

# Guideline

## Major projects

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# 1. Introduction

In order to promote the safe and timely delivery of rail infrastructure and rolling stock assets through major projects, the Office of the National Rail Safety Regulator (ONRSR) has prepared this guideline to:

- > provide guidance to duty holders about their duties and related obligations under the *Rail Safety National Law* (RSNL); and
- > explain the ONRSR's **minimum** expectations when reviewing the processes and associated evidence used to demonstrate that safe outcomes are being planned and, ultimately, have been achieved by major projects.

## 1.1 Guideline outline

**Chapter 1** provides the introduction to this guideline.

**Chapter 2** explains the legislative basis for the major project advice provided in this guideline.

**Chapter 3** explains the ONRSR's expectations in relation to the effective management and control of major projects. Further information on this topic is contained within the [Effective control and management of railway operations guideline](#).

**Chapter 4** explains the ONRSR's expectations in relation to safety assurance of major projects.

## 1.2 Scope

This guideline has been produced as part of the ONRSR's obligation to promote safety improvement in the Australian railway industry. **It does not supersede obligations for major projects to satisfy the requirements of the RSNL, particularly the demonstration that safety risks have been managed so far as is reasonably practicable (SFAIRP).**

Application of this guideline is by agreement between the ONRSR and the major project. Experience strongly suggests that the process outlined in this guideline will substantially support timely delivery of the major project.

Those responsible for initiating major projects are encouraged to engage early with the ONRSR in order to agree whether this guideline should be adopted and also to reach a common understanding as to how the guideline can be applied for the major project.

All major railway projects will result in a requirement to either vary or obtain accreditation under the RSNL. This guideline describes the minimum processes to be followed, from the onset of a major project, in order to support accreditation applications.

It is not the intent of this guideline to provide a specific definition for major projects, although usually major projects will involve significant technical or operational change, e.g. signalling system upgrades, introduction of new rolling stock, significant new railway infrastructure etc. Rail transport operators (RTOs) and industry stakeholders will be aware themselves as to the parameters that define a major project for them.

Rather, the aim of this document is to provide guidance to the industry as to how projects can safely manage major change.

Major projects can be characterised by their complexity, involving:

- > multi-disciplinary activity;
- > complex contractual structures; and
- > intricate organisation structures.

Within this environment, the clarity of safety responsibilities and safe delivery, across the whole asset lifecycle, must not be lost.

In the context of this guideline, a major project is considered to be an entity, or entities, that are managing the delivery of a significant change to railway infrastructure or rolling stock. Typically, a major project will be a railway transport operator undertaking accredited activity. However, in the early stages of a project, the major project entity may not be an RTO but would be responsible for the supply and/or design processes.

In relation to the delivery of major projects, the following are areas of particular interest to all parties:

- > demonstration that the concept design minimises macro risk;
- > identification of the accredited party/parties;
- > **demonstration of effective management and control:** to ensure the safe management of change across all entities involved with the major project; and
- > **assuring safe outcomes:** to gain confidence that safety risk is managed, SFAIRP, in a manner appropriate to the complexity of the project.

### 1.3 Project lifecycle

Assets have a lifecycle. Typically projects follow a subset of the asset lifecycle, covering inception through to commissioning and then into operations and maintenance. There are many models that can be used to describe the project lifecycle and the ONRSR accepts that a major project will adopt terminology and lifecycle definitions that are appropriate to its own delivery.

For the purposes of this guideline, a five-stage asset lifecycle model is proposed as shown at figure 1. Note that major projects will rarely progress through the asset lifecycle in one single cycle: e.g. some assets will be at construction while others may have been commissioned and are already in the operate and maintain phase.

The requirements definition phase of a major project is of particular interest to ONRSR as the decisions made at this stage have a significant impact on the safe outcomes for the project. This stage produces the scope of change and the business reason for the project that in turn provides the context for the safety risk assessments. At this early stage, it is also important to start considering the safety risks for both standard and non-standard modes of operation.

Major projects should assure themselves that the proposed concept design manages safety risk SFAIRP, and safety risk continues to be managed throughout the project lifecycle.



Figure 1: Example asset lifecycle model

## 2. Regulatory requirements

The RSNL specifies certain duties and obligations for officers, operators, and other relevant parties concerning the ongoing management and safety of rail infrastructure and rolling stock assets.

In assuring safe outcomes, the ONRSR is looking for confidence that those delivering major projects are satisfying their RSNL obligations, be that under accreditation (*RSNL s65*), RTO duties (*RSNL s52*) or duties of designers, manufacturers and suppliers (*RSNL s53*), and that safety risk is managed SFAIRP (*RSNL s47*).

### 2.1 Definitions

Refer also to *RSNL s4*.

<b>Rail infrastructure</b>	<p>The facilities that are necessary to enable a railway to operate, including:</p> <ul style="list-style-type: none"><li>&gt; railway tracks and associated track structures;</li><li>&gt; service roads, signalling systems, communications systems, rolling stock control systems, train control systems, and data management systems;</li><li>&gt; notices and signs;</li><li>&gt; electrical power supply and electric traction systems;</li><li>&gt; associated buildings, workshops, depots, and yards; and</li><li>&gt; plant, machinery, and equipment.</li></ul> <p>A <b>rail infrastructure manager</b> has effective control and management of the rail infrastructure, whether or not they own it or have a statutory or contractual right to use it.</p>
<b>Rail transport operator</b>	<p>A rail infrastructure manager or rolling stock operator, or a person or organisation which is both.</p>
<b>Railway operations</b>	<p>These include:</p> <ul style="list-style-type: none"><li>&gt; the construction of a railway, railway tracks, and associated railway track structures;</li><li>&gt; the construction of rolling stock;</li><li>&gt; the management, commissioning, maintenance, repair, modification, installation, operation, or decommissioning of rail infrastructure; and</li><li>&gt; the commissioning, use, modification, maintenance, repair, or decommissioning of rolling stock.</li></ul>
<b>Rolling stock</b>	<p>A vehicle that operates on, or uses, a railway. It includes a locomotive, carriage, rail car, rail motor, light rail vehicle, train, tram, light inspection vehicle, self-propelled infrastructure maintenance vehicle, trolley, wagon, or monorail vehicle.</p> <p>It does not include a vehicle designed to operate both on and off a railway when it is not operating on a railway.</p> <p>A <b>rolling stock operator</b> has effective control and management of the operation or movement of rolling stock on rail infrastructure for a railway, but does not include a person who drives the rolling stock, or controls the network or network signals.</p>

## SFAIRP

So far as is reasonably practicable. In relation to a duty to ensure safety it means that which was reasonably able to be done, taking into account and weighing up all relevant matters (*RSNL s47*) The ONRSR's *Meaning of duty to ensure safety so far as is reasonably practicable guideline* provides further information including the 'hierarchy of risk controls' approach.

## 2.2 Safety duties: rail transport operators

RTOs are required to ensure, SFAIRP, the safety of their railway operations (*RSNL s52(1)*).

This means that rail infrastructure managers, rolling stock operators and any organisation or contractor undertaking railway operations must ensure, SFAIRP, that:

- > rail infrastructure and/or rolling stock assets are designed, constructed, and maintained to appropriate standards that ensure safety;
- > activities undertaken across the lifecycle of rail infrastructure and rolling stock assets are performed in a way that ensures the ongoing safety of railway operations.

In addition:

- > accredited RTOs must comply with the requirements of Schedule 1 of the *RSNL National Regulations* in relation to the development and implementation of a safety management system (SMS);
- > contractors and suppliers to an RTO must comply with the accredited operator's SMS to the extent that it applies to their activities and relevant equipment. It is the RTO's responsibility to ensure that contractors remain compliant.

## 2.3 Safety duties: designers, manufacturers and suppliers

Designers, manufacturers, and suppliers must ensure that rail infrastructure or rolling stock assets are safe for their intended purpose.

They must also provide adequate information as to their safe use (*RSNL s53*) to help RTOs maintain safety, including:

- > details about the use for which the asset was designed, commissioned, manufactured, supplied, installed, or erected;
- > the results of any testing or examination of the asset; and
- > any conditions necessary to ensure, SFAIRP, that the asset is safe if used as intended.

A person who decommissions rail infrastructure or rolling stock must ensure, SFAIRP, that the decommissioning is carried out safely and that appropriate testing and examination has been carried out to comply with the duty (*RSNL s53(3)*).

## 2.4 Principles of shared responsibility, accountability

The *RSNL* makes it clear that rail safety is the shared responsibility of everyone who has a role at any point of an asset's lifecycle from project conception through operations and maintenance to decommissioning.

Each party has a duty to work with others to ensure that everything reasonably practicable is done to ensure the safety of assets throughout their lifecycle (*RSNL s50*). However, the degree to which a person is accountable for rail safety is dependent on the nature of the risk their activities might pose to rail safety.

Thus, the management of risks associated with railway operations is predominantly the responsibility of the person best able to control them.

## 2.5 Duty of officers to exercise due diligence

If an organisation has a duty or obligation under the RSNL, an 'officer' of that organisation must exercise due diligence to ensure that it complies (*RSNL s55*).

## 2.6 Requirement to have a safety management system

Section 99 of the RSNL requires RTOs to have an SMS to cover their railway operations, including tasks or activities that are contracted out, in a form approved by the ONRSR that:

- > provides systems and procedures for compliance with risk management obligations;
- > identifies, and comprehensively and systematically assesses, any safety risks to railway operations;
- > specifies the controls and procedures to be used to manage these risks, monitor safety, and review and revise the adequacy of the controls; and
- > addresses and includes any other matter prescribed by the national regulations.

The SMS must be documented and must identify the people responsible for preparing and implementing the system. Further information on this topic is contained within the [Preparation of a rail safety management system guideline](#).

## 2.7 Requirement to assess safety risks

In conducting a risk assessment, the RTO must:

- > examine and analyse each identified risk, including:
  - the nature of the risk;
  - the likelihood of it occurring;
  - consequences should it be realised;
  - the range of control measures available that are considered to eliminate or minimise it;
- > consider risks cumulatively as well as individually; and
- > use assessment methodologies that are appropriate to the risk being considered (*RSNL s100(1)*).

## 2.8 Requirement to demonstrate management of safety

Section 64 of the RSNL requires RTOs to apply to the ONRSR for accreditation to undertake railway operations, the application to be in a manner and form approved by the ONRSR.

Such applications are considered by the ONRSR and accreditation granted if it demonstrated that (*RSNL s65*):

- > the applicant is, or will be, the rail infrastructure manager or rolling stock operator for the railway operations;
- > the applicant has:
  - the competency and capacity to manage risks to safety;
  - the competency and capacity to implement the proposed safety management system;
  - the financial capacity to meet reasonable potential accident liabilities (or has public risk insurance);
  - appropriately consulted in relation to the SMS; and
  - complied with the regulations.

Major projects introduce change, and such change will result in an application for variation to accreditation (*RSNL s68*) if the RTO:

- > proposes to change the scope and nature of its accredited railway operations;

- > no longer has the competence or capacity to manage risks to safety associated with its railway operations; and
- > proposes a change to its railway operations that should be reflected in its accreditation.

Such variation applications are considered by the ONRSR and variation to accreditation granted in accordance with *RSNL s65* requirements, as outlined above.

### 3. Effective management and control: ONRSR expectations

#### 3.1 Establishing safety roles and responsibilities

Major projects can be characterised by the number of entities that are involved in their specification and delivery. The ONRSR recognises that the delivery structures and contract arrangements adopted by a major project will be based on a number of factors such as program, risk, value for money etc.

Whatever organisational structure is selected, a major project must effectively manage railway safety risks. This will include all entities understanding their role and responsibilities, in relation to the RSNL, from the start of the project, and who has effective management and control of safety risks. Further information on this topic is contained within the [Effective control and management of railway operations guideline](#).

In particular, the RTO responsible for operating and maintaining the assets will need to demonstrate how it will be assured that the delivered assets manage safety risk SFAIRP.

Major projects by their very nature are complex. Clear and effective safety leadership is required by all parties involved in project delivery for the support of safe project outcomes.

#### **As a minimum, the ONRSR expects:**

- > major projects to identify the entities that are the key safety stakeholders from the requirements definition phase onwards;
- > major projects, at the requirements definition phase, to document:
  - the role of each key safety stakeholder;
  - the responsibilities and accountabilities of each key safety stakeholder for safe project outcomes, including RSNL safety duties; and
  - the management of interfaces across the key safety stakeholders;
- > major projects to ensure roles and responsibilities support clear safety leadership and accountability throughout project delivery; and
- > the RTO responsible for the operation or maintenance of the assets (O&M RTO) to assure itself that the delivered assets are safe.

#### 3.2 Planning the accreditation process

The ONRSR recognises that major project organisational structures can be complex, with different entities potentially designing, constructing, commissioning and decommissioning assets for an operator and maintainer. The entities delivering a major project must, where applicable, do so under the effective management and control of an appropriately accredited RTO. Further information on this topic is contained within the [Effective control and management of railway operations guideline](#)

Further, major projects will often choose to stage delivery in a cost effective manner in a way that minimises disruption to the operating railway. At every stage of a major project, the assets commissioned into service must be operated and maintained by an RTO accredited to do so.

Clarity as to the RSNL accreditation requirements will reduce delivery risk for a major project.

A documented accreditation strategy will assist all stakeholders in a major project to understand their obligations under the RSNL. It will also help the major project to manage the accreditation or variation process with the ONRSR and to ensure safety and RSNL compliance is integral to project delivery and timescales.

There is one common theme to all projects: ultimately they are delivered to an O&M RTO. The ONRSR considers that there is merit in supporting a delivery model that has the O&M RTO as the accredited entity during the project delivery phases. This supports the management of safety risk in a manner consistent with how the assets will be used throughout their service life.

For some major projects, the ONRSR recognises that multiple RTOs may be involved in the development, delivery and commissioning phases. In such circumstances, an accreditation strategy that adequately describes the arrangements will support safe project delivery and RSNL compliance.

**As a minimum, the ONRSR expects:**

- > major projects to prepare an accreditation strategy that identifies the scope and timing of applications for accreditation and applications for variation to accreditation;
- > major projects to consult with the ONRSR on the content of the accreditation strategy;
- > an accreditation strategy to clearly establish the entity with effective management and control at each phase of the project lifecycle;
- > an accreditation strategy to incorporate regulatory review timescales consistent with the RSNL; and
- > the O&M RTO to apply to the ONRSR for any accreditation applications associated with the operations and maintenance phase.

### 3.3 Establishing a common safety approach

Early project engagement between the ONRSR, relevant RTOs, relevant government departments and project delivery organisations will support:

- > the adequate development of project safety requirements and controls; and
- > the appropriate consideration of operational safety from the early stages of the project.

**As a minimum, the ONRSR expects:**

- > major projects to engage with all key safety stakeholders from the requirements definition phases onwards;
- > major projects to scope the extent of their proposed change on the operations of the wider railway network;
- > major projects to undertake 'safety in design' assessments;
- > to receive plans for safety management from major projects; and
- > to receive preliminary hazard analysis and safety requirements from major projects.

### 3.4 Establishing operational and maintenance requirements

Projects deliver railway assets that will be operated and maintained on the railway.

Therefore, a major project must consider the requirements of the operator and maintainer throughout the project lifecycle. Early consideration of construction, operational and maintenance safety risks will support safe project outcomes.

**As a minimum, the ONRSR expects:**

- > major projects to identify the O&M RTOs who will be responsible for the operation and/or maintenance of the assets being delivered;
- > if no single RTO can be identified, then:

- major projects to create a review function, independent from the design function, that is responsible for ensuring operational and safety risks are appropriately identified and managed (such a function is often referred to as a ‘shadow operator’) **or**;
  - major projects to engage with all existing O&M RTOs that interface with the project to ensure operational and safety risks are appropriately identified and managed; and
- > each phase of a major project to include the O&M RTO / shadow operator in the safety risk management process.

## 4. Safety assurance: ONRSR expectations

### 4.1 Planning safety assurance

Effective safety assurance needs an approved plan in place to support a coherent approach to safety assurance across all parts of a major project’s organisation.

#### As a minimum, the ONRSR expects:

- > major projects to create their plan for managing safety assurance that:
  - documents roles and responsibilities of all parties and of key positions within each party;
  - contains the safety risk management processes to be applied;
  - documents the management of external and internal interfaces to the project;
  - documents the key safety assurance deliverables and evidence;
  - documents audit processes to ensure that the plan is appropriately implemented; and
  - is in line with the relevant RTO’s SMS;
- > major projects to create a safety assurance strategy identifying the work required to deliver the safety argument across the project lifecycle;
- > major projects to audit the application of their plan for managing safety assurance; and
- > to receive evidence that major projects have audited their safety assurance processes and, if necessary, taken corrective action.

### 4.2 Independent safety assessment

Major projects are complex undertakings, typically involving some or all of the following: multi-disciplinary activity, novel technology and safety critical engineering.

Assuring safe outcomes needs rigorous oversight of project safety processes. Independent safety assessment (ISA) represents good practice for such a review.

#### As a minimum, the ONRSR expects:

- > major projects to undertake an ISA that:
  - is appropriately independent from the project delivery organisation;
  - is delivered against a documented ISA brief covering the project lifecycle;
  - is delivered against a documented ISA plan;
  - is resourced appropriately, relevant to the scale and complexity of the task;
  - uses resources and subject matter experts with an appropriate mix of competence, qualifications and relevant experience for the project scope;
  - produces documented reports containing remedial actions categorised by safety risk; and
  - concludes in a final report with a clear, unambiguous statement as to the assessor’s opinion on the safety of the major project plus any limitations on the use of the assets;

- > major projects to support the ONRSR's direct access to the ISA through open communication between the major project, the ONRSR and the ISA; and
- > major projects to consider how an ISA can support the assurance needs of the O&M RTO.

### 4.3 System safety

Robust processes need to be implemented to enable major projects to manage change safely.

Good practice dictates that effective risk-based system engineering and safety assurance processes should be implemented.

Such practices support safety risks being eliminated or reduced SFAIRP in the design phase and the continuity of achieving safety requirements throughout the project lifecycle.

Major projects often have the opportunity to control safety risk through elimination or the introduction of engineering controls in accordance with the hierarchy of controls. Further information on this topic is contained within the [Meaning of duty to ensure safety so far as is reasonably practicable guideline](#).

#### As a minimum, the ONRSR expects:

- > major projects to adopt good practice system engineering principles that are relevant to the nature of the change, for example:
  - safety requirements management; and
  - ‘V-Model’ principles: *ISO/IEC 15288*;
- > major projects to adopt good practice safety assurance principles that are relevant to the nature of the change, for example:
  - IEC 61508;
  - ISO EN 50126/8/9;
  - the International handbook for engineering safety management (iESM); and
  - the European Railway Agency’s Common safety method on risk evaluation and assessment;
- > major projects to document all safety requirements and any associated conditions;
- > major projects to provide traceability from risk analysis to safety requirements to final verification and validation;
- > to receive the integrated safety risk register used by the major project;
- > major projects to consider elimination of safety risk and the adoption of engineering controls in accordance with the hierarchy of controls;
- > major projects to undertake verification and validation of all safety requirements;
- > major projects to document the basis of the safety change being implemented and its supporting justification; and
- > major projects to demonstrate that residual risks have been appropriately transferred, assessed and controls implemented by the O&M RTO.

## 4.4 Quantitative safety limits

Quantitative safety limits sets a clear framework within which major projects can assess safety risk and understand those risks that are unacceptable, tolerable or broadly acceptable.

The use of such limits provides guidance as to the acceptability of risk, but fundamentally all safety risk must still be managed SFAIRP.

### As a minimum, the ONRSR expects:

- > major projects to document the upper limit for individual or collective risks of equivalent fatality; and
- > major projects to ensure documented limits are consistent with the relevant RTO's SMS.

## 4.5 Quantitative risk assessment techniques

The method of risk assessment needs to be appropriate to the nature of the hazard and the assessed risk.

Most risks encountered by major projects may be managed qualitatively, but some risks need the greater understanding that can be obtained from using quantitative risk assessment (QRA). There are a number of techniques that may be used, such as cause-consequence analysis, fault tree analysis, cost-benefit analysis etc.

### As a minimum, the ONRSR expects:

- > major projects to document:
  - the decision factors to employ a QRA study;
  - the processes to be used for undertaking a QRA study;
  - the assumptions and data inputs to a quantitative analysis; and
  - the process for making safety critical decisions based on a QRA, including the acceptance criteria;
- > major projects to document key safety inputs:
  - the approach to gross disproportion;
  - value for preventing a fatality / value of statistical life; and
  - values for weighted injuries.

## 4.6 Human factors integration

Human factor-related risks must be managed throughout the asset lifecycle.

Similar to all risks, the greatest opportunity to eliminate or minimise such risks occurs during the initial phases of a major project. Planning how a major project considers such risks is a critical step in delivering effective and safe outcomes.

### As a minimum, the ONRSR expects:

- > major projects to prepare a human factors integration plan covering all phases of the asset lifecycle;
- > a human factors integration plan to consider cognitive ergonomics, for example:
  - human reliability analysis;
  - human-system interface assessment;
  - risk-based training needs assessment;
  - consideration of normal and degraded operations; and
- > major projects to manage and integrate human factors risks in the project safety risk register.

## 4.7 Standards

It is essential that all parties involved in a major project understand the safety requirements.

Documenting and communicating the relevant engineering and safety standards that will be adopted by the major project is an important early step in assuring safe outcomes.

### As a minimum, the ONRSR expects:

- > major projects to document:
  - the operational, engineering and safety standards to be adopted;
  - the process for managing any non-compliances to the identified standards along with appropriate justifications;
- > major projects to identify standards during the requirements definition phase; and
- > major projects to ensure that standards used are able to be implemented across the full asset lifecycle, supported by early engagement with relevant manufacturers, operators and maintainers.

## 4.8 Level crossings

Level crossings are a key source of risk to safe operations along the railway corridor and remain the ongoing focus of industry initiatives to eliminate them or to manage safety risk at existing level crossings.

Major projects may have the opportunity to eliminate this risk or influence level crossing protection arrangements.

### As a minimum, the ONRSR expects:

- > in greenfield locations, major projects not to introduce new level crossings to the railway corridor unless the introduction can be robustly demonstrated to manage safety risk SFAIRP; and
- > in brownfield locations, major projects to demonstrate that, if level crossings are to remain or be constructed within the project scope, then the decision manages safety risk SFAIRP

## 5. Feedback

The ONRSR welcomes constructive feedback on the content of this guideline which will be used to share good practice across the Australian railway industry.

Comments can be submitted by email to: [contact@onrsr.com.au](mailto:contact@onrsr.com.au).

## 6. References

This guideline should be read in conjunction with the following ONRSR publications available at [www.onrsr.com.au](http://www.onrsr.com.au):

- > [\*Meaning of duty to ensure safety so far as is reasonably practicable guideline\*](#)
- > [\*Preparation of a rail safety management system guideline\*](#)
- > [\*Effective control and management of railway operations guideline\*](#)