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Workplace Health and Safety Queensland

Cane rail safety – a supplement to the sugar industry code of practice 2005

Workplace Health and Safety Queensland
Department of Justice and Attorney-General

Queensland Government

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1. Introduction

1.1 Who is this document intended for?

This document is a supplement to the *Sugar Industry Code of Practice 2005*, and forms part of that code. It is intended to be used by persons with health and safety duties under the *Work Health and Safety Act 2011* including: managers of cane railway systems, as well as their workers, operators and workplace health and safety officers and representatives. Other persons that interact with the cane rail system also have duties.

This code describes methods for controlling major hazards associated with cane rail operations; the machinery, equipment, substances and work practices; and what should be considered to safeguard the health and safety of workers, the public and others. *Australian Standard 4292 – Railway Safety Management* and the *How to Manage Work Health and Safety Risks Code of Practice* have provided a basis for the development of this document.

Guidance on technical issues is described in the Australian Sugar Industry Codes of Practice (published by the Sugar Research Institute). *AS 4292 Railway Safety Management* parts one to five have provided the basis for these Australian Sugar Industry Codes of Practice.

1.2 What is a cane rail system?

A cane railway system is a light rail network that is used to deliver sugar cane from the field to a sugar mill and sugar to sugar terminals. Cane railway systems transport a large amount of cane (over 36 million tonnes) every year from farming operations to the local mill for processing (up to 100 kilometres).

The rail network interacts with:
(a) major and minor roads
(b) rivers and streams
(c) Queensland Rail
(d) through rural and, in some cases, residential areas
(e) machinery
(f) workers and other people involved with the haulage of cane.

Cane rail networks operate on a 24 hour, seven day a week basis in most mill areas, usually from June to December.

The cane rail network has been developed over many years and some mills have been in operation since the late 1800's. The gradual development of the network over such a long period has seen many changes to the local landscape, particularly through the encroachment of housing, other industry's and alternative farming enterprises (such as bananas and tree crops) around the railway system.

1.3 How this document is organised

A cane railway system can be broken into four basic operational parts:
(a) the delivery and collection of bins system (operations)
(b) track and civil infrastructure (including maintenance)
(c) sidings and delivery points (field interface)
(d) rolling stock (locomotives and bins).

This code has been organised into these four areas plus a general section on managing health and safety. Within the rail specific sections the document is generally structured in a numbered format.

For example:

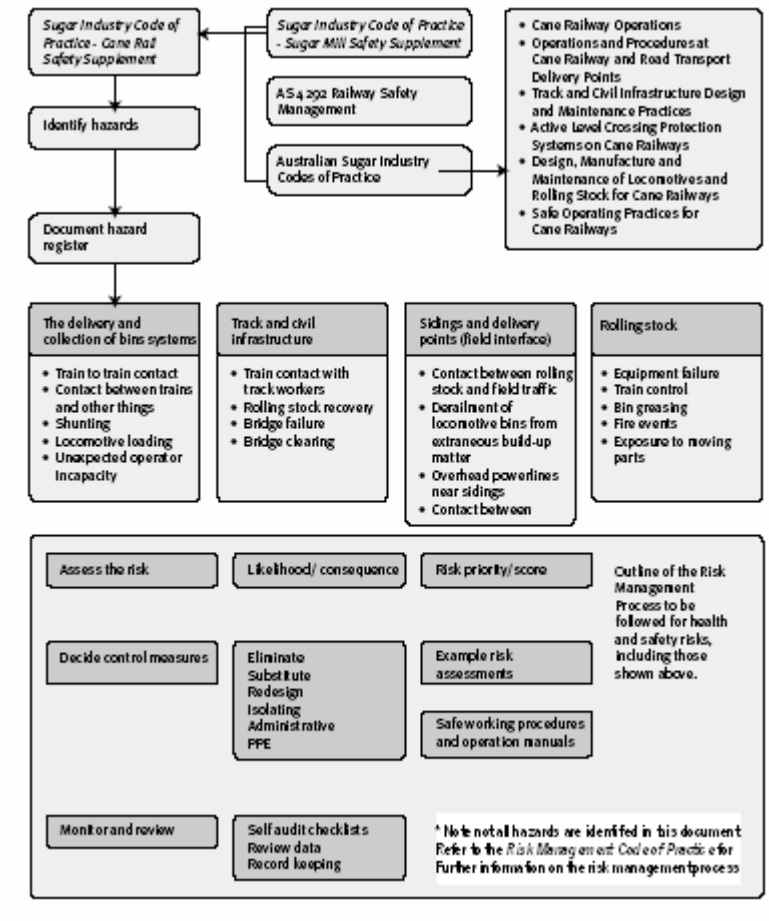
5 - The major heading (e.g. Rolling stock – including **a hazard list** for that area.

1.1 The specific hazard
Such as hitting things with the body (e.g. Train to train contact).

1.1.1 Recommended controls for the specific hazard.
An outline of the issues which should be considered as control measures for the specific hazard.

Subset item of specific hazard such as train to train contact and sidings.

Figure 1 – Hazard register and controls



2. Managing health and safety

NOTE: See part 3 of the *Sugar Industry Code of Practice 2005* for information on risk management and the associated concept of hierarchy of control.

As outlined previously the intent of this document is to identify industry specific hazards, suggest possible controls, and provide examples on the risk management process which cane rail operators could adopt to assess and control risks specific to their operation. It is expected that rail operators would develop a risk register as outlined in the *How to Manage Work Health and Safety Risks Code of Practice*, assess the risks in their operation, implement controls and monitor and review the systems implemented to control those risks

When managing health and safety in sugar cane rail systems, operators should consider the following issues as key components of the management system:
(a) hazard registers
(b) risk management
(c) consultation
(d) training
(e) emergency procedures.

Further details on these issues are provided in the following sections and in the *Sugar Industry Code of Practice 2005*.

2.1 Risk registers

The *How to Manage Work Health and Safety Risks Code of Practice* recommends the development of a risk register or list for all hazards at a workplace. Hazards can be classified under one of the following areas:
(a) biological substances
(b) energy
(c) manual handling
(d) plant
(e) substances
(f) work environment.

2.2 Emergency procedures

In the event of an accident or emergency the rail operator should ensure that appropriate, adequate and effective emergency response procedures are planned, distributed, understood and rehearsed. Processes should be identified which enable:
(a) the notification of incidents to emergency services
(b) the location of the incident site by emergency, and other services (e.g. map reference or GPS location)
(c) the provision of basic first aid.

A number of incident or emergency situations can occur within the cane railway network, including, but not limited to:
(a) train contacts

(b) level crossing incidents
(c) natural events (floods, fires, cyclones)
(d) control system failure (radio network or individual failure)
(e) secondary contacts (contacts which occur in the vicinity of the track but do not involve rolling stock)
(f) power failures to control rooms
(g) chemical/fuel spills
(h) electrical incidents.

These items should be identified within the organisation's emergency planning system or documented emergency plan.

3. The delivery and collection of bins system

NOTE: The reference to cane includes all other products and materials carried on the cane rail system.

The rail network requires the scheduled delivery and retrieval of the bin fleet. Full bins of cane are delivered to the mill for crushing within a specific time period to prevent deterioration of the product. In general, locomotives move at low speeds (typical maximum of 40 kilometres per hour) and usually travel slower on branch lines and sidings than on running lines.

Operational systems within the cane railway network include traffic offices, communication networks and control mechanisms for maintaining train separation.
A number of methods for traffic control are in use within the industry including GPS (satellite) tracking, electronic mimic boards and manual mimic boards. However, the primary tool for communicating instructions to maintain train separation is voice radio.
Signalling and communication systems such as active level crossing protection systems are an important part of cane railway operational safety systems at road crossings.

3.1 General hazards

The cane railway track crosses main roads, local government roads and minor roads with varying speed limits and traffic flows. The main hazards associated with the delivery system within the operation of the rail network are:
(a) contacts between trains, head to head and head to tail
(b) contacts between trains and other things (e.g. vehicles, workgroups, plant, machinery and equipment, people and animals)
(c) de-railing and re-railing
(d) shunting
(e) yard shunting (other than by locomotives)
(f) locomotive/load characteristics
(g) unexpected operator/s incapacity and impairment of operators (including traffic controllers).

These hazards should be included in the rail operator's hazard register and the risk associated with them assessed particular to that operation. The range of control measures provided in the

following sections should be considered (refer to page 7 for an example of a hazards register, this should also be considered with the *Risk Management Code of Practice).*

3.2 Train to train contact

The risk of contact between trains both head to head and head to tail is dependent on a number of factors including:
(a) the number of trains in operation at any one time
(b) level communication
(c) the size of the trains
(d) the size of the network
(e) weather conditions
(f) day or night operation
(g) visibility.

Risk assessments should consider these issues when assessing the risk of train to train contact.

3.2.1 Possible controls for train to train contact

The risk of **train to train** contact is eliminated within the mill rail corridor if only one train is in operation at any one time. Obviously the railway delivery system requires multiple trains and therefore a method of passing or overtaking on single tracks is required.

An overall safety system should be developed by the rail operator to ensure the safety of train crews, other workers and members of the public.

Safe occupancy methods are outlined in *AS 4292 Railway safety management Part 5 Operational systems* and the *Risk Management Code of Practice* (examples of methods of track occupancy controls are highlighted in *AS 4292.5* - Appendices B, C, D, E and F).

The process of risk reduction is not limited to the use of one type of control. Hazards can be controlled by multiple methods (e.g. process and procedures). These controls can then be supported by technology (e.g. GPS and electronic mimic boards). This provides a number of levels of hazard control, which reduces the risk of serious injury or damage.

Documented safe operating procedures are only one method of ensuring train separation. All persons with responsibility for adhering to procedures should be trained in any documented control system and regularly assessed for competence by the rail operator. This training should be documented and recorded. Compliance with the procedures should be rigorously audited.

The use of high visibility end of train markers (tail stick/s), headlights, flashing beacons and high visibility paint on locomotives and bins provide another means of reducing the risk of train to train contact.

Contact between moving rolling stock and stationary rolling stock can also occur if turnouts are left in a position that directs the locomotive into a siding that is already occupied. The line may also terminate or run into a loading pit. Main line turnouts should always be left set

for the main line unless directed otherwise by an authorised person, (usually the traffic controller) or by documented standard mill procedure.

When using administrative controls, procedures, signage and personal protective equipment should be implemented to give several layers of protection to minimise the identified risks. Multiple layers of controls provide a back-up which minimises the risk of damage and/or trauma.

An example risk assessment has been included in Appendix 7.4 - Contact between trains – Head to head and head to tail.

3.3 Contact between trains and other things

Cane railway vehicles may operate on a 24 hour, seven day a week basis and pass through a broad range of terrain including:
(a) urban and rural
(b) individual farms and properties
(c) alongside roads and road bridges
(d) across rivers and streams (from large to small bridges)
(e) all types of roadways and other rail networks.

Cane rail rolling stock can be exposed to the risk of contact with a range of objects, including:
(a) other vehicles (e.g. Cars, trucks, tractors, harvesters and motorcycles)
(b) livestock (e.g. Horses and cattle)
(c) members of the public
(d) other items (obstructions) left on the rail network
(e) unauthorised or authorised civil works which foul the track or effect track geometry
(f) items stored by property owners on or near the track (e.g. Farm machinery and irrigation equipment)
(g) property belonging to other statutory bodies and local authorities (e.g. Main Roads, Telstra or Ergon Energy).

The rail network is also at risk of damage from vandalism and malicious (deliberate) interference, as well as natural occurrences such as floods, wildfires and cyclones, particularly in far north Queensland. Cane rail operators should ensure a safe system of work is established which minimises the risk of injury to cane railway personnel from these hazards. Following such events it may be necessary to do a visual inspection prior to the commencement of the crushing season or following significant weather events.

3.3.1 Possible controls for contact between train and other things

Part of the operators overall safety system should ensure the safety of train crews, other workers and members of the public in relation to contact between trains and other things.

Road crossings
A number of methods for controlling the risk of contact with other things are available including:
(a) grade separation
(b) active control
(c) passive control.

Assessing the risk and required level of protection, the use of passive, active and grade separation to control the risk of contacts on road and rail crossings is a complicated task. The rail operator should use a competent person to assess the risks involved with crossings prior to determination of an appropriate control.

Risk assessment should use an established method that focuses on issues such as:
(a) train and traffic volume
(b) previous incident history
(c) crossing position and layout
(d) train and vehicle crossing speeds
(e) crossing visibility.

Rail operators should assess the risk of failure of active crossing protection systems and implement controls which minimise those risks. A documented process should be in place which outlines what steps locomotive operators should take in the event of a crossing light failure.

NOTE: Appropriate tools to assess risk at level crossings and identify suitable controls, which encompass (a) to (e) above are the Australian Level Crossing Assessment Model (ALCAM) and the Manual of Uniform Traffic Control Devices (MUTCD), Part 7 Rail Crossings.

Queensland Rail crossings
Queensland Rail controlled drawbridges and or diamond crossings have a derailment device installed which will force the locomotive off the track should it attempt to enter the crossing without a clearance. All drivers should be aware of any derailment devices within the network and traverse them with caution.

Farm crossings and sidings
The risk of contact with other vehicles at sidings is minimised when only one item of plant (train, haul out or other vehicle) is operating in the siding at any one time.

Other than rail operations, no activity should take place within 2.5 metres of the nearest cane rail line (except at designated crossing points and sidings) unless a documented safe working procedure is prepared, disseminated and implemented by the encroaching party in consultation with the appropriate mill owner.

Agreement of the safe working procedure by the mill owner must be given prior to any encroachment of the rail easement. The safe working procedure should take into account, but not be limited to, the need to:
(a) maintain a safe distance between the encroaching party and trains on the same track
(b) safeguard the movement of trains at turnouts and crossings where affected by the encroaching party's activities
(c) maintain the safety of personnel and equipment on or near the track.

Bridges
Where appropriate signage should be installed at locations such as river bridges and Queensland Rail crossings, warning that cane trains use these bridges/crossings. Signage should also be used prohibiting access by unauthorised persons.

General
Documented procedures are a way of controlling the risks associated with train operation. All persons with responsibility for following procedures should be trained in any documented control system and assessed for competence by the rail operator.

Other controls include the use of signs, temporary or permanent speed limits at crossings, the use of flagmen (traffic controllers) and warning devices such as:

(a) technology (e.g. electronic mimic boards, GPS tracking and reporting)
(b) the use of the locomotive horn when approaching crossings or sidings
(c) flashing lights on locomotives and brake vans
(d) high visibility paint and patterns
(e) electronic warning systems
(f) reflective devices (such as cats eyes)
(g) reflective paint
(h) end of train marker (hi-viz tail stick/s).

When using administrative controls, a suite of procedures, signage and personal protective equipment should be used to give several layers of protection to minimise the risks. This way if there is a failure in one or two of the controls, then the others will backup and minimise the damage and/or trauma.

3.4 Shunting

Shunting involves delivery or removal of cane bins from a train at the sugar mill or at sidings and loops throughout the cane rail network. Safe operation should always be paramount in any activity at a siding where people and vehicles could be present.

Shunting introduces a range of hazards due to the following factors:

(a) shunting may involve the entry between bins or bin and locomotive to couple or uncouple an existing rake, to another rake or to the locomotive
(b) the worker uncoupling the bins is sometimes not in visual contact with the operator
(c) shunting takes place during day and night operations in a range of work environments
(d) while shunting, bins are sometimes left on the running line
(e) unless secured, bins can move unexpectedly.

3.4.1 Possible controls for shunting hazards

Fly shunting **is prohibited** (uncontrolled movement of bins).

Loose shunting (bins are loose but are under control) should only be used following a risk assessment and implementation of appropriate controls. This risk assessment should be documented and incorporated into work instructions that are rigorously audited.

Chains should not be used for loose shunting due to the high risk of damage from bins, locomotive buffers or other sharp edges.

Principally the risk involved in shunting is the risk of receiving crush injuries between bins or bin buffers when coupling up. This risk is eliminated when no work takes place between bins whilst they or the locomotive are moving.

Planning and design of new rail installations should include consideration of issues such as access for maintenance of trackside areas and installations that encourage safe practices.

Maintenance of trackside areas including mowing, levelling, removal of trip hazards and covering of drains are typical controls that reduce injury risk whilst shunting.

Rail operators should review injury reports and utilise risk management processes to determine where warning devices, signs, permits to work, supervision and work instructions are necessary.

Adequate lighting should be provided in areas that are used on a regular basis during the night, for example:
(a) full and empty yards
(b) trans-loaders which are used continuously
(c) marshalling yards which are used continuously.

When leaving bins in sidings or on the running line while shunting, they should be restrained so that they cannot move in any direction. This is normally achieved by the use of chocks or mechanical restraints.

Weather conditions may influence the number of chocks required to secure the bins, particularly wind speed and rain. In extremely adverse conditions or when stored for long periods of time, it may be necessary to chain the bins to the track or derail a bin on each end of the rake to ensure security.

The risk of derailment is increased if turnouts are left partially open (split). When changing the direction of the turnout, the operator should ensure that the tumbler has moved fully, the switchblade is fully closed and no foreign material is wedged between the switchblade and the stock rail.

Other shunting movement controls involve the use of multiple communication methods such as:
(a) voice radio communication
(b) hand signals
(c) torch signals
(d) headlight signals
(e) locomotive horn codes
(f) documented shunting procedures for generic and specific sidings.

The following control measures can minimise the risk of injury for locomotive crews while shunting:
(a) never jump off a locomotive – always dismount by stepping off
(b) move briskly but do not run
(c) do not cross the path of a moving locomotive
(d) leave the locomotive on the side on which the work is to take place. If the operator is required to depart the locomotive it should be at a stop and the brakes, including the park brake, fully applied.

3.5 Locomotive loading

The design and manufacture of locomotives and bins is a specialised practice outside of the scope of this code of practice. However, rail operators should ensure that hazards associated with the loading characteristics (maximum trailing load) of the locomotive should be assessed and controlled.

3.5.1 Possible controls for locomotive loading hazards

Possible controls include:
(a) the maximum haulage rate of the locomotive including modifications:
(b) for changes in weather conditions
(c) based on track issues such as grade, slope and bridge capacity
(d) braking capacity and brake van requirements
(e) coupling capacity
(f) duty cycle
(g) modification of haulage rates for locomotives with reduced engine capacity.

3.6 Unexpected operator incapacity

The operation of locomotives is almost entirely dependent on the action of the operator (driver) and should the operator driver become incapacitated, adequate emergency systems should be established which ensure workplace health and safety.

It would be difficult to completely eliminate the risk of operator incapacity, however, control measures should be considered which minimise the risk.

3.6.1 Possible controls for unexpected operator incapacity

AS 4292 Railway Safety Management Part 5 Operational Systems, recommends that rail operators establish and maintain a system which identifies the health and fitness standards required for all persons engaged in safety related work within the rail network.

Any fitness for work assessment should be developed in consultation with medical experts and representative workers in those areas where fitness standards are being developed.

A schedule for cane railway personnel to attend fitness assessments for work should also be considered to provide consistency in the program.

Mill owners should consider the requirements of the *Anti-Discrimination Act 1991* when developing fitness for work standards.

Implementation of vigilance systems on cane railway vehicles should be considered as a control measure for unexpected driver incapacity.

Operator assistants training should include how to stop and shut down the locomotive in an emergency.

4. Track and civil infrastructure

Track and civil infrastructure includes bridges, track repair and maintenance.

Cane railway track is usually of a smaller gauge than a National and State railway and in general the track gauge is 610 millimetres (two feet). The track consists of a number of components including sleepers, fastenings, rail, fishplates, turnouts and is usually supported by a layer of ballast.

Infrastructure includes all bridges, crossings (including level, occupational and grade separated crossings and diamond/drawbridge crossings), earth works and other civil works necessary for the support or protection of the cane railway system.

Hazards
The repair and maintenance of railway tracks involves a number of common hazards which are discussed in this document such as:
(a) contact between trains and rail workers
(b) rolling stock recovery (including terrain issues)
(c) bridge failure and bridge clearing (floods)
(d) third party interaction.

A range of general hazards also exist within track maintenance, for example:
(a) manual handling (e.g. Rails and sleepers)
(b) falls from heights (e.g. From bridge work)
(c) heat and ultra violet radiation
(d) mobile plant
(e) working environment
(f) overhead powerlines including local supply and Queensland Rail
(g) dust and noise
(h) excavation/trenching
(i) slips, trips and falls.

These issues are addressed in general terms within the *Sugar Industry Code of Practice Sugar Mill Safety Supplement* and a range of guidance material issued by Workplace Health and Safety Queensland.

4.1 Train contact with track workers

A major hazard of on track work is contact between workers and rolling stock. Track maintenance may be carried out 24 hours a day, seven days per week in both the crush and non-crush periods. Track workers are usually heavily involved in rolling stock recovery after derailment and repair of any subsequent damage.

The required control measures should be determined utilising risk management procedures that consider:
(a) the amount of time required on track
(b) the type of equipment necessary to perform the repairs
(c) the visibility from the work area to both approaches
(d) emergency exit provisions (particularly for bridge and cutting work)
(e) whether lookouts are required.

4.1.1 Possible controls for train contact with track workers

The risk of workers on the track coming into contact with rolling stock can be minimised by ensuring that work does not take place within the contact zone of the track by:
(a) closing a section of track to locomotive entry
(b) using derailers to prevent rail vehicles entry into the work area
(c) erecting physical barriers.

Physical barriers may be placed on the track indicating the track is closed to locomotives. They should only be considered when they are clearly visible to the oncoming locomotive, where there is adequate stopping distance or other administrative controls are in place.

An example of an administrative control which can be put in place at short notice is to nominate an exclusion zone around the track, 2.5 metres from the outside rail, which track workers and their equipment cannot enter until other controls are put in place.

Another control measure is to erect track protection signs, such as speed restrictions, stop or slow signs and other warning signs (e.g. Workers on track). The location of signage should be determined using a risk management approach dependent on:
(a) the surrounding terrain and the opportunity to remove equipment and on track workers in the event of a locomotive entering the area
(b) the level of lighting and weather conditions (particularly those affecting visibility)
(c) the line of sight on each approach to the work area
(d) the likely speed and minimum stopping distance for any approaching trains.

The following are examples of control measures that can be used to help prevent rolling stock coming into contact with workers:
(a) voice radio communication systems (including portable and vehicle radios)
(b) hand signals
(c) flashing warning beacons
(d) high visibility personal protective equipment
(e) high visibility equipment marking (on items of plant)
(f) lookouts on each approach should there be the risk of a locomotive approaching. It would be unnecessary to have a lookout on each approach if one end of the track is a tail with no locomotive in that section
(g) warning detonators.

NOTE: Competent persons should only use detonators and there should be appropriate storage, method of delivery and disposal of unwanted items procedures in place. Detonators can be dangerous and may cause serious personal injury if carelessly used or handled incorrectly.

4.2 Rolling stock recovery

Derailments occur from time to time on any rail network and the recovery of rolling stock introduces a range of hazards that needs to be considered. Derailments can occur on any section of the track (including on bridges) and can be caused by a number of factors such as:
(a) build up of foreign material (such as in sidings)
(b) track component failure (such as at turnouts)

(c) rolling stock failure
(d) vandalism and malicious interference
(e) contact with other things
(f) emergency braking
(g) operator error.

Rolling stock recovery normally includes the use of items of plant such as cranes, low loaders, excavators and a range of smaller vehicles. Access to the site of the derailment can often be difficult and can require passing through other properties or driving directly along the permanent way.

Hazards such as difficult terrain, overhead electric lines, unstable ground, culverts and drains are often encountered. Other issues include exposure to traffic on roads and control of members of the public (e.g. Tourists and sightseers).

Work in or around live electric lines is governed by the requirements of the *Electrical Safety Act 2002* and the *Electrical Safety Regulation 2002*. Rail operators should ensure they meet these requirements. For further information, the following documents are available on the Electrical Safety Office:
(a) *Electrical Safety Act 2002*.
(b) *Electrical Safety Regulation 2002*.
(c) *Code of Practice for Work around Live Parts*.

4.2.1 Possible controls for rolling stock recovery

Rolling stock recovery provides a range of hazards similar to that of normal on track work such as train contact. Controls common to rolling stock recovery and on track work should be taken as described in section 6.

Other issues, such as those involved with the use of plant, cranes, end loaders etc are not industry specific and are dealt with in either the *Sugar Industry Code of Practice Sugar Mill Safety Supplement* or a range of material provided by Workplace Health and Safety Queensland.

Electrical hazard controls
The risk of contact with live electric lines is removed when the lines are moved from the work area, or the work areas are re-situated or the overhead lines are de-energised.

If items of plant or lifting apparatus enter the exclusion zone around live overhead lines, the risks of injury and/or damage are minimised by developing procedures and work instructions (e.g. A procedure which requires the pulling of damaged or derailed rolling stock to an area away from overhead lines before lifting).

The use of live line approach warning devices on lifting equipment is another control measure that may be considered.

Other controls include the use of a safety observer, installation of markers that show the location of the line and create an exclusion zone. Detailed guidance on the use of cranes in the vicinity of overhead electric lines may be gained from *AS 2550.1:2002 Cranes – Safe Use and the Electrical Safety Code of Practice for work around live parts*.

Prescriptive requirements are included in the *Electrical Safety Act 2002* and additional guidance material is available in the advisory standard for work near live parts issued by the Electrical Safety Office.

The use of a lookout is mandatory if any equipment could possibly enter within the minimum approach distance as specified in the *Electrical Safety Regulation 2002* unless a safe system of work is implemented and the operator is a "trained and authorised person" as defined in the electrical safety regulation.

4.3 Bridge failure

Failure of bridges or bridge components exposes operators to significant risk of injury or death from falls from heights, crush injuries and in some circumstances, drowning.

4.3.1 Possible controls to reduce bridge failure

The risk of a bridge failure should be assessed and the following items considered in terms of exposure and consequence:
(a) the size of the structure
(b) its age and condition
(c) the weight and number of bins for each locomotive crossing
(d) the speed of the locomotive crossing
(e) the approaches and what limits they place on locomotive speed.

A range of control measures should be considered for rail bridges including:
(a) regular inspections by a competent person
(b) a documented and regular maintenance system
(c) load and speed limits
(d) event triggered inspections.

4.4 Bridge clearing

During flooding large river bridges can trap various types of debris and other material which increase the side loading on the structure. In some cases this additional load can cause the structure to fail.

The identified hazard for bridge clearing during flooding events is the flood water with its associated drowning risk.

4.4.1 Possible controls for bridge clearing

Clearing bridge structures during significant weather events should be specifically risk assessed for each event including issues such as:
(a) the seriousness of the flood (i.e. Water level)
(b) consideration of tidal flow (if relevant)
(c) the loading level on the bridge
(d) the skills of the person clearing the bridge
(e) the speed of the water flow
(f) the system used to clear debris and whether the system increases the risk of injury.

Consequences and the likelihood of those consequences should consider:
(a) the likelihood of a person falling into the water
(b) what event sequence would occur should the structure fail during bridge clearing
(c) the expected exposure time for the work to take place.

Bridges under significant flood loading should be closed to rail traffic unless travel over the structure is approved by a qualified engineer or the structure can be traversed without risk for authorised use.

A range of control measures should be considered including:
(a) not performing bridge clearing once water levels or debris loading have reached a certain point
(b) using a clearing system which does not require entry onto the bridge (e.g. Bank side snigging)
(c) flood protection structures
(d) improving bridge design
(e) fall protection systems which eliminate the potential for falling in the water
(f) use of flotation devices/lifejackets
(g) methods of rescue.

5. Sidings and delivery points (field interface)

Sidings are used for the storage or shunting of rolling stock and are a key interface with field based equipment such as in field transporters and harvesters. Delivery points include infrastructure for road transport delivery such as trans-loaders (which transfer cane from road storage to rail storage bins) or roll on roll off lines. Sidings have a number of design types including, loops and double loops.

Locomotives perform three basic functions within sidings, namely; delivering empty bins, collecting full bins and shunting operations. The type of siding and its layout with respect to the main line significantly influences the process for the delivery and collection of bins.

A delivery point is considered a workplace for the purposes of the *Work Health and Safety Act 2011*. All persons, normally involved with activities at a siding, have duties to ensure that the way they undertake their activities does not pose a risk to themselves, workers or others.

During the harvesting season sidings are used by a number of industry participants including mill workers, growers and their workers, harvesting contractors and haul out drivers.

Sidings are usually only used by one harvesting contractor at a time unless the siding is arranged for multiple contractor delivery.

The interaction between cane railway rolling stock and harvesting and farm equipment at sidings can be the cause of serious incidents if adequate controls are not in place. As a general rule, right of way between rolling stock and field equipment is determined by which operator is working in the siding at the time the second operator arrives, unless agreement is reached between both (see section 5.1.1 for further information).

Hazards
Rail sidings are a high traffic area during the cane harvesting season. The main hazards within the siding environment are:
(a) contact between field traffic (e.g. Harvesters) and trains
(b) derailment of locomotives and bins from extraneous matter build up
(c) working environment (e.g. Slips trips and falls, lighting and visibility)
(d) spillage
(e) contact between workers and transporters, cane bins and/or locomotives
(f) overhead power lines
(g) other persons entering the siding (visitors, children, field workers, etc)
(h) inexperienced workers.

5.1 Contact between rolling stock and field traffic

Contact between rolling stock and field traffic can cause significant injury including death in some cases. Cane railway rolling stock is by its nature a heavy piece of plant on a fixed track with no way to avoid items within the operating envelope except by stopping.

In recent years field traffic has been increasing in size and it is not unusual for field equipment to haul loads from four to 25 tonne.

An example risk assessment has been included in Appendix 7.6 - Contact between rolling stock and field equipment in railway sidings.

5.1.1 Possible controls for contact between rolling stock and field traffic

The risk of contact between moving plant is minimised if only one item of plant is operating in a siding at any one time. E.g. increased risk exists if a locomotive arrives at the siding while an in-field transporter is already unloading. The locomotive should wait until the transporter has finished unloading and left the siding before entering the siding.

Similarly, if a transporter arrives at a siding and a locomotive is in the siding shunting bins, the transporter should wait until the locomotive crew have completed shunting and left the siding before entering.

In the absence of a detailed risk assessment and jointly prepared work instruction, haul outs and locomotives should not be operating in a siding at the same time. However the right of way should be given to whoever is occupying the siding first.

A range of warning signs (such as ‘H’ or harvester boards) have been designed by industry which provide additional warning to locomotive drivers of harvesting operations in the close vicinity of the cane railway.

Ensure radio contact between harvesting groups, locomotives and the traffic office when placing H boards.

5.2 Locomotive and bin derailment from extraneous matter build-up

Accumulated material around sidings has caused derailment of rolling stock by forcing the wheels of the equipment off its running line. In busy sidings and track areas, which are used on a regular basis, considerable amounts of material can be left behind from:
(a) spillage from haulage equipment
(b) extraction from harvesters working close by
(c) spillage from bin derailments
(d) other sources.

5.2.1 Possible controls for extraneous matter build-up

Hazards associated with spilt billets and trash are minimised when the material is regularly removed. The person who spilt the billets should remove spilt billets and/or trash from the siding before leaving the siding.

NOTE: Every person has a duty **not** to endanger the health and safety of others. Spilt billets and other extraneous matter on or near rail lines have the potential to inflict serious damage to both people and equipment.

5.3 Overhead power lines near sidings

The Electrical Safety Act 2002 (ES Act) and Electrical Safety Regulation 2002 (ES Regulation) prescribe ways to control the risks associated with electricity for duty holders.

The ES Act outlines general electrical safety duties. The ES Regulation states the allowable distance for working near a live electrical part. The following Codes of Practice give practical advice on safe systems of work and exclusion zones:
(a) Working Near Exposed Parts
(b) Works
(c) Electrical Work.

Overhead powerlines
Overhead power lines are a significant hazard in sidings and close to track operations which require specific controls.

Contact with overhead power lines can cause death. Even if you don't touch the power lines you are still in danger, as electricity can arc (or jump gaps). Working near overhead electrical power lines is therefore a very dangerous activity unless the appropriate precautions are taken. The *Electrical Safety Regulation 2002* states that workers and equipment (e.g. Hand held or powered tools or mobile work platforms) must stay outside the defined exclusion zones around overhead power lines.

For low voltage power lines (anything under 1000 volts) along a road, or a service line connecting a property to the power lines on a road, the exclusion zone is generally three

metres. A smaller exclusion zone may be possible, but only after consultation with the local electricity supplier (e.g. Country Energy, Ergon Energy or Energex), and following the requirements of the electrical safety legislation, including the use of a trained and accredited worker or safety observer.

Exclusion zone distances for high voltage lines vary somewhat, but for high voltage lines attached to either wooden or concrete power poles, the exclusion zone is also generally three metres. Where power lines are on steel towers or large easements you should contact the local electricity supplier. Please check with your local electricity authority prior to working near powerlines.

If you expect that your work may cause a person or equipment to come closer than the exclusion zone of overhead power lines, you must seek advice as to how to stay out of the exclusion zone. To do this you **must** give the local electricity supplier **written** notice that you intend to perform the work. They in turn, **must**, **within 7 days of receiving your notice**, provide you with a written "safety advice" about the work.

You are not allowed to start work near the overhead power lines without this safety advice. Therefore it is critical that you assess the work requirements prior to arriving to do the work and take the necessary steps to minimise the risks involved with work near overhead power lines.

5.3.1 Controls for overhead power lines near sidings

The *Electrical Safety Act 2002* and *Electrical Safety Regulation 2002* provides specific guidance on work in close vicinity to overhead lines which in cases provides mandatory requirements. In particular:
(a) isolating supply lines for work within exclusions zones
(b) prohibiting work within exclusion zones for overhead live lines
(c) provision of safety observers.

There are a number of devices available that either assist in preventing contact with power lines or reduce the degree of risk in the event of contact. Such devices include:
(a) Ensuring work does not encroach into the exclusion zone - all work is to be conducted outside the exclusion zone.
(b) Ensuring workers have received training in relation to cutting or trimming trees around overhead power lines.
(c) When using items of plant near power lines (e.g. Elevating Work Platforms, etc) ensuring that there is a safety observer whose job is to watch the worker and their equipment and warn them if they begin to get close to their exclusion zone around the power lines, and to keep people away from the area at ground level where falling items (e.g., branches etc) may land.
(d) Allowing for sway and sag of the overhead lines (sway is usually caused by wind and sag occurs when the temperature of the line fluctuates), and
(e) Reporting all injuries, electric shocks and near misses to the PCBU. The PCBU is required to notify the local electricity supplier of certain electrical events.

5.4 Contact between persons, transporters, cane bins and/or locomotives

Safe operation should always be paramount in any activity at a siding where people and vehicles could be present. Persons working in or around sidings and delivery point can be classified into two categories:
(a) authorised or permitted persons (someone with a genuine need to be there)
(b) unauthorised persons (e.g. Unescorted visitors).

Contact between persons and equipment working in the delivery area can cause significant injury.

5.4.1 Possible controls for contact between persons, transporters, cane bins and/or locomotives

A range of simple control measures can be applied to authorised persons such as:
(a) reducing or removing the need to exit transport equipment in delivery areas
(b) wearing high visibility clothing
(c) unless required, avoiding being on the ground in the delivery point area whilst bins are being delivered, shunted or moved
(d) creating and identifying an exclusion zones for non-essential personnel
(e) maintaining contact with equipment working in the area (e.g. Notifying by radio when exiting vehicles)
(f) always leaving the locomotive on the side on which the work is to take place and if possible work on the opposite side of the mainline to the siding
(g) looking out for moving bins or vehicles in sidings especially when cutting bins on the mainline
(h) looking out for approaching farm tractors, cane haulout units or other vehicles when placing empty cane bins or removing full cane bins from a siding
(i) being aware that some sidings may have two or more harvest groups loading and may be working on two different lines in the siding or at opposite ends of the siding
(j) avoiding commencing shunting until the siding is clear of haulout vehicles
(k) where possible avoiding walking down the centre of any lines in the siding
(l) where possible avoiding leaving the locomotive to commence any activity in a siding that runs parallel to the mainline and is currently occupied by a haulout unit or requires the driver's assistant to work between the mainline and the siding.

If the risk of unauthorised people entering the work area has been identified, duty holders should ensure warning signs are used or installed. Should unauthorised persons enter the work area, operations should cease until they are removed from the site.

5.5 Working environment

Delivery sidings are located in numerous areas within a railway transport system. These areas include easements in farm land, on roadsides, in cuttings, close to intersections, other farming areas (e.g. bananas), near rivers and creeks, drains and channels. The working environment should be considered within any risk management process and consider hazards such as:
(a) water transfer systems (such as irrigation channels)
(b) drains and culverts
(c) lighting (if work takes place regularly at night)
(d) visibility (due to track curves, crops and dust)
(e) unauthorised persons.

5.5.1 Possible controls for working environment hazards

A range of controls is available in regard to working environment including:
(a) training (refer to the *Sugar Industry Code of Practice* and the *How to Manage Work Health and Safety Risks Code of Practice* for further information)
(b) marking of hazards
(c) crop harvest scheduling
(d) warning methods (e.g. Flashing lights, high visibility paint or locomotive horn)
(e) mirrors on track curves or sidings that have permanent restricted vision
(f) physical barriers.

6. Rolling stock

Rolling stock includes any on track vehicle that operates on the cane railway track system. It includes locomotives, bins of various designs and carrying capacities, brake vans and track maintenance equipment (such as tampers). In large mill areas this can include bin fleets which number in the thousands and large locomotive fleets. In general the carrying capacity of bins varies from four to 15 tonnes and the actual load will vary dependent on the type of cane and its weight relative to its volume.

Locomotives range in size, capacity and construction and include side rod and bogie drive systems. Generally, locomotives range from 18 to 40 tonnes in weight. Hauling capacity of locomotives is dependent on the terrain (grade of track), track conditions (wet, dry or speed limited) and track capacity (in particular bridge loading).

Hazards
Rolling stock presents a range of hazards that are normally associated with mobile plant such as:
(a) equipment failure (brakes, engine and transmission)
(b) fire (on board and external)
(c) coupling and uncoupling (crush risk)
(d) derailment
(e) hot boxes (bearing failure)
(f) exposure to moving parts
(g) slips trips and falls
(h) coupling systems
(i) bin greasing

(j) structural failure (e.g. Broken couplings and runaways)
(k) working environment
(l) control system failure.

Issues, which occur during the operation of equipment, should also be considered in any hazard control process, such as:
(a) train control (acceleration/braking or train draft/buff)
(b) incorrect chocking
(c) incorrect coupling.

6.1 Equipment failure

The majority of hazards associated with rolling stock occur due to equipment failure (e.g. Couplings, brakes, transmission, hot boxes and control system failure).

The risk of injury from equipment failure can be eliminated or minimised by implementing appropriate control measures.

6.1.1 Possible control measures for rolling stock failure

Rail operators should implement processes as outlined in the *Plant Code of Practice* and as discussed below.

Inspections
Inspections can identify potential problems that were not anticipated during plant design, deficiencies in the plant or equipment due to wear and tear, corrosion or damage. Rail operators should ensure that a regular system of inspection is put in place for locomotives and brake vans, which includes, but is not limited to:
(a) a pre season inspection
(b) basic pre operational checks (such as oil and coolant levels, brake block inspection, lights and radios)
(c) operational inspections on a regular basis (scheduled maintenance).

Maintenance
Plant should be maintained according to the manufacturer's specifications, or in the absence of specifications, in accordance with other proven and tested procedures.

Records
Records should be maintained for all items of rolling stock. Records should include information such as:
(a) the unique plant and component identification number
(b) as built and approved drawings and calculations
(c) compliance or test certificates
(d) inspection results
(e) major repair details
(f) major modification details, including any design changes
(g) maintenance records, including new or changed components.

Competency and training for maintainers
Rail operators should ensure that employees using or maintaining plant are capable of safely and correctly performing those tasks. A number of methods of evaluating competency are available and the following should be considered:
(a) the persons qualifications
(b) previous work experience and performance
(c) training and supervision provided
(d) formal competency assessment
(e) authority to operate
(f) fitness for work.

6.2 Train control

Operator control of a train has a direct relationship to train incidents. Hazards which can be created by the operator include:
(a) buffering and surging
(b) braking and brake feathering
(c) speed
(d) engine braking.

6.2.1 Possible control measures for train control.

Correct methods for braking, minimising high buffing, draft and surge forces, chocking bins and coupling/uncoupling bins are usually learnt through training systems provided by the rail operator.

No course exists, at the time of development of this code of practice, within the National Competency Standards for operators of cane railway locomotives, however, a number of industry developed courses are available.

Rail operators should ensure that appropriate training and documentation is provided and competency assessed prior to workers operating a locomotive. Any competency assessment should include issues such as:
(a) network rules and procedures
(b) train movement
(c) signalling and communications
(d) examination of trains
(e) track and trackside work
(f) operational safety
(g) Queensland Rail crossing procedure
(h) road/rail crossing procedures
(i) locomotive knowledge (for each type operated by that driver)
(j) train handling
(k) route knowledge
(l) coupling systems
(m) coupling crush risks
(n) emergency procedures (following an incident)
(o) communication (radio) procedures.

6.3 Bin greasing

Bin bearing greasing is a regular maintenance activity for bin fleets which can take place several times in any season dependent on fleet usage.

The expulsion of excess grease onto track systems following greasing operations can create additional hazards for rolling stock such as:
(a) reduced stoping ability
(b) reduced acceleration control
(c) general train control issues (for example buffing).

The bin greasing process also creates hazards for workers carrying out this task due to their close vicinity to moving rolling stock.

6.3.1 Possible controls for bin greasing

Greasing, by trained operators, should take place at locations which have at a minimum:
(a) safe access
(b) sufficient lighting
(c) adequate space to perform the task
(d) a method of emergency control.

A range of control measures should be considered for track hazards which may result from the bin greasing process, including:
(a) minimising excess grease loss (e.g. Removal before leaving greasing area)
(b) scheduling greasing operations to minimise grease build up on track (allowing regular periods for cleaning or reduction in build up)
(c) regular cleaning of track areas which are hazardous.

6.4 Fire events

Sugar cane trash by its nature is a flammable substance which is sometimes burnt prior to harvesting cane. Cane rail tracks traverse throughout cane fields, bush and forestry areas and paddocks which can have significant fire loads. The risk of uncontrolled fires (wildfires) is one which should be addressed by rail operators.

Build up of foreign material on locomotive engines and brake vans has the potential to cause on board or external fires due to the heat produced in engines and braking systems. In turn fires can then be fuelled by oil, diesel or other flammable substances used by the locomotive.

6.4.1 Possible controls for fire hazards

All locomotives and brake vans should be equipped with functional fire fighting equipment and operators instructed regularly in the equipments use.

Significant external fire events may require:
(a) track closure
(b) removal of rolling stock from at risk locations
(c) follow up track inspection after significant fire events
(d) notification to emergency services
(e) fire fighting and back burning to protect track structures (e.g. timber bridges).

6.5 Exposure to moving parts

Dependent on the type of locomotive, hazards exist from exposure to moving parts such as:
(a) side rod systems
(b) wheels
(c) transmission systems
(d) engine components (e.g. Belting).

Operators can be protected from these hazards in a number of ways, risk assessments should also consider the likelihood of operators or others tripping or falling into hazard areas.

6.5.1 Possible controls for exposure to moving parts

Rail operators should apply guarding techniques for moving parts as outlined in the *Plant Code of Practice*. Other techniques which may minimise the risk of exposure include:
(a) barriers and guards
(b) providing adequate lighting
(c) keeping the locomotive in a clean condition (housekeeping).

6.6 Slips, trips and falls

The incidence of injury is increased where the following hazards exist on the locomotive and in the delivery siding, including:
(a) poor housekeeping
(b) poor lighting
(c) uneven ground
(d) build up of cane billets
(e) weather conditions (wet/rainy)
(f) discarded equipment
(g) siding design – the cant or slope of the ballast
(h) design of steps on locomotives
(i) footwear worn
(j) open drains
(k) turnout operating gear.

6.6.1 Possible controls for exposure to slips, trips and falls

Rail operators should apply guarding techniques for moving parts as outlined in the *Plant Code of Practice*. Other techniques, which may minimise the risk of exposure, include:
(a) only alighting or boarding a locomotive when it is stopped or at less than walking pace
(b) fitting non slip treads to locomotive steps
(c) providing adequate lighting on steps
(d) providing non slip hand rails
(e) keeping the locomotive in a clean condition (housekeeping)
(f) minimising excess material in the cabin or walkway areas
(g) clearing billets and chocks from siding work areas.

An example risk assessment has been included in section 7.5 Slips trips and falls – locomotive steps.

7. Appendices

7.1 Definitions

Active control: control of the movement of vehicular or pedestrian traffic across a railway level crossing by devices such as flashing light signals, gates or barriers, or a combination of these, where the device is activated prior to and during the passage of a train through the crossing.

Bin: for the purposes of this industry code of practice – any item of rolling stock that is not self propelled.

Cane railway: means the network of tracks traversing land surrounding a sugar mill which are used principally for the transport of harvested cane to the mill.

Check rails: rails positioned to guide bin wheels through the crossing area of a turnout.

Civil infrastructure: track formation and drainage (but excluding track), fixed structures beside, over or under track, including supports for signalling and telecommunications equipment but excluding that equipment.

Competence: the possession of skills and knowledge, and the application of them to the standards required.

Delivery sidings: sections of the cane railway to which cane is delivered by various road or field transport methods. In general, sidings consist of two tracks connected to the main or branch line via a series of turn outs. One track holds empty cane bins which are collected by cane harvesting operators and the other track holds full bins which have been returned by the cane harvesting operators.

Diamond crossing: a special track structure where one track crosses another track at the same level.

Drawbridge crossing: a crossing of another railway system (such as Queensland Rail) by a cane railway track in which the rails of the cane railway do not actually intersect the other track but form a drawbridge on top of the other track. The cane rails are normally in the raised position and are lowered to allow the passage of a cane locomotive / train. The passage of the cane train is controlled by a red / green aspect.

Fly shunting: a process of shunting in which a vehicle, which is not coupled to the shunting locomotive, is propelled forward and then allowed to continue uncontrolled, moving under its own momentum. Fly shunting is prohibited.

Gauge: the distance below the top surface of the rail.

Locomotive: the on rail vehicles used exclusively to haul full of empty bin trains for normal operation requirements.

Loose shunting: a process of shunting in which a single unit or several units of rolling stock not close coupled to the shunting locomotive, are propelled forward and then allowed to continue controlled, moving under its own momentum.

Occupational crossing: a defined section of track over which farm roads and access tracks cross the cane railway.

Operator: the person or body responsible by reason of ownership, control or management, for the provision, maintenance or operations of trains, or a combination of these; or a person or body acting on its behalf.

Organisation: an owner or an operator, or a person or body, which is both owner and operator.

Owner: the person or body responsible by reason of ownership, control or management, for the construction and maintenance of track, civil and electric traction infrastructure, or the construction, operation or maintenance of train control and communication systems, or a combination of these, or a person or body acting on its behalf.

Passive control: control of the movement of vehicular or pedestrian traffic across a railway level crossing by signs and devices, none of which are activated during the approach or passage of a train, and which relies on the road user detecting the approach or presence of a train by direct observation.

Rolling stock: any vehicle that operates on or uses a railway track.

Safety system: an integrated system of operating procedures and technology for the safe operation of trains and the protection of people and property on or about the railway.

Signalling and telecommunication infrastructure: the signalling equipment and telecommunication equipment provided and used as part of the safe working and operating systems of the railway, but excluding supports for such equipment.

Track: the combination of rails, fish plates, sleepers, ballast, turnouts and substitute devices where used.

Turnouts: in track structures, which provide for one track to join or cross another.

7.2 Further information

7.2.1 Workplace Health and Safety Queensland

Further information is available on the Workplace Health and Safety Queensland website www.workcover.qld.gov.au or by contacting Infoline on ph 1300 369 915.

Legislation

- Work Health and Safety Act 2011.
- Work Health and Safety Regulation 2011.
- Electrical Safety Act 2002.
- Electrical Safety Regulation 2002.

Codes of Practice

- First Aid.
- Hazardous Manual Tasks.
- Plant.
- How to Manage Work Health and Safety Risks.
- Working Near Exposed Live Parts.
- Works.
- Electrical Work.

Audit tools

- Cane farmers hazard identification checklist.
- Sugar cane harvesting contractor audit framework.

7.2.2 Australian Standards

- AS 4292.1 Railway Safety Management Part 1: General Requirements.
- AS 4292.2:1997 Railway Safety Management – Track, Civil, and electrical infrastructure.
- AS 4292.3 Railway Safety Management – Rolling Stock.
- AS 4292.4 Railway Safety Management – Signalling and telecommunications systems and equipments.
- AS 4292.5 Railway Safety Management – Operational Systems.

www.standards.com.au

7.2.3 Australian Sugar Industry Codes of Practice

- Cane Railway Operations.
- Operations and Procedures at Cane Railway and Road Transport Delivery Points.
- Track and Civil Infrastructure Design and Maintenance Practices.
- Active Level Crossing Protection Systems on Cane Railways.
- Design, Manufacture and Maintenance of Locomotives and Rolling Stock for Cane Railways.
- Safe Operating Practices for Cane Railways.

NOTE: These codes are published by the Sugar Research Institute.

7.2.4 Risk Assessment Models

- Australian Level Crossing Assessment Model (ALCAM).
- Manual of Uniform Traffic Control Devices (MUTCD), Part 7 Railway Crossings.

NOTE: The Queensland Level Crossing Steering Group is the custodian of ALCAM. Contact rsa@transport.qld.gov.au for advice. The MUTCD can be purchased from SAI Global.

7.3 Example risk assessment form

Description of hazard:		
Description of work:		
Range of possible methods:		
Method (a):		
Method (b):		
Method (c):		
Risk assessment conducted by: ..... Date:		
HAZARD	ASSOCIATED RISK	LEVEL OF RISK (risk score)
Emergency response procedures:		
Control measures – action to take:		

RISK PRIORITY CHART				
Probability	Consequence: How severely could it hurt someone?			
How likely COULD it happen	**EXTREME** – Death or permanent disablement	**MAJOR** – serious bodily injury or serious work caused illness	**MODERATE** – injury or illness requiring causality treatment	**MINOR** – injury or illness requiring first aid only, no lost time
VERY LIKELY *Could happen frequently*	1	2	3	4
LIKELY *could happen occasionally*	2	3	4	5
UNLIKELY *could happen but rare*	3	4	5	6
VERY UNLIKELY *could happen, probably never will*	4	5	6	7
What is the risk priority? ----------				
The scores (1-7) in the risk priority chart indicate how important it is to do something about each risk				

Score	Action
1, 2 or 3	Do something about these risks immediately
4 or 5	Do something about these risks as soon as possible
6 or 7	These risks may not need immediate attention

LEVEL 1: Eliminate the risk

LEVEL 2: Minimise the risk

LEVEL 3: Where risk not minimised: use administrative controls, and appropriate personal protective equipment

7.4 Example risk assessment – Contact between trains

RISK ASSESSMENT
Site / location: At a siding – generic assessment
Risk identification: Work environment – Contact between trains - head to head and head to tail
Hazard: Two trains travelling on the same track can collide head to head (travelling in opposite directions) or head to tail (travelling in the same direction). Head to head • Turnouts set in wrong direction (for example, into an oncoming train) • Trains travelling on the same track and section, operators aware or unaware • Train fails to stop at designated point • Train stops in a small a siding which can't hold all bins Head to tail • Poor visibility • Lead train slows, stops or stops unexpectedly • Following train loses control (for example, brakes)
Exposure: dependant on: • The number of trains in operation at any one time; 25 locomotives • The size of the trains; up to 600 metres • The size of the network; 400 km of track • The configuration of the network. For example, its layout of common main line, 300 sidings and loops; 45 spurs, 100 km minimum loop/siding size – hold 50 x 6 tonne bins • Weather conditions; All conditions • Day or night operation; day and night and operation • Visibility distance; varies, 100 to 1000m
Contributing Factors: • Train speed; up to 40 km/hr • Train weight; up to 1000 tonnes • Stopping distance; maximum 800 metres
Possible Consequence: • Human/physical - fatal/serious injury • Plant/business - substantial damage/destruction • Substantial production loss • Substantial repair/clean up costs

Likelihood How it could happen?	Consequence How severely could it hurt someone?			
	Extreme *Death / Permanent Disability*	**Major** *Serious Bodily Injury*	**Moderate** *Casualty Treatment*	**Minor** *First Aid /No Lost Time*
Very likely *Almost certain it could happen*	1	2	3	4
Likely *Quite possible it could happen*	2	3	4	5
Unlikely *Could happen but rare*	3	4	5	6
Very unlikely *Could happen but very unlikely*	4	5	6	7
Risk Score: Very High Risk Moderate Risk Low Risk				

Score:	Action
1,2, or 3	Do something about these risks immediately
4 or 5	Do something about these risks as soon as possible
	6 or 7 These risks may not need immediate attention

** The scores (1-7) in the risk priority chart indicate how important it is to do something about each risk*

Level 1: Eliminate the Risk.
Level 2: Minimise the Risk.
Level 3: Where risk not minimised: use administrative controls and appropriate personal protective equipment.

The risk for completely uncontrolled hazard of train to train contact is ONE - EXTREME

Risk Treatment
Avoid the risk. – Not practicable as more than one train is required to deliver cane.
Alternative is to change to road transport system. Large Capital Cost.
Reduce the likelihood of occurrence – Control measures as outlined below will reduce the likelihood of occurrence.
Reduce the consequences – Contingency /Emergency planning.
Transfer the risk – Not possible

Hazard	Risk & Score	Control Method	Reassessed Risk Score
Contact between locomotives	1	**Eliminate** • Only allow one vehicle into a section of track at a time – occupancy control – type of occupancy control to be determined.	
		Re-design & engineering • Use of GPS tracking technology • Installation of signage and control points to determine track sectioning • Use of traffic controller to maintain safe separation distances and control trains • Use of mimic board for train positioning and occupancy status • Use of voice radio for instructions / emergency notification	
		Substitute • Use road transport – large capital costs	
		Administrative • Training and competency testing – traffic controller & Locomotive operators • Documented procedures for train separation & control • Flashing beacons on all locomotives and brake vans • High visibility paintwork • Use vehicle headlights at all times • Use high visibility end of rake markers • Have standard operating instruction for specific weather conditions i.e. heavy fog • Documenting all siding data. • Fitness for work standards	
		PPE • Use high visibility clothing	
General comments (Including monitoring and review methods) field audits to assess control measure effectiveness Copy of procedures to be attached to assessment when complete Audits should include conformance with procedures by harvesting operators Competency testing of operators to take place every three years			
Risk assessment conducted by:		Jack Operator (print name and sign)	
Risk assessment date: 01/01/03		Crushing Season: N/A	

** To be reviewed 01/01/04*

Control Measures – Action Plan

Item	Action required	Action by who	Action by date	Review date
Implement electronic vehicle-alert system collision warning system.	Capital application, negotiation with growers. harvesters for cost sharing, cost benefit analysis and recommendation on implementation	Mill manager, J Smith	01/06/02	01/01/03
Modify siding design	Capital application, rail manager to mill manager	J Bloggs	01/09/02	01/03/03
Ensure field operator training – harvesting	Notification to harvesting contractors re- siding induction requirements	J Bloggs	01/01/03	01/06/03
Documented procedures for specific siding	Develop and train operators	J Bloggs	Immediate	01/02/03
Flashing beacons on equipment	Purchase and install	J Bloggs	Immediate	01/02/03 Training for
rail operators in procedures and operation	As above			
Use vehicle headlights at all times	Notify operators	J Bloggs	Immediate	01/02/03
Use locomotive horn when passing sidings and shifting bins	Notification to rail operators	J Bloggs	Immediate	01/02/03
High visibility paintwork	Add to maintenance plan.	J Bloggs	01/04/02	

7.5 Example risk assessment - Slips trips and falls (locomotive steps)

Reference No: RA-001

Form completed by: John Smith – Locomotive fleet supervisor.
Date form completed: 01/01/01

Hazard identification

Hazard: **slips trips and falls**
Associated risk: **Fall from locomotive steps while entering or leaving cabin**
Specific circumstances relating to the risk: **Use of steps in field conditions. Lighting and weather conditions need to be considered.**
Persons at risk: Locomotive operators
Is the risk: (circle one)

- Minor → attend to straight away
- Issue with a regulation/standard/ code/guide → refer to relevant regulation, standard, code or guide
- Other → continue

Risk assessment
Existing control measures (if any): walkway mesh construction allows passage of some material.

Likelihood :(tick box) very likely ☐ likely ☒ unlikely ☐ very unlikely ☐
Consequences:(tick box) extreme ☐ major ☐ moderate ☒ minor ☐
Risk rating (Refer to risk priority chart below):

Risk control

Possible control options:

1. Reduce number of entry and exits (lower exposure)
2. Install step light for night work
3. Install non slip treads and edges
4. Install guard plate on either side of steps (prevent entry into side rods/boogie area
5. Provide high sided boots with non slip soles
6. Ensure construction of steps is to an appropriate standard (for example, width, depth, and step distance)
7. Ensure two hand rails are fitted for each set of steps
8. Implement housekeeping and inspection plan (more regular in wet weather)
9. Locomotive must be stopped or moving at less than walking pace when entering or leaving the cabin.

Preferred control options (and why):

2 to 8. Control measure number one – the number of times the ladder is used is controlled by the running sheet, distance and work load. Significant capital required to implement change to this system and would be long term control.

Implementation plan						
Control option	Associated activities	Resources required	Person/s responsible	Proposed implementation date	Sign off & date	Scheduled review date
2	install step lights	install time	I SMITH	07/01/01		31/01/01
3	install non slip treads	order equipment, install time	I SMITH	31/01/01		01/03/01
4	install guard plate	sheet guard & install time	I SMITH	14 – 30 /01/01		01/03/01
5	supply PPE	change boot order	I SMITH	over period of time at – replacement		01/01/02
6	audit step construction	inspection list & auditor	I SMITH	07/01/01		14/01/01
7	audit hand rails	audit with step review	I SMITH	07/01/01		14/01/01
8	inspection plan	develop audit plan	I SMITH	16/01/01		1/02/01
8	house keeping roster	clean down loco by operators	I SMITH	01/01/01		30/01/01
9	train operators	trainer & program	I SMITH	01/01/01		30/01/01

Expected risk score after implementation – 7 Review (at appropriate dates)

Are control measures in place?

- Yes
- No, Comment:

Are controls minimising the risk?

- Yes
- No, Comment:

Are there any new problems with the risk?

- No
- Yes, Comment:

Risk priority chart

Likelihood	Consequences			
	Extreme	Major	Moderate	Minor
very likely	1	2	3	4
likely	2	3	4	5
unlikely	3	4	5	6
very unlikely	4	5	6	7

7.6 Example risk assessment – Contact between rolling stock and field equipment in sidings

Risk assessment form
Site/location: Siding – generic assessment
Subject/item for risk assessment: Generic hazard – work environment – contact between rolling stock & field equipment in railway sidings (locomotive operator assessment)
Assessment procedure: • List hazards • Assess risk using risk score chart • Determine control measure • Reassess risk • Implement control measure once effective measure is determined

Likelihood Consequence How severely could it hurt someone?				
How it could happen?	**Extreme** Death/ permanent disability	**Major** Serious bodily injury	**Moderate** Casualty treatment	**Minor** First aid/no lost time
Very likely *Almost certain it could happen*	1	2	3	4
Likely *Quite possible it could happen*	2	3	4	5
Unlikely *Could happen but rare*	3	4	5	6
Very unlikely *Could happen but very unlikely*	4	5	6	7
Risk score: Very high risk		**Moderate risk**	**Low risk**	

Score:	Action
1, 2, or 3	Do something about these risks immediately
4 or 5	Do something about these risks as soon as possible
6 or 7	These risks may not need immediate attention

** The scores (1-7) in the risk priority chart indicate how important it is to do something about each risk*

LEVEL 1: Eliminate the Risk

LEVEL 2: Minimise the Risk

LEVEL 3: Where risk not minimised: use administrative controls, appropriate personal protective equipment

Control measures – Action plan

Hazard	Risk & score	Control method	Reassessed risk score
Contact between locomotive and field equipment at sidings	1	**Eliminate** • Only allow one vehicle into a siding at any one time	
		Re-design & engineering • Use of Electronic Vehicle (EV) – alert warning systems – (long term) • Modify siding for safety issues – i.e. visibility	
		Substitute • Use road transport	
		Administrative • Ensure field operator training - harvesting • Documented procedures for specific siding • Flashing beacons on equipment • Training for rail operators in procedures and operation • High visibility paintwork • Use vehicle headlights at all times • Use locomotive horn when passing sidings and shifting bins	
		PPE • Use high visibility clothing	5
General comments (Including monitoring and review methods) field audits to assess control measure effectiveness Copy of procedures to be attached to assessment when complete Audits should include conformance with procedures by harvesting operators Competency testing of operators to take place every three years			
Risk assessment conducted by:		Jack Operator (print name and sign)	
Risk assessment date: 01/01/05		**Crushing season: N/A**	

**To be reviewed by 01/06*

Control measures – Action plan

Item	Action required	Action by who	Action by date	Review date
Implement Electronic Vehicle (EV) Alert system collision warning system.	Capital application, negotiation with growers. harvesters for cost sharing, cost benefit analysis and recommendation on implementation	Mill manager, J Smith	01/06/01	01/01/02
Modify siding design	Capital application, rail manager to mill manager	J Bloggs	01/03/01	01/06/01
Ensure field operator training - harvesting	Notification to harvesting contractors re – siding induction requirements	J Bloggs	01/01/02	01/06/02
Documented procedures for specific siding	Develop and train operators	J Bloggs	Immediate	01/02/01
Flashing beacons on equipment	Purchase and install	J Bloggs	Immediate	01/02/01
Training for rail operators in procedures and operation	As above			
Use vehicle headlights at all times	Notify operators	J Bloggs	Immediate	01/02/01
Use locomotive horn when passing sidings and shifting bins	Notification to rail operators	J Bloggs	Immediate	01/02/01
High visibility paintwork	Add to maintenance plan.	J Bloggs	01/04/01	