

Risk management

What is risk?

Risk is the likelihood of an accident or incident arising from a hazard. The significance of a risk depends on the potential worst outcome should such an accident or incident occur, combined with how likely it is to happen.

What is a hazard?

A hazard is a source (an object, situation or behaviour) of potential injury, harm, or ill health to people. This definition may also include damage or harm to property or the environment.

Hazards can be classified into the following categories, which may make them easier to identify:

- Physical (eg noise, radiation, collisions)
- Thermal (eg boilers and fireboxes, welding, exhausts)
- Pressure (eg boilers and steam lines, compressed air)
- Electrical (eg machine malfunctions, overhead traction lines)
- Gravity (eg slips/trips, runaway rail vehicles, falls from height, overhead objects)
- Mechanical (eg contact with sharp, heavy or moving objects)
- Chemical (eg toxicity, fumes, skin irritation)
- Biological (eg bacteria, viruses)
- Psychosocial (eg stress, violence, bullying)
- Ergonomic (eg repetitive movements, body stress and strain)
- Behavioural (eg poor practices, noncompliance with procedures)

What is risk management?

Risk management is the process for ensuring your organisation has the most appropriate safety controls in place to reduce the likelihood of a workplace hazard causing an accident or incident. Its purpose is to identify the potential risks a hazard presents before something happens, so plans can be put in place before it does.

It's also about ensuring that should something happen, there are safety controls in place to mitigate the consequences.

The risk management process can be broken into the following phases:

- Identifying all of the things that could go wrong (hazards)
- Working out how likely they are to cause an accident or incident
- Establishing what the potential consequences could be
- Choosing and implementing the most appropriate safety controls
- Monitoring the effectiveness of those controls and upgrading as required

What is a safety control?

A safety control is something your organisation does or puts in place to:

- eliminate a hazard
- reduce the risk of a hazard causing an accident or incident, and/or
- mitigate the consequences of an accident or incident.

Safety controls can be categorised from most effective to least effective as follows. Waka Kotahi expects the safety controls that are implemented to fall into the yellow and green categories:

Category: Elimination	
Examples: <ul style="list-style-type: none"> Remove a rail vehicle of a certain type from operation Stop performing an activity or practice (either partly or completely) 	
Category: Minimisation	
Substitution	<ul style="list-style-type: none"> Replace an item of machinery with a better one Start performing an activity or practice a different way
Isolation	<ul style="list-style-type: none"> Prevent access to a hazard Restrict the use of an item of machinery
Engineering controls	<ul style="list-style-type: none"> Upgrade a rail vehicle to make it safer Implement automated technology (eg automatic brakes)
Category: Administrative controls	
Examples: <ul style="list-style-type: none"> Adopt a new procedure Carry out training 	
Category: Personal protective equipment (PPE)	
Examples: <ul style="list-style-type: none"> High visibility clothing Hard hats 	

What we expect to see in your risk management

To be effective, risk management must be used to inform decisions on a new activity or a change before it's made. It isn't a compliance exercise you perform after a change is in place.

For us to be confident that you are managing your risks, we expect you to demonstrate that risk management in your organisation:

- creates and protects value and safety
- is an integral part of all organisational processes
- factors into the overall decision making process
- explicitly addresses uncertainty
- is systematic and structured
- is based on the best available information
- is tailored to the specific circumstances
- takes into account human factors
- is transparent and all-inclusive
- is dynamic and adaptable to change, and
- is continuously monitored and improved upon as the project moves forward.

Fulfilling your risk management obligations

To meet the fundamental aspects of the Railways Act in regards to risk management, you need to comply with [Section 7, General safety duties of rail participants and persons working for rail participants](#), which states:

“(1) A rail participant must ensure, [so far as is reasonably practicable](#), that none of the rail activities for which it is responsible causes, or is likely to cause, the death of, or serious injury to, individuals.

(2) No rail personnel of a rail participant may do or omit to do anything in respect of a rail vehicle, railway infrastructure, or railway premises if he or she knows or ought reasonably to know that act or omission will cause, or will be likely to cause, the death of, or serious injury to, individuals.”

Risk assessments

While there is no single “right way” to perform a risk assessment, there is an overall process that should be followed to ensure the assessment is effective. This process can be broken down as follows:

1. Identify all hazards using your organisation’s identification procedures.
2. Determine who or what might be harmed by the hazard, how they would be harmed and the potential consequences.
3. Evaluate/score the risk (likelihood of it happening and the impact).
4. Record your findings from the assessment and update your organisation’s risk register.

The frequency of your organisation’s risk assessments depends on your activities. For example, if you carry out rail movements several times a year, you won’t need to perform risk assessments as often as you would if you ran daily scheduled services.

Choosing appropriate safety controls

After identifying and prioritising your risks, a decision needs to be made on the safety controls required to reduce the risk [so far as is reasonably practicable](#) (or to remove the risk completely).

The most effective safety control for a hazard is one that reduces its effects, the likelihood of an accident or incident occurring, and the consequences of such an event should it occur. Deciding on the appropriate safety control required should follow your organisation’s decision process, which should include:

- assessing current safety controls for the same or similar risks and how effective they are
- determining whether there are any legal requirements relevant to the risk (eg handling asbestos, preventing falls from heights)
- consulting with others who do similar work to see how they manage the risk
- enlisting specialist advice where appropriate (eg [HASANZ](#))
- consulting with your workers to ensure they are part of the decision
- consulting with other rail operators and other organisations (eg councils) who may share control over the risk
- considering whether the control(s) would work in your specific environment, and
- assessing whether the control itself could create other risks.

Before implementing the safety control, the process should include:

- consulting with anyone affected by the safety control and ensuring they’re given the appropriate training before it’s implemented
- amending appropriate documentation to reflect the new safety control (eg reporting, auditing, maintenance records), and
- providing adequate supervision to ensure the control is being implemented correctly.

You should also consider what could create a vulnerability in your control. For instance, the effectiveness of a safety procedure is reduced if the worker is tired or distracted. Therefore, to manage tiredness, you might also need to educate staff, provide self-detection checklists, and encourage regular breaks.

Risk matrix – Likelihood and consequence tool

To make it easy to determine a consistent risk rating for each hazard, it's useful to have a tool that combines the likelihood of an accident or incident occurring with the potential consequences. This allows for easy identification of the highest risks in the business and the appropriate resources can be allocated.

An example risk matrix and definitions have been provided below:

Likelihood	Impact / Consequence				
	1 Negligible	2 Minor	3 Moderate	4 Major	5 Catastrophic
5 Almost certain	5	10	15	20	25
4 Likely	4	8	12	16	20
3 Possible	3	6	9	12	15
2 Unlikely	2	4	6	8	10
1 Rare	1	2	3	4	5

Extreme risk (20-25)	The process, task or activity in question must not occur or must cease until actions are taken to eliminate the hazard or minimise the risk. CE/Board oversees specific review of effectiveness of new or additional controls before process, task or activity can commence or recommence.
Very high risk (15-16)	Actions are to be taken to eliminate the hazard or minimise the risk. The relevant Executive Manager oversees action plans and receives reports on progress. Specific consideration of control effectiveness and new or additional control options to be considered.
High risk (10-12)	Actions are to be taken to eliminate the hazard or minimise the risk. General Manager oversees action plans and receives reports on progress. Periodic consideration of control effectiveness and new or additional control options to be considered.
Moderate risk (4-9)	Actions are to be taken to eliminate the hazard or minimise the risk. Relevant Business Unit Manager oversees action plans and receives reports on progress. Periodic consideration of control effectiveness and new or additional control options to be considered.
Low risk (1-4)	The process or activity in question continues with existing controls. Ongoing monitoring of existing control effectiveness (within agreed business as usual (BAU) arrangements). Continue to reduce the risk by adopting any improvements in safety the business becomes aware of.

All levels of an organisation should have awareness of the risks the organisation is exposed to, even “moderate” and “low” risks. The executive and governance bodies may not need to be involved in the active management of these risks, but should be aware of them – particularly regarding common themes between minor risks and the catastrophic events the organisation is exposed to, but is controlling with its safety systems.

Likelihood definitions:

- **Rare:** May occur, but only in exceptional circumstances. It would be highly unexpected (ie not in the next 50 years)
- **Unlikely:** Could occur in some circumstances, but would be surprised if it happens (ie once in the next 11-50 years)
- **Possible:** Might occur in some circumstances (ie once in the next 2-10 years)
- **Likely:** Is expected to occur in most circumstances. Not surprised if it happens (ie at least annually and up to 10 times per year)
- **Almost certain:** Is expected to occur and is almost inevitable (ie more than 10 times per year)

Impact/consequence definitions:

- **Negligible:** Illness or injury that doesn't require medical attention. No adverse effect on environment and regulator notification not required.
- **Minor:** Minor illness or injury requiring medical treatment (eg first aid) and/or minor effect on environment that can be cleaned up. Any potential damage remediation likely to cost less than \$5,000. Regulator notification unlikely to be required.
- **Moderate:** Injury requiring admission to hospital and/or effect on environment that may take 1-2 months to restore and cost up to \$20,000. Regulator notification mandatory.
- **Major:** Life threatening injury or multiple injuries requiring admission to hospital and/or significant effect on environment that may take up to a year to restore and cost up to \$1,000,000. Regulator notification mandatory.
- **Catastrophic:** Death and/or catastrophic effect on environment that may take longer than a year to restore and cost more than \$1,000,000. Regulator notification mandatory.

It's important to remember that a single risk usually can result in a range of consequences, generally with less severe consequences being more common. To obtain one rating you generally consider the scenario that gives the highest number. However, you may choose to focus on the rating associated with the greatest consequence.

For instance, using the above matrix, a derailment of a rail vehicle:

- Possible likelihood (3) of medium property damage (3) = 9
- Rare likelihood (1) of a fatality (5) = 5

Therefore it scores a 9 as the highest score and is classed as a 'medium risk'.

Risk register

Your organisation's risk register is where all of your identified work-related hazards are contained. It is a key means of communicating risks with your governance, your management team, your workers, organisations you interact with, and us.

For each hazard there will be a number of identifying details, which will determine the risk and show both the actions taken and actions required to ensure this risk is being managed appropriately.

Risk registers are most often created in Excel, with each identified hazard listed beneath one another in the first column. As you progress across the row for each hazard, the columns will dictate the information required (which will come from your identification and assessment procedures, and your risk matrix).

An example of a risk register (that uses the above risk matrix) has been provided in [Appendix 1 – Example Risk register](#).

Some of the columns we recommend include:

- **Ref no.:** A reference number for the hazard (useful for related action plans)
- **Risk description:** A summary of the hazard and what may cause it
- **Date raised/reviewed:** The date the hazard was identified or reviewed
- **Potential consequences:** A list of the things that could go wrong
- **Likelihood:** A ranking given to the hazard based on how often an accident or incident may occur due to the hazard
- **Inherent risk rating:** The overall rating given to the hazard based on the likelihood and consequence of an accident or incident before safety controls are in place (using the risk matrix)
- **Safety controls:** A list of the safety controls in place to mitigate the risk
- **Assurance:** The methods of tracking the effectiveness of the safety control
- **Residual risk rating:** The overall rating given to the hazard based on the likelihood and consequence after safety controls have been put in place
- **Risk owner:** The name of the position responsible for the hazard and safety control

Monitoring procedures

Once your organisation's safety controls have been implemented, you need to have procedures in place to ensure they are effective, and that they are being used appropriately by workers. Some of these monitoring procedures and mechanisms include:

- inspections, observations and walk-throughs
- meetings and worker feedback
- checklists and audits
- independent reviews
- technology (eg monitoring alarms on machinery, or gas alarms)
- health surveillance records, and
- environmental monitoring activity (eg air quality and noise testing).

Some of the other organisational aspects that need to be monitored in regards to risk management (outside of safety controls) include:

- staff competencies – keep them up to date
- staff training – ensure it's still fit for purpose, and
- accident and incident trends – do they identify areas which need attention to prevent recurrences?

Continuous improvement

Continuous improvement is a key principle in rail safety. In the context of risk management, continuous improvement is about continually and effectively taking opportunities to improve the resilience of your organisation to hazards. Your safety systems should work together to provide you with information you can act upon, which includes:

- monitoring and reviewing your organisation's performance so you know where to improve and when you can celebrate success
- reviewing your safety case and safety systems to ensure they remain relevant and fit for purpose
- ensuring the culture of your organisation encourages people to share ideas, and
- understanding the impacts of any changes and ensuring they are managed appropriately.

The risks identified in your risk register also need to be reviewed periodically to ensure they are accurate and that aspects of them haven't changed. Changes in safety practices, new plant items, staff changes and technological advances are examples of why regular reviews are necessary.

By reviewing your organisation's work activities on an ongoing basis, you are well placed to identify any new risks that might need to be managed as soon as they arise. Even if your current processes are working, there may be a better way to do things. Often it could be as simple as involving your workers more.

Risk management in your safety case

When developing a safety case, which is a requirement in order to become a licensed rail participant (see [Rail safety cases](#)), organisations must demonstrate they have management systems in place to:

- identify and assess the safety risks arising from its rail activities, and
- develop and implement safety risk control measures.

The term 'management systems' encompasses all the aspects of an operating framework, including the documents and tools your organisation uses to demonstrate its safety case, which include:

- safety policies
- risk identification and assessment procedures
- risk registers
- safety control selection methods
- safety control implementation and monitoring procedures
- critical risk and critical task management procedures
- training plans and competency measures
- joint operating procedures with those you interact with
- audit and assurance plans
- quality assurance methods, and
- reporting and notification procedures.

Risk management on-site

Maintaining awareness on the day ensures you are prepared for factors like weather, crowds, unforeseen events and changes to plans that may create new risks and/or change ones you've already identified.

To account for this, it's a good idea to regularly remind your teams to think of what has changed (or could change) in tasks they are about to perform, and to always be aware of their surroundings. To make everyone safer, a quick run through of significant or uncommon risks associated with the task (eg a group going out to repair a piece of track) and an awareness of how they could be avoided should be completed before it's started.

These activities should already be covered in your risk assessment, but this is a chance to remind people of the critical controls, their roles, the responsibilities that need to be assigned and highlight any factors that will make things easier or harder.

Some of the ways to do this are known as "Take 5" or "Toolbox Talks".

Appendix 1 – Example Risk register

Ref No.	Risk description	Date raised/ reviewed	Potential consequences	Inherent risk (before controls) 1=Low, 5= high			Safety controls	Assurance	Residual risk (RR) (remaining risk after controls have been applied)			Risk owner
				Likelihood (L) 1-5	Consequence (C) 1-5	Inherent risk (L x C)			Likelihood (L) 1-5	Consequence (C) 1-5	Residual risk (L x C)	
1	Derailment - shunting empty wagons	14/02/2018	Serious injury to staff or significant damage to property	4	4	16	Shunter training and procedures	Certifications, assessments, verifications	3	3	9	Ops Manager
2	Derailment - passenger service	14/02/2018	Potential death or serious injury to multiple passengers	3	5	15	Track maintenance and inspections, speed restrictions, train control procedures	Internal audit	2	4	8	Ops Manager
3	Carriage fire while on open track	19/02/2018	Potential death or serious injury to multiple passengers	2	5	10	Fire retardant materials, fire suppressed loco, fire extinguishers, safety procedures	Specifications, standards, training, internal audit	1	3	3	Maintenance Manager
4	Level crossing - scheduled service collision with pedestrian	19/02/2018	Likely death or serious injury	3	5	15	Signage, barrier/maze, tactiles, flashing lights, bells, education	Standards, inspections, comms strategy	2	4	8	Infrastructure Manager
5	Passenger slip while alighting	19/02/2018	Potential injury	3	3	9	Non-slip flooring, grip handles, door opening procedures	Specifications, driver training	2	2	4	Ops Manager
6	Workshop slip on spillage	19/02/2018	Potential injury	3	3	9	Controlled substance storage, safe handling protocol, spill kit and procedures, staff training	Inspections, monitoring	2	3	6	Workshop Manager

Note: Ensure your 'Risk description' for each risk allows you to differentiate between vastly different consequences (eg a carriage fire while on open track vs. in a long tunnel) or activities (eg a collision with a person – a scheduled service colliding with a member of public on track is different to a shunt colliding with a worker).