions to be taken outlined in Section 3.1.1 and further details on these actions included in Sections 4 and 5.

1.1.2 WORKPLACE HEALTH AND SAFETY INVOLVING HEAVY VEHICLES IS EASIER TO MANAGE THAN ROAD SAFETY

'78 percent of the work-related injury fatalities in the Road freight transport industry occurred while driving or being driven in a vehicle on a public road.'[12]

'It is often easier to manage work health and safety (WHS) hazards and risks in the workplace where you can see the hazard or risk and control the environment more effectively than you can when workers are outside your workplace. Vehicles used for work purposes are considered a workplace so it is important for all [employers] and workers to be aware of the hazards of driving vehicles and working around them.'[13]

'Truck drivers have a unique working environment. Their workplace is mobile and inevitably interacts with public spaces shared by other motorists, the general public, pedestrians and other commercial users. Because of this, safety in the road transport industry can have a broader impact on society than safety issues in other workplaces. When a truck is involved in a safety incident the general public is affected, either through direct involvement in the accident, in which case the other party statistically is likely to suffer worse consequences than the truck driver, and also through the impact on shared infrastructure and monetised and non-monetised community costs. Sharing this workspace with the public and other users can result in serious consequences. In this sense, the transport industry has a unique and higher burden than many other industries in relation to safety outcomes.'[14]

1.1.3 TREAT SAFETY ON THE ROAD AS SERIOUSLY AS SAFETY AT WORKSITES

1.1.3.1 Recommended Actions to Proactively Manage Road Safety to the same level as Workplace Safety

'Employers may be inclined to think that when their employees are on the road, the law of road use – not health and safety legislation – exclusively governs the safety of drivers and other road users. However, the legal case of Downer EDI v The Queen (2017), which followed on from DPP v Downer ED (2015), has dispelled that idea. Under health and safety law, any place where work is undertaken is a workplace, so health and safety law applies.' [15]

In the Downer cases, a traffic controller died when a street sweeper reversed over him.

Both VicRoads and Downer argued in the first instance that the death was caught exclusively by the Road Safety Act 1986, so health and safety legislation did not apply.

The matter was referred to the Victorian Appeal Court of the Supreme Court (ACSC). The ACSC rejected the argument, making it clear there would need to be express provisions within any legislation to exclude health and safety law from being applicable, which the Road Safety Act 1986 did not do.

Downer subsequently argued that the allegations against it – that it was required to have provided the driver of the street sweeper with training and instruction – was not a proper claim.

The ACSC held that the issue of whether the failure to provide training and instruction caused the death was not relevant for the breach of the primary health and safety duty to provide a safe workplace.

All the Crown had to prove was that training and instruction were reasonably practicable to prove a breach of the primary duty. In this case it was reasonably practicable.

3 key lessons for employers

Employers that have people working away from their principal site can learn the following:

1. **Wherever someone works is a workplace and must be covered by the employer's safety system.**
2. **A safety system involves a strategic safety plan that:**

- identifies hazards with the highest risk, allocates resources and makes people accountable for the control of those risks;
- is documented;
- creates training with a frequency consistent with identified risk and ensures competence;
- has supervisors and managers who are aware of the risks and familiar with documented systems and safety law to supervise and enforce the system and law;
- is monitored to ensure systems are being followed and that there is reporting against the system through the governance structure of the organisation; and
- ensures training and instruction is focused on the risks experienced by the business's workers.

3. **It is a breach of your primary health and safety duty not to have a safety system in place, even if no one is injured.**

In the event of injury or death, the regulator will examine that failure and prosecute. The court will determine whether that failure was causative or partly causative, and such a finding of causation will increase the penalty.

Employers must always take reasonable practicable steps.[15]

'Well-managed organisations have moved beyond considering who did the wrong thing to identifying what went wrong in their processes and how this can be prevented from happening again.' [16]

Transport safety issues in the construction sector must be treated in a holistic way. A nationally consistent approach is recommended as construction vehicles and drivers are often operating across different sites, councils and jurisdictions to service multiple projects simultaneously. To achieve the best safety and productivity outcomes, a national and coordinated approach that allows for innovation and collaboration across Australian industry and jurisdictions is required.

1.2 WORKPLACE HEALTH AND SAFETY CONCEPTS

A number of key principles which are well understood and applied in the workplace health and safety context are often ignored despite their relevance in the road safety context. A perception that risks in the transport context are too complex to address can cause a reluctance to act which may leave organisations vulnerable to legal action should an incident occur.

Risk Management – including Hazard Identification, Risk Assessment, Control and Evaluation, 'So Far as is Reasonably Practicable' and 'Due Diligence' are important concepts which apply to both the WHS and HVNL. These concepts should be considered in order to adequately identify and control risks in the transport context.

A key component of any organisation's risk management strategy should be an action plan mapped out over several years and include the resources required to make this a reality. There is no expectation that any organisation can take all reasonable steps in a single bound but rather to do what is feasible which is the application of the principle reasonably practicable. Not having an action plan, timelines, resourcing and accountability will leave an organisation exposed should an incident occur.

1.3 THE SAFE SYSTEM APPROACH AND ITS APPLICATION TO THE TRANSPORT SUPPLY CHAIN OF CONSTRUCTION PROJECTS

The Safe System is the underpinning approach applied to road safety. All of Australia's state and national based strategies are centred around the Safe System and how it is applied to reduce road trauma on the nation's roads. An important element of the Safe System is recognising that road safety is a shared responsibility and everyone has a responsibility to help reduce road trauma. The Safe System provides a mechanism for industry to work through its hierarchy of risk and apply each of the Safe System pillars to reducing the road transport related risk associate with the project.

1.3.1 WHAT IS THE SAFE SYSTEM APPROACH?

To address the risk of crashes involving heavy vehicles and vulnerable road users, it is practical to take a Safe System approach to improving road safety.

'The Safe System means recognising that people do make mistakes and that there are physical limits to the amount of force our bodies can take. This means that the road transport system should be designed so that the forces in collisions do not exceed the limits of human tolerance.'[17]

The Safe System approach is also acknowledged internationally as the guiding concept for delivering a 'vision zero' strategy.[18]

It is also the basis of Australia's National Road Safety Strategy (NRSS):

'This involves a holistic view of the road transport system and the interactions among roads and roadsides, travel speeds, vehicles and road users. It is an inclusive approach that caters for all groups using the road system, including drivers, motorcyclists, passengers, pedestrians, cyclists, and commercial and heavy vehicle drivers.'[19]

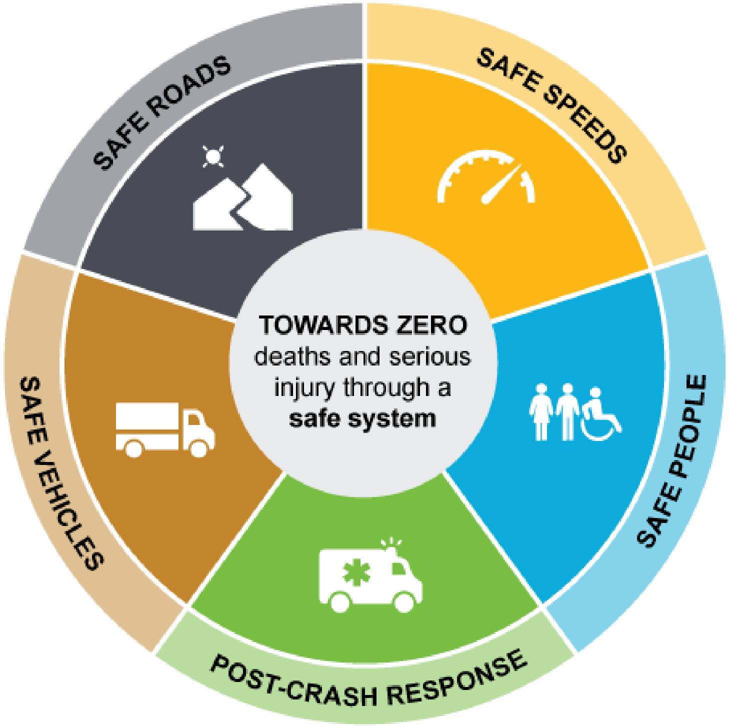


Figure 1.2 Five pillars of the Safe System

The NRSS centres on a shared commitment from all jurisdictions to the vision that

'No person should be killed or seriously injured on Australia's roads.'[20]

As outlined below, the Safe System is broken down into 5 pillars of action.[21]

Safe roads

'Relates to both the road itself and the roadside. This considers ways to design, operate and maintain the road network to reduce the chance of a crash occurring as well as the consequence when one does occur.'

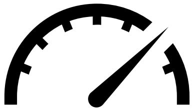
Safe vehicles

'Relates to the safety features, including intelligent technologies that are incorporated into vehicles of different types, which contribute to crash avoidance and/or reducing the severity of crashes.'

Safe people

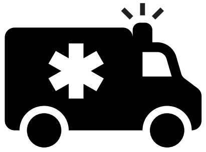
'Relates to road user behaviour, driver / rider training and licensing, levels of compliance and personal safety equipment, particularly in the case of vulnerable road users such as cyclists and motorcyclists.'

Safe speeds



'Relates to the speed at which vehicles are likely to travel on the road. Factors that influence operating speeds include posted speed limits, the level of compliance with the speed limit and physical constraints. Unsafe speeds can increase both likelihood and consequence of a crash.'

Post-crash response



'Relates to emergency medical and rescue response, trauma care (both at the scene and in hospital) and injury rehabilitation.'

1.3.2 WHAT DOES THE SAFE SYSTEM APPROACH LOOK LIKE FOR CONSTRUCTION PROJECTS?

Applying the Safe System approach to the supply chains of construction projects means focusing on taking actions across the 5 pillars of action.[21]

For construction projects, the Safe People and Safe Vehicles pillars of action have been prioritised through Critical Action K of the National Road Safety Action Plan 2018-2020.

Critical Action K of the National Road Safety Action Plan 2018-2020

'require[s] contractors on government-funded construction projects to improve the safety of vulnerable road users around heavy vehicles through safety technology and education programs'.[17]

Through responsible planning for construction projects, the Safe Roads, Safe Speeds and Post-Crash Response pillars can also be addressed.

It is understood that each stakeholder in a Construction Project's supply chain will have different levels of influence and information which will determine what role they should take in contributing towards each of the 5 pillars of action.

Ultimately it is the role of all stakeholders to ensure the Safe System pillars are integrated rather than viewed as silos within safety. The safe journey management of the construction heavy vehicle is where all of these Safe System components interact to protect the supply chain stakeholders and all road users. More info on safe journey management is included in Section 4.4.

Stakeholders involved in embedding a Safe System on Construction Projects are described in Section 2 along with specific recommended actions to be taken outlined in Section 3.1.1 and further details on these actions are included in Sections 4 and 5.

Figure 1.3 The Safe System for Construction Projects

2 STAKEHOLDERS INVOLVED IN ADDRESSING THE PROBLEM

A Safe System approach to managing the safety of vulnerable road users around heavy vehicles will require involvement and integrated actions from various stakeholders.

'Achieving lasting change in road safety will require governments, industry and the broader community to work together. It will also require significant improvements in the way governments and other organisations manage the safety of our road transport system.'[20]

A construction project typically has five key stakeholders in the transport supply chain with each providing positive influence and information.[22] The community is considered to be the overarching stakeholder in any construction project.

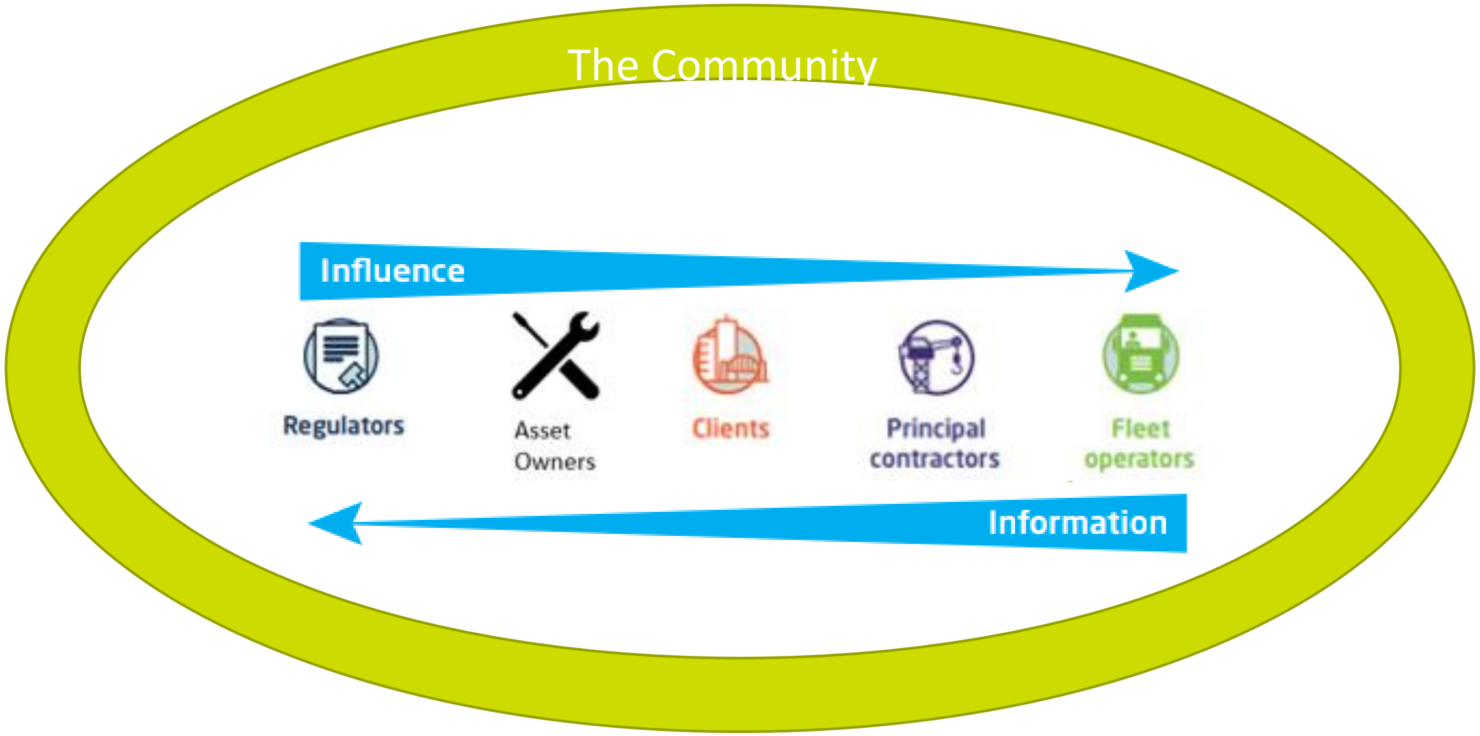


Figure 2.1 Key stakeholders in the transport supply chain for construction projects

Each stakeholder takes a leading or supporting role in contributing to a Safe System as indicated in the following table.

Table 2.1 Primary roles for stakeholders in transport supply chains for construction projects

Stakeholders Involved	Primary role		Safe System Pillar
	Leading	Supporting	
Regulators		✓	Safer roads
Asset Owners	✓		
Clients		✓	
Principal Contractors		✓	
Fleet Operators		✓	
Regulators		✓	Safer vehicles
Clients	✓		
Principal Contractors	✓		
Fleet Operators	✓		
Regulators		✓	Safer people
Asset Owners		✓	
Clients	✓		
Principal Contractors	✓		
Fleet Operators	✓		
Regulators	✓		Safer speeds
Asset Owners		✓	
Clients		✓	
Principal Contractors		✓	
Fleet Operators	✓		
Regulators		✓	Post-crash response/Advancing the Safe System
Asset Owners	✓		
Clients		✓	
Principal Contractors		✓	
Fleet Operators	✓		

Safe Vehicles, Safe People and Post-crash response pillars are the areas where construction project stakeholders have greatest information and influence, due to their direct involvement in vehicle safety technology, vehicle procurement, selection, operation and maintenance, training and education programs and monitoring/response activities. However, their actions also have indirect implications for Safer Speeds and Safer roads pillars.

Examples of how each stakeholder can provide positive influence and information to address each of the Safe System pillars are included in Sections 3, 4 and 5 below.

2.1 SAFETY LEADERSHIP

Without an organisation's leaders expressing genuine concern for road safety and demonstrating their commitment and leadership to improving workplace road safety, the Safe System approach cannot be implemented with any lasting cultural change, and may simply become a 'bolt-on' exercise.

It is vitally important for Regulators, Asset Owners, Clients, Principal Contractors and Fleet Operators to commit to and take an active role in ensuring that they are minimising the road safety risks and impacts to the communities in which they deliver their projects.

This will drive management decisions relating to the project's planning, procurement, and delivery which take into account road safety, and flow down to influence the workforce and driver's actions, behaviours and decisions.

An example of how to get leaders engaged in road safety, is to get them to participate in a Safe Urban Driving Course, conduct Safety Leadership Inspections of sites, haulage routes or of the vehicle fleet, conduct toolbox talks with the site and drivers on the topic of road safety, and challenge any decisions which may introduce risks to road safety and the community.

3 HOW TO ADDRESS THE PROBLEM: AN OVERVIEW

REDUCE RISK OF CRASHES INVOLVING HEAVY VEHICLES AND VULNERABLE ROAD USERS

Recognising that people do make mistakes is the first step to take to address this risk. The next step is to take action to reduce the likelihood of crashes involving heavy vehicles and vulnerable road users.

This should include embedding a Safe System approach and proactively managing the risks and impacts to the community from construction heavy vehicle movements so far as is reasonably practicable (SFAIRP) as you would on site.

An overview of the key aspects of this approach is included within this section. More detailed information is provided in Section 4.

It is important to ensure that each of these aspects, which can be considered as control measures, is considered and applied in a holistic way. In other words, it is not sufficient to address each aspect individually. To ensure these actions are effective it is necessary to incorporate them as part of the construction project's management plans and processes. This may involve integrating risk management controls or mitigation measures into the construction project's Traffic Management, Logistics Management, and Safety Management Plans and Processes. More details on Journey Management are covered in Section 5.

3.1 ADOPT SAFE SYSTEM APPROACH ON CONSTRUCTION PROJECTS

3.1.1 RECOMMENDED ACTIONS TO EMBED SAFE SYSTEM PRINCIPLES

3.1.1.1 Safe Roads

Ensure that everyone in the transport supply chain is aware of the limitations of the road environment which may increase the risks for interactions between vulnerable road users and trucks. Routes should be mapped out and evaluated on the basis of their practical suitability to cater for heavy vehicles which are considered to be the largest (or most difficult to manoeuvre) vehicle combinations using them, with improvements to infrastructure considered and implemented wherever practical.

Transport operators should also empower their drivers to provide feedback on road infrastructure issues they perceive increase the risk to themselves and other road users. This feedback should then be provided to the asset owner and clearly documented in a risk register and the owner notified. Under the hierarchy of control if the infrastructure can be modified it may be possible to engineer out the risk. Equally, if the asset owner has been warned of the risk and they choose not to take action to remediate the risk, they are possibly exposed should an issue occur.

3.1.1.2 Safe Vehicles

Fleet management should ensure vehicles are fitted with appropriate safety technologies. A summary of these technologies is indicated in the image below from the best practice CLOCS approach.[23]

The age of the heavy vehicle should also be considered. For example, certain vehicle technologies which have demonstrated safety benefits such as Front Underrun Protection Systems and Antilock-braking systems were only mandated in Australian Design Rules from 2012 to 2015.

A lack of sufficient vehicle checks can increase risks in attracting some of the oldest trucks on the job, operating in the highest risk environment due to vulnerable road user interactions.

A pipeline of emerging technologies should also be established which can then enable contractors to make informed and proactive investments in newer vehicles and associated safety technologies. The NSW Centre for Road Safety has published a comprehensive guide listing the latest proven safety technologies and features for heavy vehicles and combinations currently available.[24]

Figure 3.1 Overview of VRU related safety technologies that should be fitted to heavy vehicles[23]

3.1.1.3 Safe People

Ensure heavy vehicle drivers are provided with appropriate vulnerable road user awareness training and also understand the limits of their vehicles and their vehicles' safety technology as it relates to vulnerable road users.

It is equally important to educate the public of the risk surrounding heavy vehicles. Such as through hosting community engagement events and communicating to affected stakeholders of the construction project's transport activities and impacts to the surrounding community.

3.1.1.4 Safe Speeds

Without significant speed reductions in areas with high numbers of vulnerable road users, there is limited potential to take practical action to address this pillar. Due to the size and mass differential between heavy vehicles and vulnerable road users, increased efforts across pillars of greater influence such as safe vehicles and safe people are recommended.

However, drivers should be trained to drive to the conditions and to be aware that the posted speed limit does not mean they need to travel at such a speed. The safe speed should be determined by environment and surrounding risks the vehicle is moving through. The fleet operator can also lower the speed limit for the heavy vehicle drivers in perceived higher risks areas.

3.1.1.5 Post-crash Response

Provide driver with emergency response plan and first aid training.

4 SOLVING THE PROBLEM IN DETAIL

4.1 IDENTIFYING HAZARDS AND ASSESSING RISK

An important starting point in understanding the problem is identification of the specific hazards a construction project's transport and logistics task can introduce and assessing the road safety risks associated with these activities.

Each project should have a formal process of identifying specific hazards, understanding and assessing each risk and then seeking to mitigate them with appropriate controls which are proportionate to the level of risk. This risk management process should reflect existing processes the organisation has in place to ensure safety risks associated with the organisation or project's transport activities are eliminated or minimised so far as is reasonably practicable (SFAIRP).

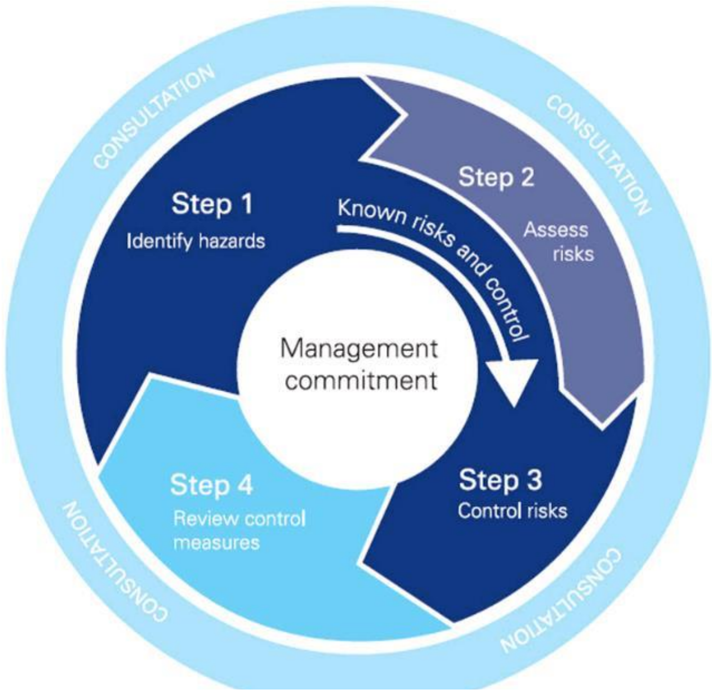


Figure 4.1 Risk Management Cycle Diagram

4.1.1 HAZARD IDENTIFICATION

When identifying specific road safety hazards associated with a project's construction transport task, the end-to-end journey from the project's construction site(s) to the point of delivery/disposal, or from a supplier's base to the construction site should both be considered alongside the following influencing factors:

- Understanding what the project is building. This will involve considering what goods/materials require transporting to/from site (e.g. demolished rubble and debris, earthworks or excavated spoil, precast concrete elements or structures, reinforced steel, mobile plant and machinery, tower cranes, concrete and aggregates, construction waste, general trades and other ancillary heavy vehicles);
- Identifying where the project is being constructed, where its on-road haulage routes, potential delivery locations and suppliers are likely to be. This would require an organisation to look at the existing road network and if there are any sensitive land use areas nearby that are likely to be impacted (e.g. hospitals, schools, retail, dining precincts, pedestrian generators such as train/tram or bus stations, cycling routes, etc.). Part of this assessment can also allow you to identify if there are any nearby freight routes that the project's construction traffic can use and explore options to substitute road transport with alternative modes such as barge or rail if the project's location is in proximity to nearby rail freight lines and/or waterways (refer to Section 4.3.1).
- Identifying any times when there is high VRU activity or local traffic volumes (this is generally in the morning and afternoon peak, but may also be around lunchtime if the project is being constructed in a Central Business District or Business Park environment, or school zone operational hours in local centres).

4.1.2 RISK ASSESSMENT

An assessment of the project's risk profile should take into account the following factors to determine the consequence and likelihood of the project's construction transport and logistics task being involved in a road collision and should be supported by data and evidence:

- Analysing both high-level fatal and serious injury (FSI) and localised FSI crash data in the area in which the project is being built; where the project's haulage routes are proposed to be; and where deliveries are likely coming from/being delivered to (this will allow the project to determine the current risk profile on the road network and to identify any 'black spots');
- Assessing any past incidents the project/organisation and its supply chain partners may have had (if available); and
- Assessing any current controls in place and if they are effective/likely to address the risks to your project.

An assessment of current controls may involve reviewing:

- The surrounding road infrastructure or local roads to the closest arterial or collector road for factors such as adequate separation between road user groups, signalised intersections or crossings, and any limitations to the existing infrastructure. This assessment will generally form part of a Road Safety Audit by an accredited Road Safety Auditor who will be able to assess the impacts that construction traffic may have to local road users;
- Current fleet safety technologies and systems adopted by suppliers in the project's transport supply chain and what risks or crashes these technologies and systems are designed to prevent; and
- Current training programs for staff and drivers which focus on road safety topics such as: safe urban driving, vulnerable road user safety, and safe heavy vehicle driver behaviours in general.

Consideration should also be given to any previous industry lessons, recommendations from past incidents or crash investigations, inquests, safety alerts, lessons learnt, or other guides, standards, etc.

4.1.3 RISK TREATMENT/CONTROL

The approach undertaken within this guide to manage the risk of construction transport and logistics to community safety has been developed to reflect the hierarchy of control.

However, it is also important to recognise that the road network is a complex system with the potential for human error. As with all complex systems, redundancies must be factored in to account for this human error. This concept as previously introduced is referred to as the Safe System and requires its multiple layers of protection for the system to work effectively. For example, relying on safe behaviour alone (an administrative control and only one part of the Safe System) is not the most effective control when managing risks with a high consequence such as a vehicle collision, whether in the workplace or in the road environment.

The figure below illustrates the different levels within the hierarchy, with examples of how this can be applied to the road transport system included in the table below.

1. Eliminate hazards and risks
Highest level of protection and most effective control.

Eliminating the hazard and the risk it creates is the most effective control measure.

2. Reduce the risk
Reduce the risk with one or more of the following controls:

- **Substitution**
  Substitute the risks with lesser risks
- **Isolation**
  Isolate people from the risks
- **Engineering**
  Reduce the risks through engineering changes or changes to systems of work.

3. Administrative controls
Low level of protection and less reliable control.

Use administrative actions to minimise exposure to hazards and to reduce the level of harm.

4. Personal protective equipment
Lowest level of protection and least reliable control.

Use personal protective equipment to protect people from harm.

Figure 4.2 The hierarchy of control structure[25]

Table 4.1 Hierarchy of controls as applied to Road Traffic Safety[26]

Level of control	Control	Primary RTS Mechanisms
Level 1	Eliminate the hazard	Eliminate exposure to road traffic, and consider alternatives to travel
Level 2	Substitute the hazard with something safer	Avoid the use of motorcycles, and consider safer modes of transport such as buses, trains, and aeroplanes
	Isolate the hazard from people	Ensure non-road activities are adequately separated from road traffic
	Reduce the risks through engineering controls	Specify vehicles, equipment and technology to reduce the risk of crashes, and of harm arising from those crashes that occur
Level 3	Reduce exposure to the hazard by using administrative actions	Introduce policies, provide training and supervision, and develop procedures to control access to and use of vehicles and increase compliance with safety policies
	Use personal protective equipment	Ensure safety equipment is used and consider additional equipment for specific risks

4.2 APPLYING SAFE SYSTEM CONTROLS

Applying the Safe System approach to construction projects involves assessing the risks associated with each of the five pillars within the system individually and bringing all parties in the transport supply chain together to engage in doing everything practical to reduce these risks.

4.2.1 SAFE ROADS

Table 4.2 Safe Roads: Primary roles for stakeholders in transport supply chains for projects contributing to a Safe System

Stakeholders Involved	Primary role		Example of information and/or influence
	Leading	Supporting	
Regulators		✓	Work with industry to help enforce heavy vehicle regulations under Heavy Vehicle National Law (HVNL) and Work Health and Safety Legislation
Asset Owners	✓		Maintain the road networks to national guidance standards as set by Austroads, which seeks to reduce the risk to all road users
Clients		✓	Monitor and evaluate the supply chain paths being used to supply the projects that they are the safest options. Record and act on any complaints from community with regards to project vehicles which may be not abiding by directions, signage, etc.
Principal Contractors		✓	Monitor and evaluate the supply chain paths being used to supply the projects. Inform the Asset Owner and Clients of key paths being utilised and monitor and evaluate safety performance of fleet operators.
Fleet Operators		✓	Develop, monitor and enforce speed management system for drivers, journey management and trains the drivers on speed management

Awareness of the limitations of the road environment which are relevant to risks for interactions between VRUs and trucks should be considered by everyone in the transport supply chain. Routes should be mapped out and evaluated on the basis of their practical suitability to cater for heavy vehicles depending upon the time of day and day-to-day which are considered to be the worst-case combinations using them.

For example, truck and dogs may pose significant risks when turning. What kerb alterations, signage or other measures along the route might be identified as countermeasures to reduce risks to vulnerable road users?

The Human Impact Risk Assessment (HIRA) tool that was developed for the Melbourne Metro project is a tool developed to encourage collaboration between different stakeholders to assess and select haulage routes most suitable for construction heavy vehicles on major infrastructure projects with the intent of minimising the risks to local road users.

Drivers should be aware of areas of the road infrastructure which may increase their safety risk and create confusion with other road users. Such areas should be brought to the attention of the asset owner. For example, a turning left arrow may provide right of way for a vehicle to turn left, this may be blocked however by cyclists and motorcyclists stopped in a cycling box. Both road users are in the right and such issues create anger and confusion as both parties feel they are, and they are, in the right. In such cases asset owners should be notified and road users should attempt to remain considerate of other road users.

4.2.2 SAFE VEHICLES

Table 4.3 Safe Vehicles: Primary roles for stakeholders in transport supply chains for projects contributing to a Safe System

Stakeholders Involved	Primary role		Example of information and/or influence
	Leading	Supporting	
Regulators		✓	Publicise benefits of minimum safety standard in contracts in helping meet legal obligations, enforce Chain of Responsibility and WHS legislation for those with heavy vehicles in breach.
Clients	✓		Set the minimum standard for all heavy vehicles working on the project to abide by CLOCS-A. Any vehicle which does not meet the standard is not permitted to enter the site.
Principal Contractors	✓		Specify in the project's policies and requirements certain vehicle safety requirements. Require and enforce the CLOCS-A standard for all heavy vehicles contracted to work on the project.
Fleet Operators	✓		Utilise vehicles which meet the CLOCS-A standard and train drivers in how to use the technology and its limitations.

Descriptions of recommended Heavy Vehicle safety technologies and equipment are detailed below alongside images to demonstrate in action. References for these recommendations include Sydney Metro's Frequent Heavy Vehicle Safety Requirements Guide[27] and Major Projects Vulnerable Road User Alignment Group's Heavy Vehicle Safety Equipment Specifications[28] documents are the primary sources referenced in collating this information.

With any new technology being included in a heavy vehicle, the driver should be fully trained in its use and aware of its limitations.

4.1.2.1 Blind Spot Minimisation

A key risk for heavy vehicles relates to the blind spots associated with these vehicles due to their size as illustrated in Figure 4.3. As a result, third party road users which sit or travel in these blind spots are at greater risk of being involved in a collision. To help reduce the blind spot risks heavy vehicle operators may deploy tools which can assist the driver in reducing the risk; however, each tool has its own limitations which the driver should be aware of.

Awareness of Blind Spots – Use of Diagrams

To be able to mitigate heavy vehicle blind spots, operators need to know where they are and the risk they pose. The typical blind spots for a heavy vehicle are identified below in Figure 4.3 and are key focus areas of educational engagements with the public to help them to be aware of these areas and to avoid them.

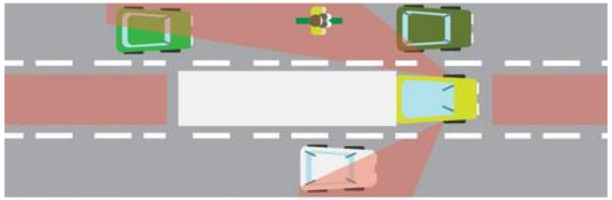


Figure 4.3 Red shading showing blind spot locations for a truck[29]

However, heavy vehicle blind spots vary significantly between heavy vehicle models, therefore the driver should be aware of each vehicle's limitations. As an example, Hanson developed a Blind Spot Diagram[30] for each of its heavy vehicle types and has trained its drivers in being aware of these at loading and unloading sites. Below are three illustrated examples which Hanson mapped:

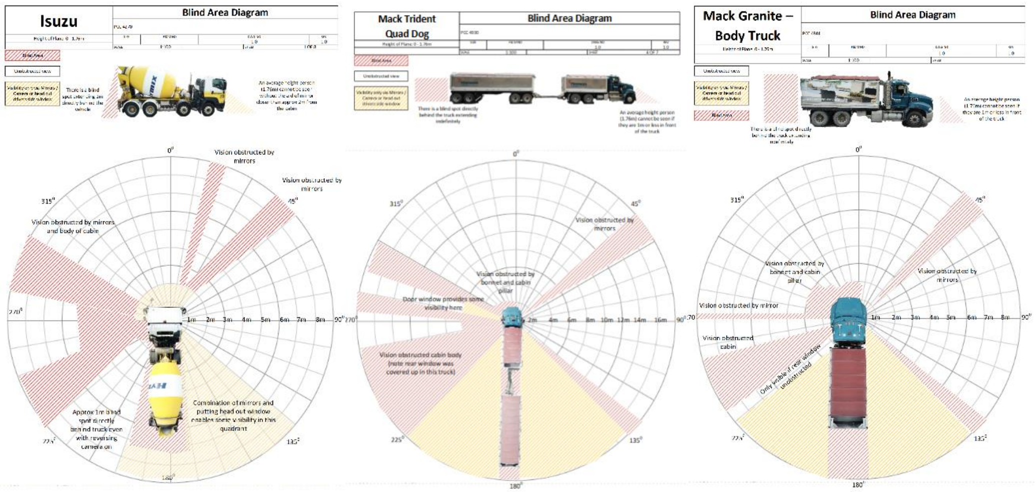


Figure 4.4 Blind spot diagrams for different heavy vehicle types mapped by Hanson[30]

Blind Spot Mirrors

Heavy vehicle blind spot mirrors are a low-cost tool which can help reduce the blind spots on each vehicle. The driver prior to leaving depot should ensure each mirror is properly positioned and retains its position once adjusted.

Heavy vehicles should be fitted with Class IV (Wide Angle), V (Close Proximity) and VI (Front View) mirrors which are compliant with ADR 14/02 – Rear Vision Mirrors, or equivalent blind spot elimination/minimisation measures as defined in the Truck Industry Council's Voluntary Code of Practice to ensure an adequate field and clarity of view.[31]

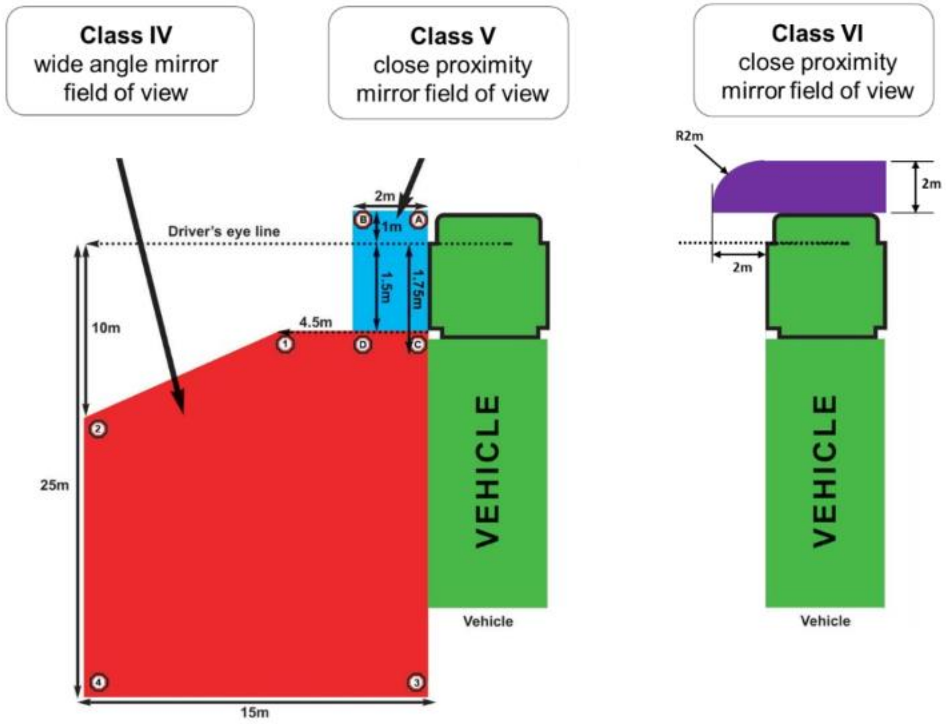


Figure 4.5 European guidance for additional close proximity mirror field of view[31]

Examples of mirrors fitted to heavy vehicles are illustrated below courtesy of Sydney Metro's Frequent Heavy Vehicle Safety Requirements Guide.[27]

Class IV (‘Wide Angle’) and V (‘Close Proximity’) Heavy Vehicle Blind Spot Mirrors

Class IV mirrors increase the field of vision for the driver on both sides of the vehicle. This enables the driver to see, for example, a cyclist or motorcyclist who is on their left-hand side, or a car in the left-hand lane, if the driver needs to move into that lane.

Class V mirrors increase the field of view to the left side/passenger side of vehicle such that the driver can see a vulnerable road user (e.g. cyclist, pedestrian or motorbike rider) who may be travelling or stationary next to a heavy vehicle when it is either changing lanes left or making a left turn.

Figure 4.6 Examples of Class IV mirrors[27]

Figure 4.7 Examples of Class V mirrors[27]

Class VI Heavy Vehicle Front blind spot mirrors

Class VI front mirrors increase the field of vision in the blind spot covering a two-metre ground plain in front of the vehicle cab. This allows the driver to see a moving or stationary cyclist, pedestrian or motorbike rider in front of the truck.

Regulations now permit the fitting of frontal blind spot mirrors which do not impact on the length considerations of the heavy vehicle.

For this Regulation, a front blind spot mirror, fitted to a heavy vehicle in accordance with section 13A of Schedule 2 to the Heavy Vehicle (Vehicle Standards) National Regulation, is to be disregarded for the purpose of measuring the length of the heavy vehicle unless the mirror projects more than 150 mm beyond the body of the heavy vehicle[32].

Figure 4.8 Examples of Class VI mirrors[27]

Blind Spot Cameras

Blind spot cameras are fitted on the side and the rear of the heavy vehicle and can be added to any vehicle.

Figure 4.9 Example of blind spot camera on the outside of a truck[33]

Figure 4.10 Example of blind spot camera on inside of a truck - Image courtesy of Sydney Metro.

Truck Door or Direct Vision Windows

Truck Door or Direct Vision Windows provide direct vision so that the truck driver has much more visibility down low on the left-hand side of the truck where VRUs often appear.

Figure 4.11 Example of truck door direct vision window[34]

4.1.2.2 Audible Warnings

Heavy vehicles should be fitted with audible warning devices of left-turn manoeuvre. These may be fitted with a manual on/off switch or reset button for circumstances, such as working between 23.00 and 07.00, where it may be appropriate for the device to be deactivated. Consideration of visual cues should also be included to assist members of the community with hearing impairments.

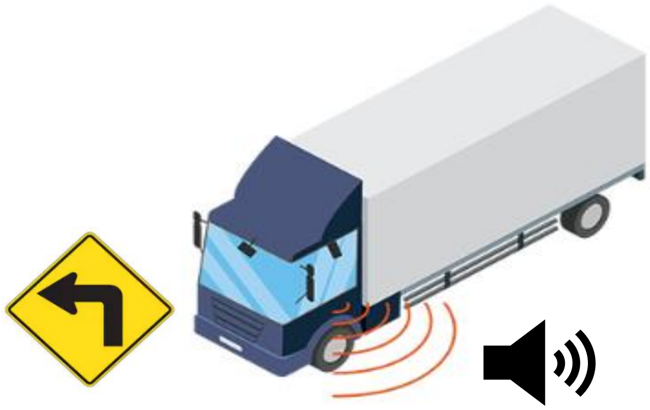


Figure 4.12 Examples of audible warnings

4.1.2.3 Warning Signage

Heavy vehicles over 4.5 tonnes should be fitted with prominent signage that visually warns other road users not to get too close to the vehicle.

Warning signage should be prominent, clean and clearly visible to a road user. Warning signage should be A4 or equivalent size unless this is not practical in which case an appropriately sized warning sign may be used instead.

Warning signage should be placed on the rear of the vehicle at eye level for a cyclist. The sign should be pictorial to visually warn other road users not to get too close to the vehicle. If any text is included on the signage, it should be legible by a cyclist at a reasonable distance from the vehicle. Signage should not be offensive and should not give instructional advice e.g. ‘Stay back’ or ‘No Entry’ to the vulnerable road user.

Figure 4.13 Examples of rear warning signage – Image courtesy of Sydney Metro

Additional warning signage may be applied to side underrun protection on both sides of the vehicle.

Figure 4.14 Examples of side underrun guard signage – Images courtesy of Sydney Metro

Illuminated panels or LED warning signs may also be fitted at the rear of the vehicle to alert cyclists to the blind spot on the heavy vehicle.

Signs on the front nearside warning pedestrians about walking close to the front of a moving or stationary heavy vehicle should also be fitted.

Examples of preferred signage are shown in Appendix A. Signage should be discussed and agreed upon by everyone in the transport supply chain as part of the journey management planning process.

These warning signs can provide direct and indirect benefits to improving community safety for vulnerable road users as well as other road users in that they may reduce risks associated with road users undertaking unsafe manoeuvres around trucks and also provide benefits in greater public awareness of truck safety issues which may influence safer interactions around trucks.

4.1.2.4 Visibility Markings

Heavy vehicles should be fitted with full body conspicuity (line and contour) markings compliant with the requirements of UNECE Regulation No. 104 – Revision 1 – Uniform Provisions Concerning the Retro-Reflective Markings for Heavy and Long Vehicles and their Trailers[35] and ADR 13/00 Installation of Lighting and Light Signalling Devices[36]. Reflective markings should also be fitted to the drawbar of dog trailers.

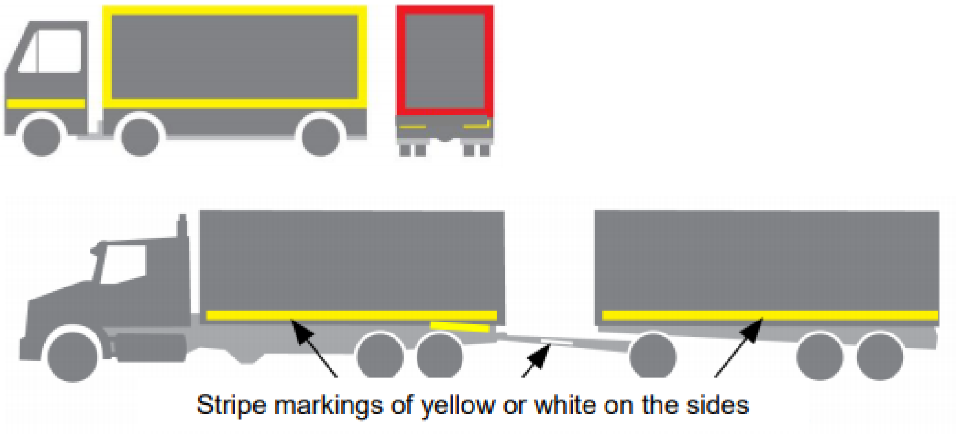


Figure 4.15 Examples of retro-reflective markings with full contour marking for prime mover and stripe markings for truck and dog[37]

Figure 4.16 Example of stripe marking on trailer bar – Image courtesy of Sydney Metro

The Australia Trucking Association Heavy Vehicle Visibility Technical Advisory Procedure[37] also referenced significant benefits with regards to the fitting of consipicuity markings.

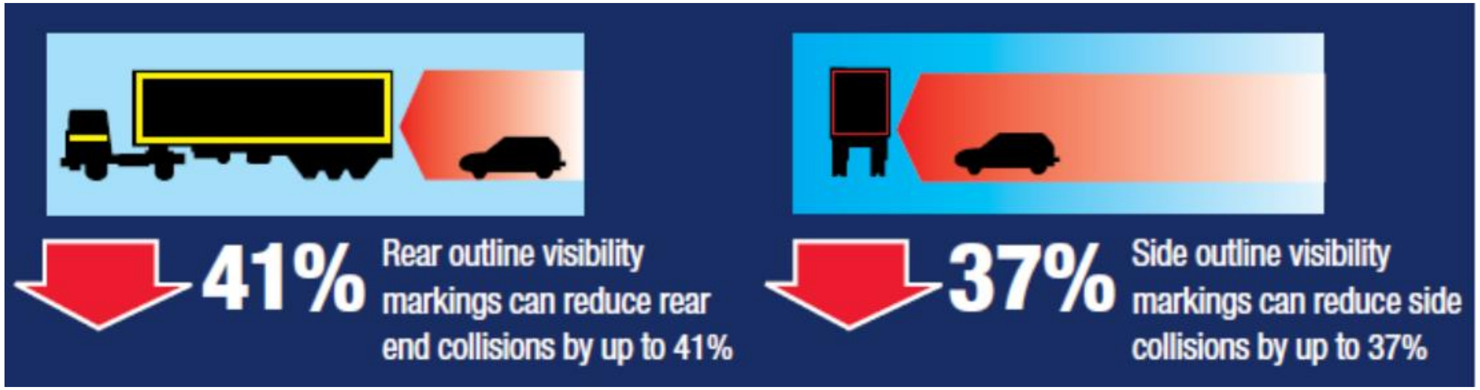


Figure 4.17 Safety benefits from improved visibility for truck/passenger car accidents with injured persons for 'night time/twilight' where 'recognition too late' or 'no recognition at all'[37]

The image below from the Technical Advisory Procedure illustrates the visual effectiveness of consipicuity markings at night.

Figure 4.18 Visual effectiveness of conspicuity markings at night[37]

4.1.2.5 Side Underrun Protection

Side underrun protection protects the spaces between axles and prevents vulnerable road users – specifically on bikes or motorbikes – from being trapped under the truck, dragged or run over by the wheels.

Heavy vehicles over 4.5 tonnes gross vehicle mass (GVM), should be fitted with side underrun protection on both sides of the vehicle, in accordance with UNECE Regulation No. 73 – Rev.1 – Lateral Protection Devices[38] and the ATA's second edition of the Industry Technical Council's Side Underrun Protection Technical Advisory Procedure.[39]

Figure 4.19 Examples of side underrun protection – Images courtesy of Sydney Metro.

4.1.2.6. Heavy Vehicle Safety Technologies

The purchase of a heavy vehicle is always a significant investment due to the cost of these vehicles, but also, a vehicle purchased will typically remain in operation on average for 15.5 years. Australia has a significantly older heavy vehicle fleet than other countries. Infrastructure projects present an opportunity for contracts to increase the uptake of newer safer vehicles which will provide long-lasting safety benefits to the public beyond construction once they are sold on. There are a number of emerging technologies as highlighted by the Truck Industry Council[40] which should be included in any new truck purchase to support the safety of construction vehicles servicing infrastructure/construction projects, these include:

- **Anti-lock Braking Systems (ABS)** compliant to ADR 35/06 – Commercial Vehicle Brake Systems; eliminating brake lock by controlling the braking pressure applied to individual tyres thus allowing the driver to continue steering, making it easier to avoid a crash.
- **Electronic Braking Systems (EBS);** electronically signals the brake system speeding up the reaction time of the brakes.
- **Electronic Stability Control (ESC)** under ADR 35/06**;** building on ABS and EBS to provide advanced braking and stability control.
- **Adaptive Cruise Control (ACC);** uses a form of radar to determine the speed and distance of the vehicle ahead. ACC enables the truck driver to select the time and distance gap to the vehicle in front. ACC maintains this gap by automatically controlling the throttle and brakes.
- **Autonomous Emergency Braking Systems (AEBS**) compliant to UN ECE R131; uses sensors to determine objects in front of the truck and if required will apply the trucks brakes automatically to prevent or minimise the chance of an accident.
- **Lane Departure Warning** compliant to UN ECE R 130**;** An image processing system that helps the driver to keep to their lane and warns the driver in good time if the vehicle unintentionally leaves the lane.
- **Front Underrun Protection (FUP) Systems** compliant to ADR 84/00**;** is a structure mounted at the front of the truck to prevent a car from becoming trapped underneath, and will ensure that the safety features of the car (airbags and crumple zones) are deployed. FUP also prevents damage to the truck's steering, enabling the truck driver to remain in control preventing the potential for further accidents.
- **Side Underrun Protection (SUP) Systems** compliant to UN ECE R73; designed to reduce the likelihood of pedestrians, cyclists and motorcyclists from entering under the sides of a heavy vehicle and being run over by the rear wheels.
- **Rear Underrun Protection (RUP) Systems** compliant to UN ECE R 58; designed to prevent lighter vehicles from running under the rear of a heavy vehicle and being damaged by the heavy vehicle's unyielding structure.
- **Blind Spot Information Systems;** designed to assist the driver by providing an audible and/or visual warnings to other road users travelling in the heavy vehicle's blind spot.

Figure 4.20 Example of vehicle fitted with Truck with Autonomous Emergency Braking – Image courtesy of Sydney Metro·

4.1.2.7 Vehicle Maintenance and Roadworthiness

A system should be in place by transport operators to ensure their heavy vehicle fleet is maintained and roadworthy.

Accreditation schemes such as the NHVAS Maintenance Management or TruckSafe accreditation scheme can provide Principal Contractors and Clients with assurance that the transport operator adequately maintains their fleet and is compliant with the HVNL.

4.2.3 SAFE PEOPLE

Table 4.4 Safe People: Primary roles for stakeholders in transport supply chains for projects contributing to a Safe System

Stakeholders Involved	Primary role		Example of information and/or influence
	Leading	Supporting	
Regulators		✓	Establish driver education and training in relation to their job task into legislation; conduct community engagement programs in relation to being safe around heavy vehicles and their role.
Asset Owners		✓	Ensure signage and road design are all abiding by current guidelines and standards, review and modify road conditions to reduce the speed or risk of interactions between road users.
Clients	✓		Require driver education and training in relation to their job task to be included in contracts.
Principal Contractors	✓		Identify what quality driver training and education will consist of, including how it will be measured, monitored and evaluated in relation to supplying the project. Promote safety training and awareness which relates to work-related road safety on projects.
Fleet Operators	✓		Ensure all drivers undergo driver training and education, that they understand it and act as a two-way conduit between their drivers and the Principal Contractor in relaying any issues/concerns. Utilise feedback from the public, established monitoring systems and other mechanisms to engage and educate the driver to help them continuously improve.

4.1.3.1 Transport Operator Accreditation

Accreditation to a national heavy vehicle accreditation scheme can demonstrate to third parties that fleet operators are practicing their due diligence toward meeting requirements and duty of care. Furthermore, it can provide confidence that operators have responsible work practices, maintained vehicles, healthy and trained drivers and management systems to meet their transport needs.

Heavy vehicle accreditation schemes that exist in Australia include the National Heavy Vehicle Accreditation Scheme (NHVAS) and the TruckSafe Accreditation scheme.

The NHVAS is described as a formal process for recognising operators who have robust safety and other management systems in place. It is also increasingly being used to show compliance with general duty requirements under road transport law.

TruckSafe accreditation is the industry alternative to NHVAS and is based on a set of minimum standards a trucking business should meet for it to be a safe, responsible operation. The TruckSafe accreditation scheme’s Standards further align more closely with the master industry code of practice, giving supply chain parties greater confidence of compliance with the HVNL.

4.1.3.2 Training and Development

Each project should ensure the drivers have the minimum necessary license class for any vehicle they operate and are sufficiently trained in its safe operational use. Heavy vehicle drivers should be provided with sufficient training, instruction and supervision to ensure the competent use of any vehicle safety technology and equipment specified in Section 4.2.2 of this guide. Education and training should not be treated as a one-off course but a continuous engagement process between drivers, fleet operators and the principal contractors.

Project Inductions should include providing an awareness of:

- Project specific rules/requirements
- Project haulage route, local traffic, access/egress point specific risks.

Driver training should include the minimum knowledge and content to include in Safe Urban Driving Courses[41] which are specific to the operational urban conditions of these projects.

Fleet operators should be continually developing their driver's knowledge, skills and awareness of safety critical aspects to operating heavy vehicles in a wide range of traffic environments.

Minimum knowledge, skills and awareness should expand beyond technical knowledge and skills to include:

- Understanding and applying low-risk driver behaviours;
- Understanding purpose and operation of active and passive vehicle safety technology and equipment;
- Driver professionalism when representing the fleet operator but also the Principal Contractor and the Client; and
- Sharing the road safely with vulnerable road users, such as pedestrians, cyclists and motorcyclists.

4.1.3.3 Fitness for Duty

Under the HVNL and WHS laws, all parties in the chain need to take a pro-active approach to managing their responsibilities, including assessing a driver's fitness to drive. Core areas include:

- Driver medicals
- Fatigue management
- Drug and alcohol testing.

An established CLOCS-A standard would provide a minimum guidance for each of the Fitness for Duty components to be met. Consideration should be given to the TruckSafe Accreditation Scheme which further specifies best practice requirements for periodic driver medicals.

4.1.3.4 Community Engagement

- Exchanging places
- Community days
- Pedestrian safety
- Awareness in community notifications.

4.2.4 SAFE SPEEDS

Table 4.5 Safe Speeds: Primary roles for stakeholders in transport supply chains for projects contributing to a Safe System

Stakeholders Involved	Primary role		Example of information and/or influence
	Leading	Supporting	
Regulators	✓		Set speed limits that reflect the operational risks, for example modify speed limits to 40 km/h for high VRU areas and time of day.
Asset Owners		✓	Maintain the asset, signage and where possible separation of road users.
Clients		✓	Monitor and evaluate compliance from principal contractors that fleet operators are driving to the conditions and that principal contractors are not placing pressure on fleet operators to meet impractical schedules
Principal Contractors		✓	Monitor and evaluate compliance of fleet operators that they are driving to the conditions, and ensure that project demands are not forcing the drivers to speed to meet schedules.
Fleet Operators	✓		Must have systems in place to reasonably ensure their drivers are driving safely to the conditions and there is a speed management which underpins this. Routes' speed limits are set not to the speed limit but to the conditions.

Crashes involving pedestrians and passenger vehicles tend to be survivable if they occur below 40 km/h impact speeds as indicated in the figure below.[42]

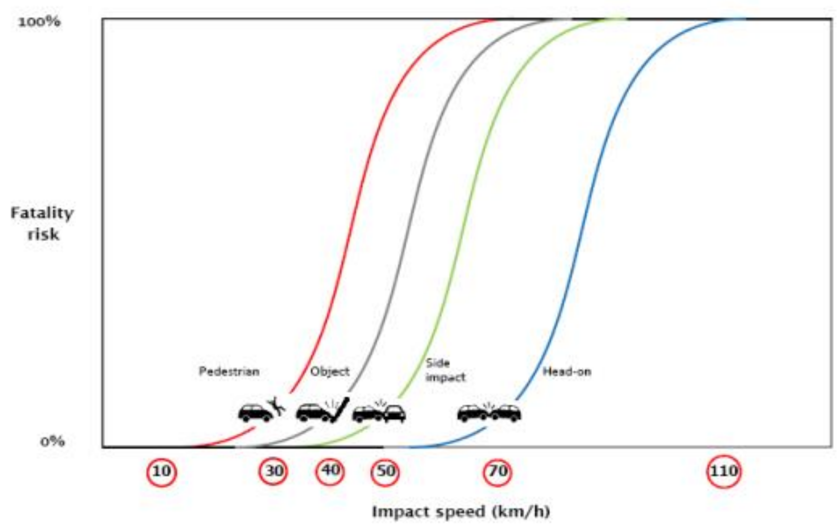


Figure 4.21 Fatality risk based on different impact speeds and crash types involving passenger vehicles[42]

Since heavy vehicles tend to be larger and heavier than passenger vehicles, they represent a greater fatality risk to pedestrians in a crash. This is because the size and mass differential between a heavy vehicle and a pedestrian is greater than that of a passenger vehicle and a pedestrian. The table below attempts to demonstrate this by comparing impact energies at various travel speeds for crashes involving a heavy vehicle with those for crashes involving a standard passenger vehicle.

Table 4.6 Comparison of heavy vehicle and passenger vehicle impact energies for relative to travel speed*

		Kinetic Energy (in kJ) should a crash occur (1/2mv^2)	
		Heavy Vehicle	Passenger Vehicle
Vehicle Travel Speed (km/h)	8	111	42
	10	174	66
	15	391	148
	20	694	262
	25	**1085**	410
	30	1563	590
	35	2127	803
	40	2778	**1049**
	45	3516	1328
	50	4340	1640
	55	5252	1984
	60	6250	2361

**Based on assumed heavy vehicle mass of 4.5 T and passenger vehicle mass of 1.7 T.*

In order to reduce the impact energies to survivable levels for vulnerable road users, (equivalent to 40 km/h impact speed for passenger vehicle crash) it would be necessary for heavy vehicles to travel at speeds below 25 km/h, which is considered unfeasible and may result in other unintended risks on the road which are associated with increasing the extent of interactions between large trucks and passenger vehicles.

Increased efforts across pillars of greater influence such as safe vehicles and safe people are recommended.

4.2.5 POST-CRASH RESPONSE

Table 4.7: Post-Crash Response: Primary roles for stakeholders in transport supply chains for projects contributing to a Safe System

Stakeholders Involved	Primary role		Example of information and/or influence
	Leading	Supporting	
Regulators		✓	Establish crash response processes in legislation.
Asset Owners	✓		Maintain crash databases and share information to reduce future crash risks.
Clients		✓	Ensure fleet operator's drivers are trained in post-crash response.
Principal Contractors		✓	Ensure fleet operator's drivers are trained in post-crash response.
Fleet Operators	✓		First on scene, drivers should be trained in dealing with such situations, who to contact and supporting actions to help ensure a rapid response.

Efforts to improve response time in the period immediately following a crash are recommended to drastically improve the likelihood of preventing death and serious injury for those involved. The first hour after a crash is often referred to as the 'Golden Hour'. In a crash involving a heavy vehicle and a vulnerable road user, the truck driver has a major role in influencing the steps that can be taken immediately following a crash during the Golden Hour.

Ensuring drivers are provided with an emergency response plan and first aid training are recommended actions to improve the likelihood of survival and reduced trauma for the community should a crash occur.

Learning from crashes that do occur or have occurred in the past is also a recommended aspect of the post-crash response actions. Occurrences could be directly relevant to the project through lessons learnt procedures or come from external sources such as incident investigations or coronial findings. These can provide valuable lessons to prevent future recurrences.

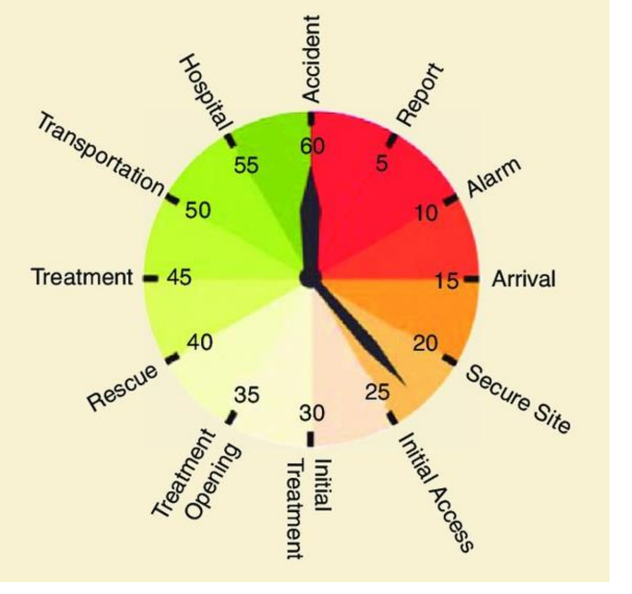


Figure 4.22 Post-crash response golden hour of action[43]

4.3 LOGISTICS MANAGEMENT

Planning a construction project's logistics can significantly reduce the impacts and risks to the community where heavy vehicle movements can be minimised through a number of the following measures:

4.3.1 MODE SHIFT

Using transport modes, such as by rail or marine methods as an alternative to roads, can be a cost-effective and efficient way of transporting a range of construction materials, plant and equipment and should be considered by infrastructure and construction projects located in proximity to nearby rail freight lines and/or waterways.

Such alternative modes provide additional sustainable benefits by reducing vehicle emissions and improving safety by significantly reducing construction vehicle movements.

Example: Sydney Metro's City and Southwest Project established and operated a temporary barging facility at Barangaroo to deliver Tunnel Boring Machine equipment and remove excavated spoil by barge, reducing traffic impacts to the community and cutting thousands of truck movements on busy inner-Sydney roads.

4.3.2 RE-USE OF MATERIALS

Re-use of materials, such as excavated spoil and earthworks within a construction site boundary is also an effective way of eliminating or reducing construction transport off-site and can provide sustainable benefits by contributing to a project's waste management objectives.

4.3.3 PREFABRICATION

Prefabrication of structures off-site can reduce the number of construction vehicle movements required to deliver construction materials, plant, and equipment to sites.

In addition, prefabricated structures which are over-size/over-mass can be transported to site in a more highly controlled manner which can be done at night, under escort, and with careful route assessment and planning.

Not only does prefabrication reduce risks on the road, but it can also minimise on-site WHS risks, by reducing site congestion and the need to carry-out various high-risk construction activities in order to build the structure on site.

4.3.4 LOGISTICS EFFICIENCY

4.3.5 HIGHER-PRODUCTIVITY VEHICLES

Optimising the efficiency of construction heavy vehicles used on infrastructure and construction projects can provide both productivity and safety benefits to the project through the use of higher-productivity or performance-based standards (PBS) heavy vehicles.

Such vehicles can carry higher payloads than general access heavy vehicles operating under regulatory general mass limits, thereby reducing the overall number of heavy vehicle movements required.

There is also evidence to suggest that PBS heavy vehicles are less likely to be involved in major crashes, although, the safety benefits to vulnerable road users is still unclear.

4.3.6 CONSOLIDATING LOADS/DELIVERIES

Heavy vehicle transport for construction can also be optimised by consolidating deliveries or loads onto one vehicle destined for a project with multiple sites or multiple construction projects located nearby using a common supplier.

4.3.7 DELIVERY SCHEDULING

Scheduling and retiming deliveries to avoid peak periods can naturally reduce congestion and exposure risk. Planning deliveries during less congested hours allows site-related vehicles to operate more efficiently and reduce the risk of collisions.

Construction deliveries and collections made outside of peak traffic times are also more likely to arrive on time, which can reduce potential on-site delays. They also reduce congestion in the vicinity of the site.

Utilising a Delivery Management System (DMS) – whether electronic or paper-based – can significantly improve the reliability of delivery for critical items and coordination of a site's booking and delivery process, ensuring the flow of vehicles to and from sites are controlled.

Delivery management systems are also recommended to ensure that everyone in the transport supply chain is able to:

- • confirm the routes taken by vehicles in their journey to and from site
- • ensure that site supervisors are trained in what technologies vehicles arriving on site should be fitted with
- • have a process for checking the driver has appropriate training
- • achieve efficiency improvements to project logistics.

4.3.8 TRAFFIC MARSHALLING

Where construction sites are limited for space, providing off-site truck marshalling facilities or approved marshalling areas en-route to site in collaboration with local authorities can reduce heavy vehicle movements from circling construction sites that are waiting to be 'called-in' or construction vehicles parking in unapproved locations which might pose a hazard to other road users (i.e. by obscuring sight distance or blocking visibility to local driveways or pedestrian crossings).

Providing such facilities can reduce emissions, fuel consumption and road safety risks, however requires collaboration from local authorities.

4.3.9 HAUL ROADS AND SITE STANDARDS

Sites should be designed in such a way that provide sufficient space for laydown of materials and to prevent heavy vehicles queuing on local roads outside the construction site or in nearby streets.

Ground conditions for site haulage routes and load/unload areas should take into account the clearance requirements for on-road heavy vehicles, including rear overhang, and ground clearance for safer vehicle designs such as heavy vehicles with low-entry direct vision cabs and side/rear underrun protection.

4.4 CONSTRUCTION JOURNEY MANAGEMENT

Incorporating the Safe System measures outlined in Sections 4.2 and 4.3 into a project's Construction Traffic Management Plan, Logistics Management Plan and/or Journey Management Plan(s) will allow the construction project to systematically plan, implement and monitor each measure for ongoing compliance and effectiveness.

The Management Plan should also articulate how the requirements will be communicated/cascaded throughout the supply chain, such as through procurement terms and conditions or scope of works documentation.

Likewise, transport operators should reflect the specific measures/requirements which they are responsible for implementing through their Management Plans.

Applying a Journey Management Plan can set out approved heavy vehicle haulage routes which are to be adhered to by heavy vehicle operators (including their sub-contractors and owner-operators) in the road transport supply chain.

The Journey Management Plan could also include procedures for drivers to check their routes each time before departing, understand the high-risk areas, and whether there are any road works or other updates which have come through before departing. These will also vary with time of day and day of week.

5 MONITORING AND EVALUATION

Standards, terms and conditions are only effective if their application is monitored and reviewed periodically to ensure their compliance and overall effectiveness.

The success of CLOCS in the United Kingdom is due to consistent application and compliance monitoring of the scheme's implementation which ensures drivers, vehicles, principal contractors and clients signed-up to CLOCS are all meeting the program standards. Failure to do so results in penalties and removal from the program.

The following section identifies the tools which are available and how they can be applied in the Australian context.

Further work is needed to assess the supporting elements which will assist with monitoring compliance with standards established in Australia.

5.1 PERFORMANCE MONITORING PROCESSES AND TOOLS TO ENSURE SAFE SYSTEM IS BEING CONSISTENTLY APPLIED

5.1.1 COMPLIANCE INSPECTIONS

Monitoring compliance of site operations and fleet operations against the project's standards is critical to ensure all parties consistently meet the standard and, where necessary, take appropriate constructive action where a party falls short of their obligations to prevent recurrence.

For example, safety and compliance inspections of heavy vehicles should be conducted by fleet operators prior to delivering to project sites and at access/egress points by the Principal Contractor to ensure vehicles transporting the project's materials are both safe and meet project standards and requirements.

Similarly, inspections should be carried out by Clients and Principal Contractors of site conditions to ensure they provide adequate driver facilities, laydown space, safe access/egress, and ground conditions for on-road heavy vehicles. Any deficiencies or non-compliances should be raised by drivers and fleet operators.

Such inspections can be incorporated into project plant pre-mobilisation processes and as part of regular site safety inspection regimes.

Where a driver, vehicle or site does not comply with the agreed standards or project requirements, corrective action plans with timelines should be developed and agreed between parties demonstrating the steps to be taken to ensure compliance with the project's standards or requirements.

5.1.2 TELEMATICS MONITORING

Telematics monitoring systems capable of monitoring driver speed, acceleration/deceleration, fatigue, harsh braking, and vehicle location can be an extremely useful tool providing the project with valuable information about safety and efficiency of its transport and logistics task.

Reports from these systems should be reviewed on a regular basis by parties in a construction project's supply chain to address any community complaints, identify any non-compliances or potential black spots along haulage routes that may require treatment or avoidance.

Fleet operators can use this data to maximise the efficiency of their operation further by providing key information about vehicle utilisation and fuel consumption.

5.1.3 NEAR-MISS REPORTING

Systems and processes should be established and implemented to allow for near-miss and incident reporting. Ensure heavy vehicle drivers are provided with a system for hazard and near-miss reporting. This should include a procedure for drivers to identify and report near misses, including applying corrective actions to reduce the likelihood of re-occurrence.

For example, there could be near-misses occurring when turning at a certain corner where there is road infrastructure issues, or VRUs rushing through entry/exit points to a site. Reporting the near-miss may mean the site manager can then install a management system to prevent this from re-occurring. This should then be reported back through the cycle with the drivers who identified them to ensure this has addressed the issue.

5.1.4 INCIDENT REPORTING AND INVESTIGATION

Systems for incident reporting and investigation should be similarly applied to on-road traffic incidents including collisions and breaches. These should be reported and tracked in the same way as on-site WHS incidents are reported.

Investigations to determine the root-cause and contributing factors should be conducted where corrective actions are established which are proportionate to the level of risk.

Reporting and investigating traffic incidents can provide valuable information to the fleet operator, principal contractor, and client who may establish and monitor any agreed corrective actions to prevent similar future occurrences and communicate valuable lessons learnt to the supply chain and wider industry.

It also allows the opportunity to identify any black spots that may exist on the road network that should be communicated to the supply chain to avoid and to Asset Owners for treatment or rectification works.

5.1.5 PERFORMANCE MEASUREMENT

Projects should measure their road safety performance to ensure the effectiveness of implementing control measures and treatments and to assist in identifying any emerging issues or trends that require additional monitoring or treatment.

Information which can assist in measuring road safety performance may include:

- construction vehicle registers providing information on vehicle compliance
- number of round trips made to project sites or vehicle kilometres travelled each month
- % compliance scores for site/route/vehicle/driver compliance
- number of community complaints, breaches, near-misses and incidents
- number of corrective actions open vs closed.

The project's road safety performance should similarly be reported alongside WHS or environmental performance in regular performance reports for management review. Any significant incidents should also be brought to the attention of organisational leaders.

Appendix A CONTRIBUTORS TO THIS GUIDE AND WARNING SIGNAGE EXAMPLES

A.1 CONTRIBUTORS TO THIS GUIDE

The authors wish to sincerely thank all those who provided information and gave their advice in assisting with development of this guide. A full list of contributors is listed below:

ATA

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HVNL Review JSOP

Laing O'Rourke

NTI

Rail Projects Victoria

SECBE (UK)

Spotless

Sydney Metro

TfL (UK)

TMR

Transurban

VicRoads

Vic DoT

VTA

A.2 WARNING SIGNAGE EXAMPLES

Examples of preferred warning signage that should be used to satisfy requirement 4.1.2.3 Warning signs are shown below.

Full size signage artwork can be accessed via the FORS website.[44]

Images courtesy of Sydney Metro's Frequent Heavy Vehicle Safety Requirements Guide.[27]

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REFERENCES

[1] The initial effectiveness of the scheme has been measured by the City of Camden which incorporated CLOCS into its planning and procurement policies and achieved a 47% reduction in Fatal and Serious Injuries involving heavy vehicles and vulnerable road users within 2 years of implementation.
[2] The terms 'heavy vehicle' and 'truck' are used interchangeably throughout this document.
[3] This includes heavy vehicle safety requirements which have been mandated on certain construction project contracts managed by Sydney Metro and Melbourne Metro Rail Authority (currently known as Rail Projects Victoria).
[4] This includes the UK's Construction Logistics and Community Safety (CLOCS) Standard.
[5] https://www.businessinsider.com.au/australia-transport-infrastructure-pipeline-deloitte-2019-5
[6] BITRE Australian Road Death Database 2018
[7] NRSSS 2018 Statistical Progress Measures
[8] https://www.roadsafety.gov.au/sites/default/files/2019-11/nrss_inquiry_final_report_september_2018_v2.pdf
[9] https://www.roadsafety.gov.au/sites/default/files/2019-11/nrss_inquiry_final_report_september_2018_v2.pdf
[10] http://content.tfl.gov.uk/construction-logistics-and-cyclist-safety-summary-report.pdf
[11] https://www.roadsafety.gov.au/sites/default/files/2019-11/nrss_inquiry_final_report_september_2018_v2.pdf
[12] https://www.safeworkaustralia.gov.au/doc/work-health-and-safety-road-freight-transport-industry
[13] https://www.safework.sa.gov.au/business-industry/transport-stevedoring/road-transport
[14] https://www.ntc.gov.au/sites/default/files/assets/files/Safe-payments-report-October-2008.pdf
[15] https://www.healthandsafetyhandbook.com.au/when-the-road-is-your-workplace/
[16] https://www.worksafe.qld.gov.au/__data/assets/pdf_file/0020/173072/vehicles-as-a-workplace-national-guide.pdf
[17] https://www.roadsafety.gov.au/sites/default/files/2019-11/national_road_safety_action_plan_2018_2020.pdf
[18] https://read.oecd-ilibrary.org/transport/zero-road-deaths-and-serious-injuries_9789282108055-en#page20
[19] https://www.roadsafety.gov.au/nrss/safe-system
[20] https://www.roadsafety.gov.au/sites/default/files/2019-11/nrss_2011_2020.pdf
[21] https://www.vicroads.vic.gov.au/-/media/files/technical-documents-new/miscellaneous-guidelines/safe-system-assessment-guidelines-v10-july-2018.ashx
[22] https://www.clocs.org.uk/resources/clocs_standard_march_2019_single_page_view.pdf
[23] https://www.clocs.org.uk/resources/clocs_gate_check_poster_a1.pdf
[24] https://roadsafety.transport.nsw.gov.au/downloads/safety-technologies-heavy-vehicles-2020.pdf
[25] https://www.worksafe.vic.gov.au/hierarchy-control
[26] https://austroads.com.au/publications/road-safety/ap-r561-18
[27] Sydney Metro – Frequent Heavy Vehicle Safety Requirements Guide
[28] Major Projects Vulnerable Road User Alignment Group's Heavy Vehicle Safety Equipment Specifications
[29] https://www.nrspp.org.au/resources/truck-blind-spots-nrspp-quick-fact/
[30] https://s3-ap-southeast-2.amazonaws.com/cdn-nrspp/wp-content/uploads/sites/4/2020/03/23155137/Blind-Spot-Diagrams-FINAL.pdf
[31] https://assets.website-files.com/5cbe46bce3c2320cf45d2b62/5d37fe4fca62b67269ac50fa_CoP%20field%20of%20view%20July%202019.pdf
[32] https://www.legislation.qld.gov.au/view/pdf/inforce/current/sl-2013-0076

[33] Amy Gillett Foundation, 2019, Sharing Roads Safely Facilitator guide V1.0, January
[34] http://truck-door-windows.com/
[35] https://www.unece.org/fileadmin/DAM/trans/main/wp29/wp29regs/r104rev.1.e.pdf
[36] https://www.legislation.gov.au/Details/F2005L03991
[37] https://www.truck.net.au/system/files/industry-resources/TAPS%20-%20HV%20Visibility%20August%202016.pdf
[38] https://www.unece.org/fileadmin/DAM/trans/main/wp29/wp29regs/R073r1e.pdf
[39] https://www.truck.net.au/system/files/industry-resources/Side%20Underrun%20Protection%202019.pdf
[40] https://www.truck-industry-council.org/todays-trucks
[41] https://www.nrspp.org.au/resources/safe-urban-driving-trainer-notes/
[42] https://www.rms.nsw.gov.au/saferroadsnsw/safe-system.pdf
[43] https://www.researchgate.net/publication/224185142_Emergency_Services_in_Future_Intelligent_Transportation_Systems_Based_on_Vehicular_Communication_Networks/figures?lo=1
[44] https://www.fors-online.org.uk/cms/warning-signage/