

UIC ASSET MANAGEMENT WORKING GROUP

UIC Railway Application Guide

Practical implementation
of Asset Management
through ISO 55001

November 2016



INTERNATIONAL UNION
OF RAILWAYS

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EXECUTIVE SUMMARY

This document provides practical guidance to railway infrastructure managers who wish to improve their existing Asset Management capability. It is based on a standardised approach that is being widely adopted in railways and other asset intensive sectors around the world.

The two principal assertions underpinning this work are:

- Railways are not yet operating at their full potential in terms of providing customers and funders with a safe, quality service that is demonstrably value for money
- Asset Management is the only system-wide approach that has the breadth, depth and whole life focus necessary to help infrastructure managers to realise this potential

Asset Management integrates decisions and activities, and it creates a clear 'line of sight' or alignment between organisational objectives and the delivery of work on the ground. It is the only management system that puts the asset portfolio and its operation at the centre of activities. It also has an emphasis on the importance of risk-based decisions taken over the asset life cycle, and the critical role of information in supporting such decisions.

The directly measurable returns are long term and may be difficult to isolate from other improvement initiatives. However, a body of evidence on benefits is emerging from railway, and other asset intensive, organisations that have already adopted Asset Management as a core mechanism for business improvement. These benefits include:

- Improving train performance by focussing asset reliability initiatives on critical parts of the network, supported by information on the condition of assets and better understanding of the likelihood and consequence of failure over their lifecycle.
- Reducing costs by doing the right work in the right place at the right time, with interventions co-ordinated to achieve the optimum balance between maintenance, renewal and enhancement across the asset base.
- Providing customers and funders with informed choices based on scenarios that describe how the infrastructure will perform over the long term, under varying levels of expenditure, traffic growth, length of engineering possessions, and deployment of automation.

- Assuring that risks are being managed effectively, for example risks to safety from infrastructure failures, risks to train performance from the introduction of new technology, and risks from outsourcing infrastructure work.
- Making decisions more transparent, helping to build credibility with customers and stakeholders, including funders and regulators.

Compared with traditional approaches, Asset Management focuses on the major decisions and activities that need the coordination of multiple functions and affect multiple stakeholders. The challenge of adopting such a holistic approach can be considerable. Fortunately, there has been a significant recent increase in the availability of guidance and case studies from the early adopters of good practice Asset Management in countries such as Australia, Hong Kong and the United Kingdom. Support now includes the global standard on Asset Management, the ISO 55000 series.

The ISO 55000 series is important for the rail industry because it represents a global consensus on what Asset Management is and what it can do to increase the value generated by organisations. It provides an internationally recognised definition of competent Asset Management, based around an integrated and continually improving management system.

Because of its generic nature, it does not by itself provide sufficient direction and detail for railways to implement Asset Management consistently in their own organisations.



A need was identified, therefore, to provide a bridge between the ISO 55000 series and railway infrastructure processes: those core business processes of planning and executing infrastructure works, defining the operating strategy, and managing the timetable.

In response, these guidelines translate the requirements of ISO 55001, the specific standard that contains the Asset Management System requirements, into a railway context. They make specific recommendations on implementing an effective Asset Management regime and on the evidence needed, where desired, to achieve and demonstrate compliance. The guidelines are aimed principally at Asset Management practitioners within railway infrastructure organisations who already have an appreciation of the concepts of Asset Management contained in ISO 55001, and are seeking to establish, implement or enhance an Asset Management System in accordance with its requirements.

Member organisations of the UIC Asset Management Working Group have started or are already well on the way to implementing Asset Management regimes in accordance with these guidelines. Case studies are being generated which illustrate good practice and these will be made available as they are produced (<http://www.uic.org/Asset-Management-63>). It is hoped that other users of these guidelines will contribute case studies illustrating their own Asset Management journey which would benefit others and accelerate the adoption of Asset Management across the railway industry.



PART 1: INTRODUCTION TO ASSET MANAGEMENT AND ISO 55001

1.1 INTRODUCTION

Asset Management is fundamentally about achieving an appropriate balance of asset cost, risk and performance to meet organisational objectives and deliver value from the assets to an organisation and its stakeholders.

In 2014 the International Standards Organisation (ISO) published its 55000 Asset Management series. The series consists of three parts:

- ISO 55000:2014 – Asset management – Overview, principles and terminology
- ISO 55001:2014 – Asset management – Management systems – Requirements
- ISO 55002:2014 – Asset management - Management systems – Guidelines for the application of 55001

The series can be used by any organisation. Different organisations and industries will utilise and apply the standard in different ways depending on their business context and the relevant assets. ISO 55000 defines an asset to be '*an item, thing or entity that has potential or actual value to an organization*'. Assets may be physical, such as railway infrastructure, or non-physical, such as intellectual property or reputation.

The ISO 55000 series of documents is important for the rail industry, not just for their content, but also because they represent a global consensus on what Asset Management is and what it can do to increase the value generated by all organisations. They provide an internationally recognised definition of competent and good practice Asset Management, based around an integrated and continually improving management system. ISO 55001 defines the requirements of a '*management system for asset management*'; this is referred to as an Asset Management System within the international standard and throughout this UIC ISO 55000 Guidelines document.

1.2 PURPOSE OF THIS DOCUMENT

This ISO 55000 Guidelines document has been developed by UIC to promote a consistent approach for railway infrastructure organisations to more efficiently and effectively align their existing Asset Management capability with the Asset Management System requirements of ISO 55001.

Primarily this document is intended as a practical guide for Asset Management practitioners within railway infrastructure organisations who have an existing understanding or appreciation of the concepts of Asset Management contained in ISO 55001 and are seeking to establish, implement or enhance an Asset Management System in accordance with ISO 55001.

The secondary purpose of the document is to provide high-level information to leaders and executives of railway infrastructure organisations on the differing intent, benefits and implementation requirements of ISO 55001 - the establishing of a compliant Asset Management System - and Asset Management as whole – as a coordinated and holistic approach to achieving value from assets and realising benefits for the organisation.

This document is intended for use by railway infrastructure organisations to supplement the ISO 55000 series and not replace it or replicate the text within. The ISO 55000 series should be read and considered before and during the use of these guidelines. This document does not repeat the requirements contained in ISO 55001 or guidance in ISO 55002.

Neither, like ISO 55001 itself, does this document provide a ‘how to’ guide for Asset Management as a whole. Excellent sources of background reading and information on Asset Management as a whole and how to implement it are available online at sites such as www.theiam.org, www.amcouncil.com.au and www.gfmam.org.

The specific aims of each part of this document are to:

- Part 1:
 - Explain the relevance and benefits of Asset Management as a whole and the intent and context of ISO 55001
 - Align the requirements of ISO 55001 with the original UIC document *Guidelines for the Application of Asset Management in Railway Organisations* (2010) and the Asset Management Framework defined within that document
- Part 2:
 - Explain each requirement of ISO 55001 – captured as ‘shall’ statements in various clauses within the standard
 - Provide practical guidance on the implications and requirements of each requirement for railway infrastructure organisations
 - Identify potential sources of evidence that may be used to demonstrate compliance with ISO 55001

- Introduce case studies, where available, from UIC members and other organisations to provide example approaches for alignment with the requirements of ISO 55001
- Part 3:
 - Provide an outline of the sequential approach to implementation of ISO 55001, drawing from the experience of railway infrastructure organisations that have sought or are seeking certification
 - Assist railway infrastructure organisations in preparing for a certification audit against ISO 55001.

Part 2 has been structured around the requirements of ISO 55001 and takes into account the guidelines for the application of ISO 55001 contained in ISO 55002 and other relevant Asset Management good practice, such as:

- Water Services Association of Australia (WSAA): *ISO 55001 Implementation Guidelines*, May 2015 (www.wsaa.asn.au)
- Global Forum on Maintenance & Asset Management (GFMAM): *The Asset Management Landscape*, Second Edition, March 2014 (www.gfmam.org)
- Institute of Asset Management (IAM): *Asset Management – An Anatomy*, Version 3, December 2015 (www.theiam.org)

UIC would like to thank all those who contributed to the development of these guidelines.

1.3 ASSET MANAGEMENT MATURITY

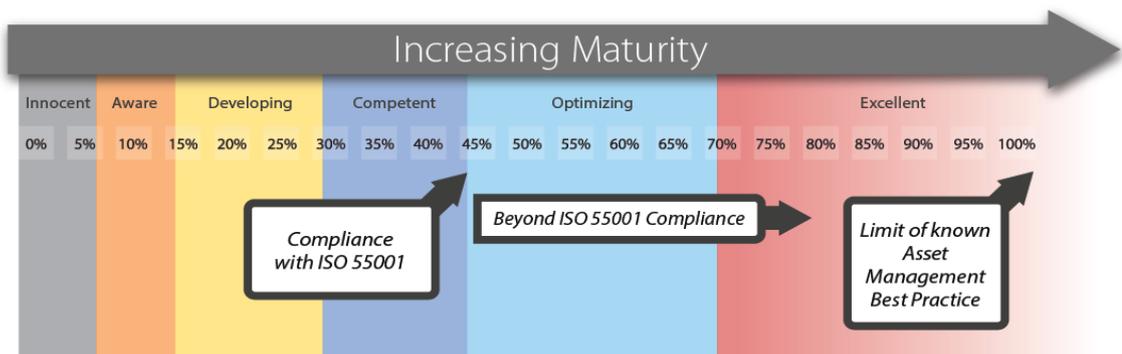
Asset Management maturity refers to the capability of an organisation's people, processes, technology, leadership and culture to derive and deliver value from its assets to meet the needs of the organisation and its stakeholders in a sustainable manner.

Asset Management maturity is generally assessed against known good practice in Asset Management. It is a complex and still emerging subject which is not discussed in detail in this document. Useful guidance on the subject of Asset Management maturity can be found via the following documents:

- Global Forum on Maintenance & Asset Management (GFMAM): *Asset Management Maturity – A Position Statement*, First Edition, May 2015 (www.gfmam.org)
- Institute of Asset Management (IAM): *Asset Management Maturity Scale and Guidance*, Version 1.0, June 2015 (www.theiam.org)

Compliance with ISO 55001 identifies that a well-structured baseline level of Asset Management capability, i.e. a certain level of maturity, has been established and implemented by an organisation. The relative position of nominal ISO 55001 compliance against an overall scale of Asset Management maturity can be seen in Figure 1.

The level of Asset Management maturity associated with ISO 55001 compliance may be appropriate for some organisations, depending on their specific context, risks and opportunities. For the majority of organisations, rail or otherwise, the appropriate level of Asset Management maturity may be different. The point where any organisation’s Asset Management maturity is appropriate will be defined by the balance of cost, financial and non-financial, to enhance the relevant capability, against the associated business benefits.



The maturity scale has six maturity states as follows:

1	Innocent	The organization has not recognised the need for this requirement and/or there is no evidence of commitment to put it in place
2	Aware	The organization has identified the need for this requirement, and there is evidence of intent to progress it.
3	Developing	The organization has identified the means of systematically and consistently achieving the requirements, and can demonstrate that these are being progressed with credible and resourced plans in place.
4	Competent	The organization can demonstrate that it systematically and consistently achieves relevant requirements set out in ISO 55001.
5	Optimizing	The organization can demonstrate that it is systematically and consistently optimizing its Asset Management practice, in line with the organization's objectives and operating context.
6	Excellent	The organization can demonstrate that it employs the leading practices, and achieves maximum value from the management of its assets, in line with the organization's objectives and operating context.

Figure 1: Asset Management Maturity Scale (Asset Management Consulting Limited - 2016)

Increasing Asset Management maturity does not necessarily mean increasing complexity in terms of capability. A key part of achieving an appropriate level of Asset Management maturity is to understand how critical an asset, activity, process or technology system is to delivering organisational and stakeholder value and establishing a suitable approach. For example, planning of asset interventions may range from simple, paper-based methods through to the use of sophisticated, technology based, modelling tools depending on the criticality of the relevant asset.

Asset Management in general is still a developing field and what is recognised as good or best practice in one industry may not be the same in other industries. The limit of known best practice, as shown on the right-hand edge of Figure 1, is also continually moving as industries and organisations mature, technology enhances and techniques evolve.

It is rare that compliance with ISO 55001 alone will ever provide the ‘final answer’ or the optimal level of Asset Management maturity for an organisation. Achieving maximum value from assets will usually require an organisation to develop its Asset Management capability beyond compliance with the requirements of ISO 55001.

What ISO 55001 does do is assure that an organisation has a competent and effective Asset Management System in place. This will, over time, enable the organisation to continually improve its understanding of how best to derive and deliver value from its assets and establish the appropriate level of Asset Management maturity based on the associated business benefits. As such, it represents a good practice initial target for organisations seeking to achieve the benefits of Asset Management.

1.4 THE BENEFITS OF ASSET MANAGEMENT AND ISO 55001

1.4.1 Benefits of Asset Management

Effective Asset Management enables an organisation to make the right decisions at the right time to achieve the greatest value for the organisation and its stakeholders from the assets. There has been increased recognition of the criticality of effective Asset Management in achieving the output performance goals of railway infrastructure organisations by translating organisational priorities and targets into appropriate and best value asset-related decisions, strategies, plans and activities. The Board level benefits gained by railway infrastructure organisations following adoption of an Asset Management approach include:

- **Long-term Return on Investment (RoI)**
- **Better understanding and more demonstrable management of risk**
- **Improved governance**

The experience of multiple organisations has shown that these are delivered through the following strategic benefits of Asset Management:

- **Reduction or deferral of capital expenditure**, often based on an asset criticality and risk-based optimisation of investment across the asset portfolio
- **Optimisation of operational expenditure** through refining maintenance regimes away from traditional time or manufacturer based approaches to a risk based approach and reduction in rework or reactive requirements
- **Improved performance and reliability** of the network through the justified adoption of condition monitoring, focusing of maintenance and investment on the most critical assets and parts of the network, and better asset information to inform the optimal management of the network
- **Greater ability to justify expenditure** to regulators and funders and demonstrate the consequences of reduced funding in terms of long-term risk, performance and cost impacts
- **Better engagement with customers** and other stakeholders through the ability to develop scenarios which map differing levels of funding input to forecast output performance
- **Improved governance** in terms of the demonstrably consistent, systematic and cross-business management of **risk and transparent compliance** with regulatory and legislative requirements
- **Reputation enhancement** as a result of better reliability and availability of the network, increased customer satisfaction and greater stakeholder confidence
- Continual, **incremental improvement** of the efficacy of asset performance and Asset Management capability

In real terms, case studies also demonstrate the benefits of increasing Asset Management maturity. For example, Network Rail, the mainline rail network manager and operator in the UK, improved its Asset Management maturity from approximately 51% to approximately 66% - based on the scale show in Figure 1 - between 2006 and 2014.

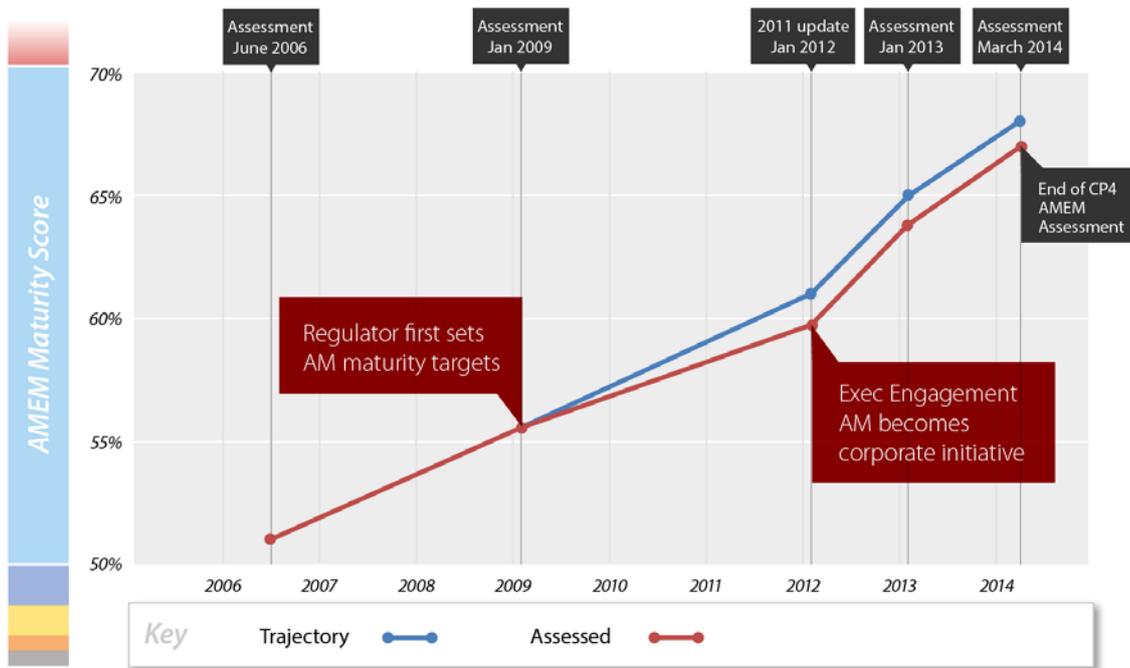


Figure 2: Network Rail Asset Management Maturity Development 2006-2014 (AMCL)

During this period Network Rail realised significant improvements in key Asset Management metrics¹, for example:

- **Reduced Capex:** initial focus on highest spend asset group (Track) resulting in **extended asset lives** and **reduction of capital spend by around 20%**
- **Reduced Opex and maintenance costs per vehicle kilometre by 46%** between 2003/04 to 2011/12
- **Improved asset performance with greater reliability** and sustainability, e.g. incidents of **broken rails were reduced from 322** in 2004/05 to **125** in 2011/12
- **Better regulatory outcomes** such as the ability to demonstrate evidence for decision-making to prove that approach is sustainable over the long term
- **Safest 'major' railway in Europe** and significantly safer than road and comparable with air transport
- **Carries more trains than ever before**, with **10% more train kilometres** and **3% more freight** moved than 2004/05

During this same period Network Rail also achieved accreditation to the British Standards Institute's Publicly Available Specification 55 (BSI PAS 55), an internationally recognised 'standard' for good practice Asset Management Systems, now superseded by ISO 55001. Critically, Network Rail recognised both

1. IAM Awards submission by Network Rail, 2014

the benefits and the risks of seeking compliance with BSI PAS 55 and targeted appropriate Asset Management maturity as its primary goal. Compliance of Network Rail's Asset Management System to BSI PAS 55 was achieved as part of that ongoing process.

An ISO 55001 compliant Asset Management System alone is unlikely to achieve the benefits identified above. Targeting compliance with ISO 55001 rather than business improvement is a common pitfall. The benefits stated above have been achieved by organisations that focused on Asset Management as an integrated, cross-function, continually improving approach to delivering value, underpinned by appropriate leadership and culture.

Asset Management must be led from the top of the organisation. It must be a holistic way of working that involves relevant stakeholders from Procurement, Finance, Human Resources, IT and other relevant functions of railway infrastructure organisations as well as the more technical Planning, Engineering, Operations, Projects and Maintenance teams. It cannot be developed in siloes or implemented by a single function or department, unlike some International Standards. Asset Management is a strategic, top-down approach to delivering real value that requires appropriate leadership and culture.

1.4.2 Benefits of ISO 55001

The benefits of implementing an ISO 55001 compliant Asset Management System are more difficult to quantify as they are often achieved in the medium to long-term, after establishing the Asset Management System itself, rather than immediately. During this period, the established Asset Management System inherently drives enhancements and continual improvement. This makes the attribution of direct benefits difficult. However, aligning an organisation's Asset Management System with ISO 55001 provides that good practice foundation to enable an organisation to deliver continual improvement, establish appropriate levels of Asset Management maturity and achieve benefits in the areas identified in the previous section.

ISO 55000 and experience from several organisations also identifies a number of benefits associated with the definition and establishing of an ISO 55001 aligned Asset Management System, including:

- The consideration of lifecycle value
- Alignment of strategies and plans with organisational objectives
- The identification of improvement opportunities – and 'quick wins'
- The collation of new data and the creation of associated management and analysis processes or the enhancement of existing arrangements
- Consideration of value creation from new perspectives across the organisation
- Enabling diverse organisational functions and departments to work coherently

- Enabling diverse geographical regions of a rail network to work coherently
- Enhanced organisation-wide communications
- Improved asset knowledge through consideration of criticality and business impact
- The development of a long-term and sustainable approach to optimising cost, risk and performance
- The alignment of financial and non-financial elements of the organisation including more robust financial information on budgets and actual spend and more stable funding requirements

The purpose of ISO 55001 is to provide a structure of requirements and guidelines for the creation of an Asset Management System to answer, in a general way, the key issues all infrastructure managers are struggling with today, including:

- The justification of operating & maintenance costs to funders and other stakeholders
- The transparency of technical decisions to support technical compliance and funding submissions
- The optimisation of investment decisions within funding constraints and the often conflicting interests of stakeholders
- The definition of a coherent set of capability improvement programs that are effective in delivering improved stakeholder value

It is likely that future stakeholder expectations will become even more pronounced and demanding for railway infrastructure organisations, including:

- More capacity and better service for less money
- Higher availability with less, but more appropriate and adequate, maintenance
- The need for collaboration between organisations, services and functions, supported by technological innovation, will only increase in order to implement more efficient and effective processes.

An example of the latter point is the increased demand for appropriate and accurate asset data to support:

- Condition or risk-based maintenance
- New generations of signalling and traffic management systems
- Network access and outage planning systems that reconcile net use in line with maintenance needs

The maturity and capability of an organisation to manage and adapt to these changes in an agile and appropriate way will be a critical success factor. If a rail infrastructure organisation is already satisfied with how it manages these issues, it may not need the ISO 55001 standard.

The ISO 55001 standard brings all existing activities and processes related to railway infrastructure assets together in one management system. The advantages of having a single company-wide management system are twofold:

- It provides specific asset requirements and strategies for maintenance, renewal, operation and disposal based upon critical success criteria and company objectives (e.g. safety, punctuality, capacity and environmental) and relevant constraints (e.g. funding, resources and legislation)
- It provides a coherent set of principles and criteria to support and optimise all asset related decisions relating to costs, risk and performance over time

Misconception	Benefit
ISO 55001 is just another ISO system that will ensure even more overhead without adding value.	ISO 55001 is particularly designed for any organisation that manages a significant spread of physical assets, and is an accepted industry good practice used in rail and other asset intensive industries to assure value creation.
An ISO 55001 management system can only be used by a select number of very advanced companies.	The guideline offers a way to go forward and improve performance from any starting position. All advanced companies started somewhere.
We know our business. We have been doing it for years.	ISO 55001 offers a structured way to justify, challenge and improve your accepted practices. In particular, the standard mandates that all asset activities should be justified and prioritised by the risks to performance, safety, compliance, customer satisfaction, reputation and costs that they mitigate.
ISO 55001 is just a method to define what renewal must be planned at what time.	ISO 55001 offers a structured way to optimise all your investment decisions to increase stakeholder value at minimum cost. It requires consideration of investment scenarios or options in an objective way, using value and risk to do this.
Transparency is dangerous, it puts you in a vulnerable position.	The cost of having no transparent governance or decision-making is worse. Inconsistencies in objectives lead to inconsistencies in planning and rework. Increasingly external stakeholders insist on transparency, so they can see what is being delivered for what cost and why

Table 1: ISO 55001 Misconceptions and Benefits

1.5 THE PRINCIPLES OF THE ISO 55000 SERIES

When railway infrastructure organisations seek to enhance their Asset Management Systems to align with or certify to ISO 55001, there are a number of generic principles that should be considered throughout.

1.5.1 Fundamentals

ISO 55000 identifies the following four fundamentals of Asset Management:

Value – the creation, acquisition, maintenance, refurbishment and general retention of railway infrastructure assets should only be undertaken to deliver value to the organisation and its stakeholders. Asset Management objectives and activities should be fully aligned with the organisational objectives to define and assure the derivation of value from the assets.

Alignment – conversion of the organisational and Asset Management objectives into fully aligned Asset Management plans and asset interventions on the ground to derive value and deliver organisational objectives. These should be established via risk-based and information-driven technical and financial decisions, coordinated and continually improved by the Asset Management System.

Leadership – due consideration of the people factors which influence the realisation of value and organisational objectives from the assets. This includes leadership and commitment from the very top of the organisation, culture, roles and responsibilities, competence, appropriate empowerment and authority, communication, coordination of functions and awareness of the organisational objectives and Asset Management System throughout the organisation.

Assurance – the effective governance of the organisation to assure the assets will deliver the intended value and organisational objectives. This includes the optimal management of resources within relevant constraints, establishing effective and efficient people, processes and systems to achieve the necessary capability, and continual monitoring and improvement.

1.5.2 Decision Making Criteria

Establishing and consistently utilising Asset Management decision-making criteria is a recurring theme throughout ISO 55001. Decision-making criteria should consider the business context, stakeholder requirements and the organisational and Asset Management objectives to assure decisions on Asset Management plans and asset interventions on the ground support the delivery of overall value. These will be specific to the individual organisation and context, but potential examples for railway infrastructure organisations include:

- Safety risks to passengers, workforce and members of the public
- The impact of infrastructure faults on train performance, which is likely to vary by the criticality of the route

- The impact of the infrastructure and associated interventions on the environment
- The remaining life of the infrastructure, based on nominal life, current condition and long term condition trends
- Whole life cycle cost requirements versus current budget constraints
- The resilience of the infrastructure to weather and climate change

1.5.3 The Treatment of Risk

1.5.3.1 - Overview

Understanding and managing risk is a universal requirement throughout ISO 55001. It is particularly prevalent in the definition and implementation of the overall Asset Management System, in planning what to do to the assets to manage risks, and in operation, i.e. doing things to the assets to manage risks.

ISO 55001 explicitly refers to the ISO standard on Risk Management, ISO 31000. Railway infrastructure organisations should refer to this standard in conjunction with ISO 55001. Note that the definition of risk in ISO 31000 – “*risk is the effect of uncertainty on objectives*” - includes both threats and opportunities to objectives.

Similar to the approach of ISO 55001 for Asset Management, ISO 31000 describes a framework for implementing risk management, rather than providing a ‘how to’ guide for risk management. The individual organisation is required to establish an appropriate risk management framework and processes for its particular industry and context.

For railway infrastructure organisations, decisions and plans for designing, procuring, constructing, renewing, maintaining and operating the railway infrastructure should be robust against uncertainties in assumptions and hazards or other events that may occur. Risk management should provide an effective mechanism for identifying threats to Asset Management objectives, for assessing their impact and for identifying appropriate mitigation measures. Techniques developed for managing safety risk, such as the ALARP framework, can be extended and applied to provide an integrated approach to identify and manage, for example, train performance, financial, environmental impact and other organisational risks to achieving objectives.

1.5.3.2 - Practical Guidance

The following statements of practical guidance on risk are generic and applicable throughout the clauses of ISO 55001 but have particular relevance in clauses 6, 8 and 9:

- Risk identification should be undertaken on each component of the Asset Management Framework from the setting of organisational objectives to the execution of work and operation of the network. In most cases, the major source of the risk derives from decisions taken at a strategic level e.g. reducing

possession times to improve availability, decisions on whether to outsource maintenance and renewals activities, the setting of targets to achieve a given level of punctuality. The risks become better understood as the risk assessment progresses through other components of the Asset Management framework, generating a complete picture of the risk profile.

- A Corporate Risk Matrix describes the risk assessment criteria used to quantify and compare risks (usually probability and consequence). These are examples of the 'Decision Making Criteria' described in Section 1.5.2). A well-constructed Corporate Risk Matrix will enable the consistent sizing and ranking of risks from wide range of sources which may impact on a number of corporate objectives e.g. safety, train performance, finance. Most railway organisations adopt a standard two-dimensional framework: one dimension is the likelihood or frequency of an event occurring, the other is the impact on corporate objectives should the event occur.
- A risk register provides a structured format for recording risks. Each risk should be linked to one or more components of the Asset Management framework. The risk register should record the cause of each risk, the likelihood and consequence, the current controls and mitigation. This provides a firm basis for evaluating the risks and prioritising actions for additional controls and mitigation.
- The level of detail undertaken in the risk assessment should be commensurate to the severity and complexity of the risk. Formal approaches are required for safety risks, and most sophisticated risk tools have been developed in this area e.g. bow-tie, fault and event tree analyses. For other risk sources, it is unusual for there to be sufficient empirical information available to support fully quantified assessments. In these cases, the identification and ranking will normally be workshop based with a panel of subject-matter experts.
- Risk actions should be prioritised to support achievement of the appropriate balance between costs, risks and performance. Standard cost-benefit analysis methods provide a well-established mechanism for such comparisons, usually involving the monetisation of risks to enable comparison with financial costs.

1.5.4 Scope of an Asset Management System

For railway infrastructure organisations, which are inherently complex in nature, defining the scope of an Asset Management System is a critically important early step to alignment with ISO 55001 and successful Asset Management as a whole. It will also have significant implications if certification to ISO 55001 is the organisation's target or a key milestone. **Critically, it is the Asset Management System that is certified against ISO 55001, NOT the organisation.**

Figure 3 depicts the relationship between Asset Management, the Asset Management System and the assets or asset portfolio, as defined by ISO 55000.

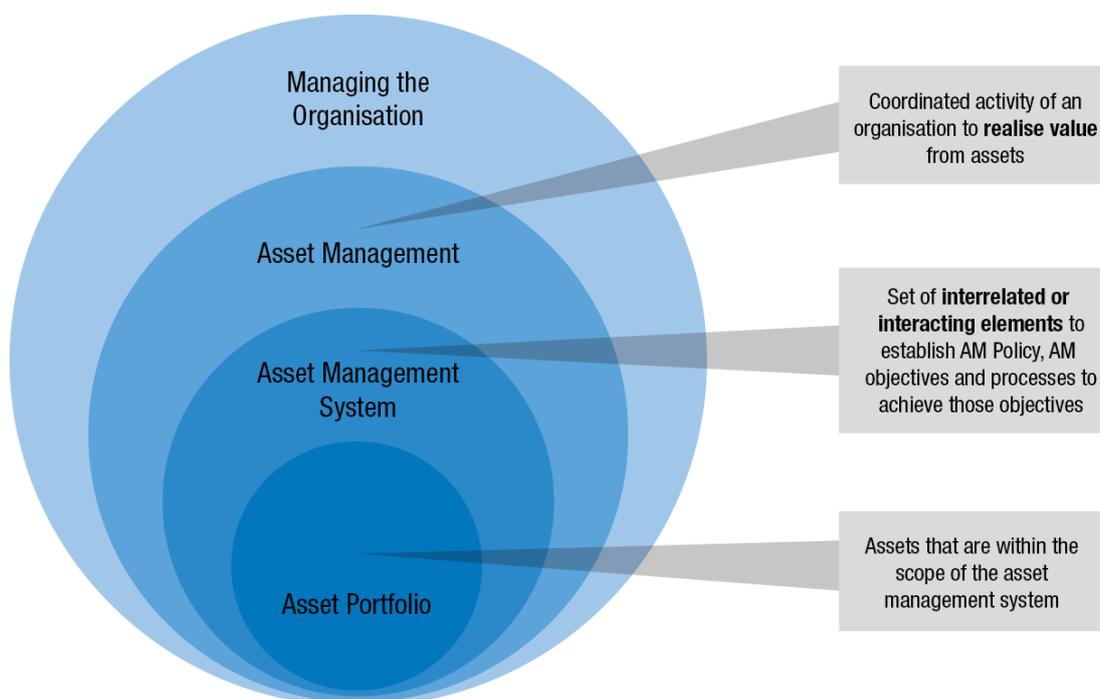


Figure 3: Relationship between Asset Management, the Asset Management System and the Asset Portfolio (ISO 55000)

Figure 3 recognises that an Asset Management System does not include all of the activities, or even all the Asset Management activities, of a railway infrastructure organisation. Some activities may be outside of the scope of an Asset Management System but nevertheless influence the achievement of Asset Management objectives and derivation of value. Any interactions or interfaces between these activities and the defined Asset Management System should be defined and managed.

The Asset Management objectives, the scope of the Asset Management System and the asset portfolio should all be aligned. Careful consideration should be given to each of the following questions:

- What are our Asset Management objectives and how do they relate to our organisational objectives?
- What are the functions, processes and activities that are required to meet the Asset Management objectives?
- What are the assets required to deliver the services under the Asset Management objectives?

The objectives of rail organisations and operators across the world, at their core, are about delivering the outputs valued by customers, funders and other key stakeholders, in a sustainable way, for the lowest whole life cost through their assets and services.

The Asset Management System scope will be determined by each railway infrastructure organisation, and may have to take into account the requirements specified by external stakeholders, such as owners or regulators. For example, an economic regulator may require the railway infrastructure organisation to become certified to ISO 55001 within a certain period of time, and may specify which services, functions or assets are to be included in its Asset Management System. As a minimum, however, an Asset Management System must be able to demonstrate compliance to all clauses within ISO 55001 and long-term stewardship of the assets to justify certification to the standard.

1.5.5 ISO 55001 Artefacts

Whilst a range of documented evidence will be required to demonstrate compliance with ISO 55001, as identified in subsequent sections, the existence of the following key artefacts within an organisation is a specific and definitive requirement of ISO 55001:

- **Asset Management Policy** - The Asset Management Policy was covered in the 2010 *Guidelines for the Application of Asset Management in Railway Infrastructure Organisations (GAAMRIO)*, and this remains a good concise definition: “a high level statement of intent by the organisation’s senior management, demonstrating commitment to the adoption of Asset Management principles” (GAAMRIO 2010 page 4). The Asset Management Policy should commit to appropriate good practice Asset Management principles which are relevant to the organisational objectives, and be signed-off by top management.
- **Strategic Asset Management Plan** - The Strategic Asset Management Plan (SAMP) covers both “*how the infrastructure has to perform in order to deliver the Asset Management contribution to achieving the vision of the railway*” and “*how the Asset Management System will be implemented to deliver the Asset Management capabilities*” (GAAMRIO 2010 page 4). It is often not one document, but a set of related documents from top level summary to asset class, route and line strategies. It may also include asset information, risk management, competency, operations and other ‘enabling’ strategies and plans. The SAMP should be integrated with the long-term financial plans of the organisation to enable balancing of any short to medium-term financial constraints with plans for investment and asset interventions on the ground.
- **Asset Management Plan(s)** - The Asset Management Plan or Plans are often more complex in railway infrastructure organisations than in some other asset-intensive sectors. They should describe the activities, resources and timescales

to achieve the organisation's corporate and Asset Management objectives in the short, medium and long term, across the asset lifecycle (i.e. new assets, maintenance, inspection, refurbishment, replacement, rationalisation and disposal). ISO 55001 also requires Asset Management plans focused on the continual improvement of the Asset Management System itself (e.g. implementing a new asset information system, or training for staff in risk-based maintenance techniques).

Each of the above are discussed in further detail under the relevant ISO 55001 clause in this section.

1.5.6 General Considerations

Any ISO 55001 compliant Asset Management System will also have to demonstrate:

- **Asset Management Leadership and Governance** including clarity about where and how asset decisions are made
- **Quality management processes** are established for stakeholder engagement, delivery, operation, performance monitoring and evaluation, continual improvement and document management

1.6 DEFINITION OF AN ASSET

ISO 55000 defines an asset to be *'an item, thing or entity that has potential or actual value to an organization'*.

The definition of an asset will vary between railway infrastructure organisations and may include physical or non-physical assets. This document intentionally focuses on physical railway infrastructure and has adopted the definition defined by the UIC Lasting Infrastructure Cost Benchmark (LICB) project (1996).

The LICB defines railway infrastructure as consisting of the following items, assuming they form part of the permanent way, including sidings, but excluding lines situated within railway repair workshops, depots or locomotive sheds, and private branch lines of sidings:

- Ground area
- Track and track bed etc.
- Engineering structures: bridges, culverts and other overpasses, tunnels etc.
- Level crossings, including appliances to ensure the safety of road traffic
- Superstructure, in particular: rails, grooved rails, sleepers, small fittings for the permanent way, ballast, points and crossings
- Access way for passengers and goods, including access by road

- Safety, signalling and telecommunications installations on the open track, in stations and in marshalling yards etc.
- Lighting installations for traffic and safety purposes
- Plant for transforming and carrying electric power for train haulage: sub-stations, supply cables between sub-stations and contact wires, catenaries

Some railway infrastructure organisations may also be responsible for other types of physical operational assets, such as stations, and may want to include these within the scope of their Asset Management System as appropriate.

1.7 ASSET MANAGEMENT FRAMEWORKS

An Asset Management System defines the processes, timescales, people, information, IT systems and activities that form an overall management system to enable an asset intensive business to achieve its organisational objectives and maximise value from its assets. The structure, scale, format and documentation of an Asset Management System will vary considerably by business and business context.

An Asset Management Framework identifies the key components of an Asset Management System, including:

- **Core decisions and activities** – the decisions, strategies, plans and activities that link organisational objectives to the delivery of asset interventions on the ground, including both work on the infrastructure and operation of the network
- **Competence and capability mechanisms** – the management of current and future Asset Management competences and capabilities to assure the effective and efficient implementation and continual improvement of the Asset Management System
- **Asset Management enabler mechanisms** – the effectiveness of the core decisions and activities are dependent on many support mechanisms, such as asset information, life-cycle costing tools and business processes
- **Performance and evaluation mechanisms** – reviewing mechanisms are required to monitor and improve the effectiveness of the Asset Management System in delivering organisational objectives, value and sustainable infrastructure outputs for the level of committed funds, effectively providing the feedback loop for continual improvement of the Asset Management System.

Asset Management Frameworks provide a common basis for the development of appropriate Asset Management Systems for any organisation within a relevant industry and context that has a comparable asset base.

1.8 UIC ASSET MANAGEMENT FRAMEWORK FOR RAILWAY INFRASTRUCTURE ORGANISATIONS

Assuming a comparable asset base to that outlined in Section 1.6, Figure 4 shows a generic Asset Management Framework for a railway infrastructure organisation. This is based on the framework established by UIC in its document *Guidelines for the Application of Asset Management in Railway Organisations* (2010) and subsequent adaptation to align with the requirements of ISO 55001.

The grey boxes, with titles to the right of the main framework diagram, show the alignment to key components of ISO 55001, including:

- The establishing of a Strategic Asset Management Plan (SAMP) and Asset Management objectives, informed by the Asset Management Policy, to assure alignment with the organisational context and objectives
- The development and implementation of Asset Management Plan(s) to achieve these objectives and derive value.

The purple boxes in the centre of the diagram represent the core decisions and activities (see Section 1.6). The orange elements of the diagram incorporate the further generic requirements of ISO 55001 discussed in Section 1.6, namely:

- Competence and capability mechanisms
- Asset Management enabler mechanisms
- Performance evaluation mechanisms
- Improvement mechanisms

It is key to note the closed-loop feedback process, from the performance evaluation and improvement mechanisms on the left, back into the top level of the core decisions and activities. The primary requirements of ISO 55001 to demonstrate continual monitoring, review and improvement cannot be overstated.

The purple boxes at the centre of the diagram represent the flow of decisions from strategic to tactical, through to asset interventions, including operations, on the ground. These have been developed by the UIC Asset Management Working Group (AMWG) as a generic framework for use by railway infrastructure organisations. Each of the purple boxes are defined in the table below with respect to railway infrastructure organisations. The more generic requirements of ISO 55001, shown in orange in Figure 4, are discussed in the relevant ISO 55001 Clause in Part 2 of this document.

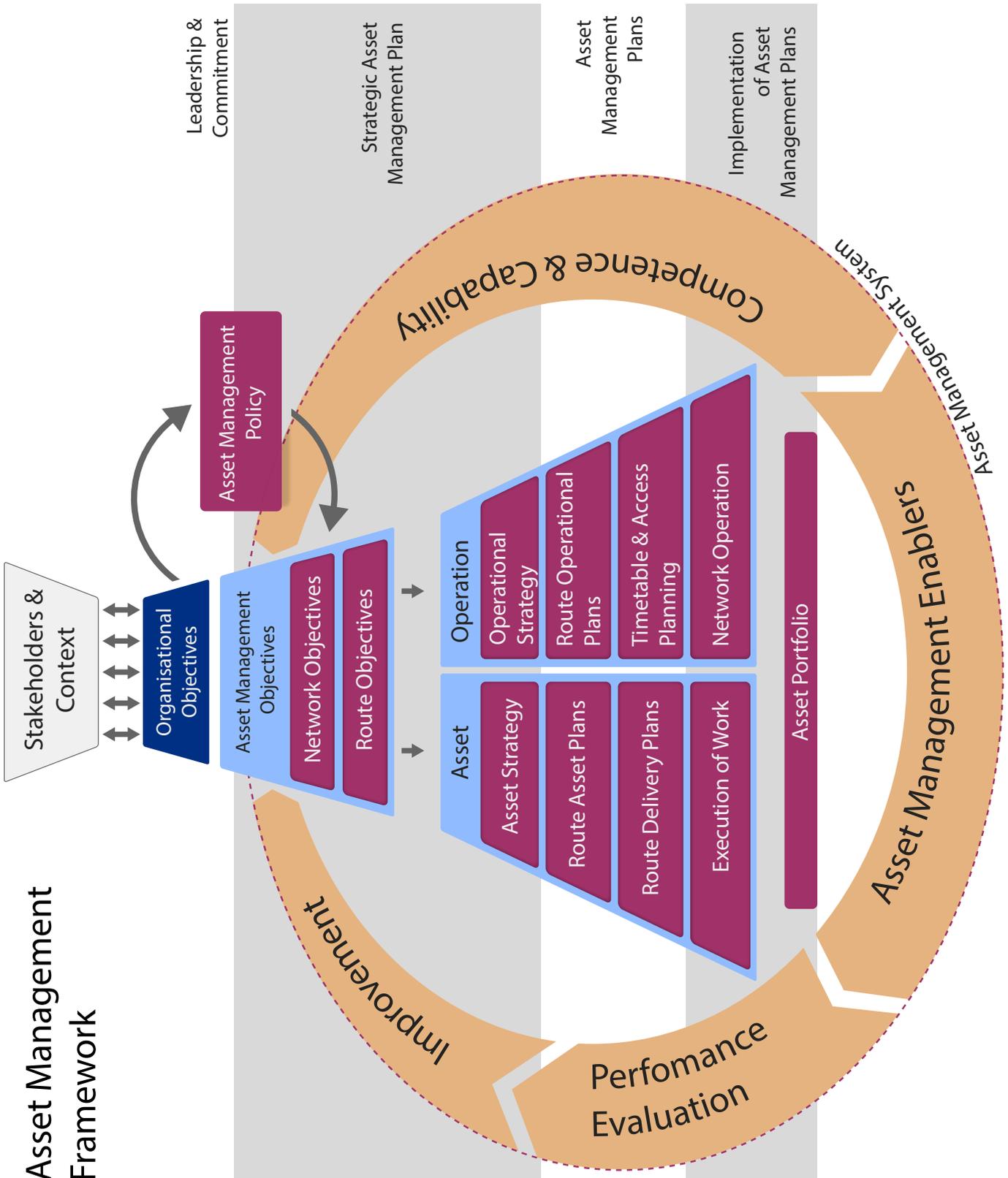


Figure 4: ISO 55001 Adaptation of the UIC Asset Management Framework for Railway Infrastructure Organisations

Organisational Direction

Organisational Objectives - the overall goals, purpose and long range intentions for business operation that have been established by the railway infrastructure organisation, taking into account the needs and expectations of stakeholders and its overall business philosophy. These are often significantly shaped or directed by Government or regional funders for railway infrastructure organisations.

Asset Management Policy – see Section 1.5.5. Documentation of an organisational commitment to appropriate good practice Asset Management principles which are relevant to the organisational objectives, and are signed-off by top management, nominally the CEO. Policy statements may refer to factors such lifecycle cost, total cost of ownership, risk management and network performance.

Asset Management Objectives

Network Objectives – define the high level requirements for the railway from the perspective of the customers i.e. train and freight operators, and funders, usually the Government. They provide the vision for the type of railway that the country/state/region wants and the willingness to pay for it. They should provide clarification on traffic growth, and targets for network punctuality, safety and sustainability. They should also include a specification of the level of funding available to sustain the core railway and to deliver any required enhancements.

Route Objectives – should disaggregate the Network Objectives to the route level and provide the specification of route level targets consistent with the Network Objectives. They should recognise the differentiation of the network and allocate priorities according to the assessed importance of each route. The Route Objectives should set output targets and budgets and define the requirements for the infrastructure and therefore the targets to be achieved by the relevant maintenance, renewal and enhancement decisions and plans. In some countries the Route Objectives will be derived from negotiations with relevant train operating companies or local government.

Asset	Operational
<p>Asset Strategy - the primary objective of the asset strategy (or asset strategies) is to optimise decisions on designing, procuring, constructing, inspecting, maintaining, disposing, renewing and enhancing the infrastructure such that the route outputs are delivered at the minimum whole life cost. The asset strategies should provide demonstrable evidence that asset intervention decisions deliver the Route Objectives for the lowest whole life cost. The specification of the intervention criteria in the asset strategies represents the pivotal link between the customer/funder requirements of the railway infrastructure and the planning and delivery of work. More than any other component of the framework, the asset strategies are the major determinant of the cost and sustainable performance of the infrastructure. A key requirement of the asset strategies is that they demonstrate how the work undertaken on the assets will deliver the Route Objectives. The majority of railway infrastructure managers are only at the preliminary stage of being able to link inputs (the work undertaken on the infrastructure) with outputs (the effect of the work on train punctuality, safety, availability etc.).</p>	<p>Operational Strategy – specifies the requirements for the future configuration of the infrastructure, for example the number of signalling centres and the degree of automation. It also specifies the required level of train service capacity and the high level requirements for the production of a robust timetable. The operating strategy also specifies the arrangements for providing access to the network in order to allow maintenance and renewal work to be undertaken. It should explicitly recognise and account for the interaction between the operational and asset strategies to achieve an optimum balance between cost, risk and performance.</p>

Asset	Operational
<p>Route Asset Plans - specify the asset intervention activities, including inspection, maintenance, refurbishment, replacement, new assets, rationalisation and disposal. The specific asset interventions are usually specified as the tactical component of the plans, in which the longer-term elements are typically derived from modelling tools. The plans should provide a specification for the delivery function. They should also provide assurance to senior management and external stakeholders, such as regulators and governments, that the costs are justified and that infrastructure outputs will be delivered in a sustainable way. The typical content of the Route Asset Plans listed below is comprehensive but not exhaustive and will vary by organisation:</p> <ul style="list-style-type: none"> • Overview of the route section • Condition and performance trends • Work history • Route condition and performance targets • Selection of the appropriate asset strategy to deliver the route targets • Maintenance and renewal work volumes and costs resulting from application of the asset strategy • Assessment of the risks to the plan delivering its objectives 	<p>Route Operational Plans - Route Operational Planning is the process that translates train and freight operator requirements for running services on the network into detailed plans for the provision of safe and reliable train paths. It involves detailed capacity planning, typically over a ten-year horizon. The overall capacity of a route is determined by the signalling system, with a contingency built in to allow for perturbation. The route operation plans also include the arrangements for access to undertake work on the infrastructure. The production of the route operation plans should take account of the trade-off between the number of trains operated and the level of performance delivered.</p>

Asset	Operational
<p>Route Delivery Plans - translate the work specified in the Route Asset Plans into a detailed plan for execution. The Route Delivery Plans should:</p> <ul style="list-style-type: none"> • Optimize the delivery of asset interventions, grouping work spatially, by skills, by access arrangements and combining work to be delivered at the same time • Provide a detailed design for construction projects • Confirm the availability and source of funding • Agree the delivery programme with customers and stakeholders • Align the delivery programme with the local track access regime and the delivery capability of suppliers. 	<p>Timetable & Access Planning - the time tabling process comprises a number of phases which typically includes:</p> <ul style="list-style-type: none"> • An initial phase during which track access arrangements (possessions) are prepared • A drafting phase in which the infrastructure manager and the train operators collaborate to produce a draft timetable, often based on a number of automatically generated timetable scenarios • A finalization phase to refine the content and make final decisions on the timetable content, usually involving manual alterations to the selected scenario • In parallel and in iteration with the production of the timetable, an annual access (possession) plan is produced. Following the production of the annual timetable, it is frequently necessary to make short term amendments to the timetable, to meet particular commercial and operational needs, in particular to schedule paths for freight trains.
<p>Execution of Work - the final element in the asset leg is the delivery of work. This should include the following:</p> <ul style="list-style-type: none"> • Mobilisation of the project team, the scheduling of resources and booking of possessions • The provision of tools, facilities and equipment • Construction, testing and commissioning • Hand back of work • Updates to asset registers and cost management systems as a result of changes to the infrastructure. 	<p>Network Operation - concerned with the provision of safe and reliable train paths in accordance with the defined timetable and the recovery response following incidents on the network. Network operation is the real time people, processes and systems that monitor and control the movement of trains, manage incidents as they occur to minimise delays and enable access for planned and unplanned asset interventions.</p>

Table 2: UIC ISO 55001 Asset Management Framework for Railway Infrastructure Organisations - Definitions

The Asset Management Framework shown in Figure 4 considers the full range of a railway infrastructure organisation's Asset Management activities within the scope of the Asset Management System. This includes operational planning, asset operations and work execution.

However, there are numerous business models established for railway infrastructure organisations worldwide. These may include all or just some of the activities listed in Table 2 within the scope of a particular organisation. For example, some railway infrastructure organisations may outsource all of their maintenance and project delivery to contractors or may not be responsible for the operation of the infrastructure.

Consideration of all possible models is not feasible here but the framework in Figure 4 is intended to provide a comprehensive starting point for railway infrastructure organisations to align with ISO 55001. The boundaries of the specific Asset Management System can, and should, be redrawn to reflect the actual scope of the specific organisation's Asset Management activities.

However, the requirements of ISO 55001 are not lessened. Any organisation seeking compliance with ISO 55001 would still have to demonstrably satisfy each requirement of the standard. For example:

- Full specification, control and review and assurance of the execution of work by contractors, or
- Full specification, control and review and assurance of the interfaces and management mechanisms between the organisation and the rail operations organisation(s) to demonstrate appropriate and continually improving management of access and risks.

1.9 UIC ASSET MANAGEMENT FRAMEWORK MAPPING TO ISO 55001 ASSET MANAGEMENT SYSTEM

Figure 5 shows how an ISO 55001 Asset Management System, as defined by the ISO 55001 Clauses (and the requirements of the standard held within each Clause), aligns with the key components of the UIC Asset Management Framework for railway infrastructure organisations.

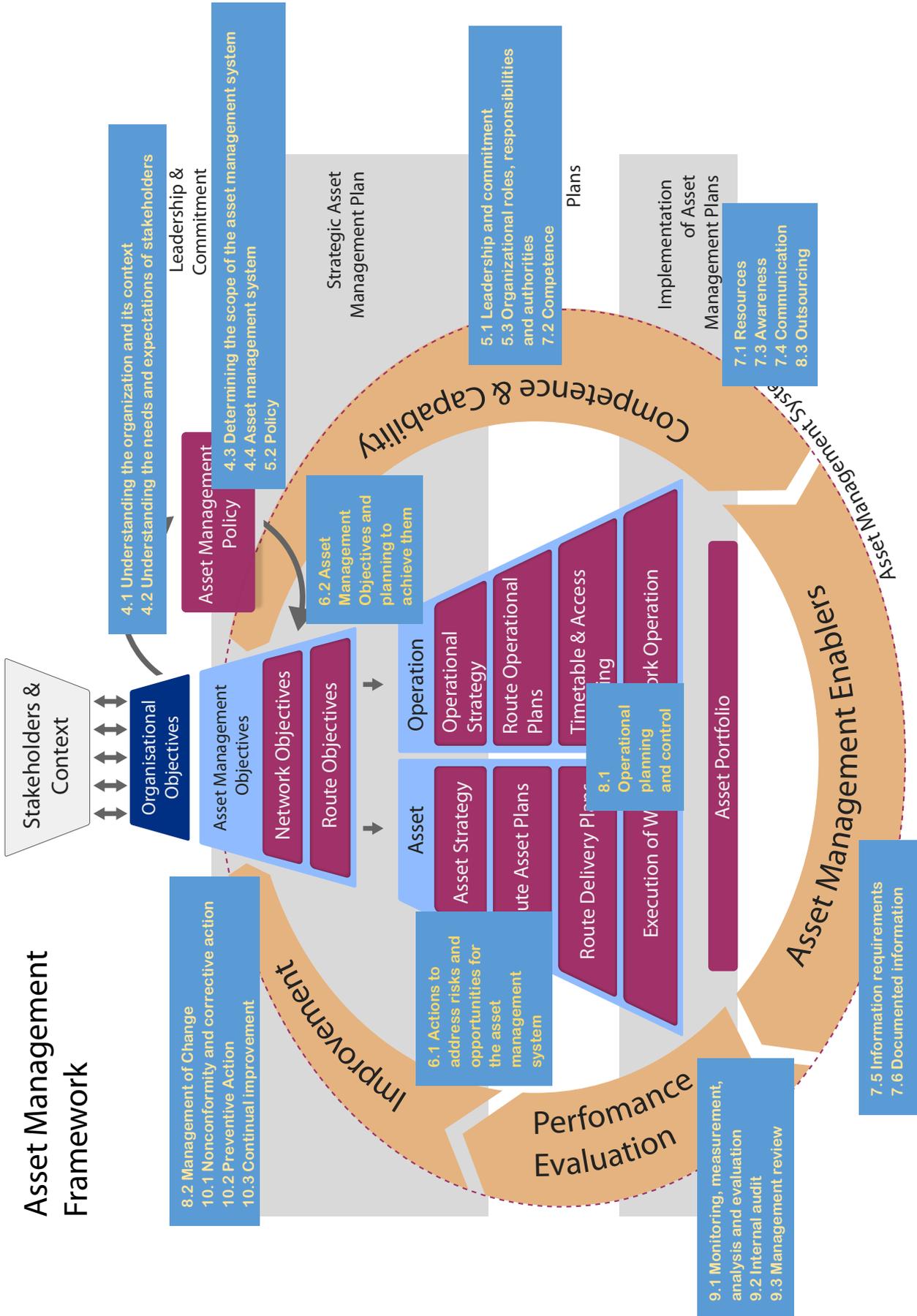


Figure 5: Alignment of ISO 55001 Clauses with UIC Asset Management Framework

PART 2: ISO 55001 REQUIREMENTS OF AN ASSET MANAGEMENT SYSTEM

2.1 INTRODUCTION

Part 2 of this document provides specific guidance on each of the requirements of ISO 55001.

The complete and explicit ISO 55001 'shall' statements have not been repeated verbatim in this document. The ISO 55000 series – both the shall statements in ISO 55001 and the guidance in ISO 55002 - should be read and considered before and during the use of these guidelines to establish a full understanding of what is required for compliance.

2.2 CLAUSES 1 – 3

ISO 55001 is comprised of ten individual clauses or sections. Clauses 4 – 10 form the body of the document and include all 72 of the 'shall' statements or requirements. Clauses 1 – 3 are short, stand-alone sections, with clause 1 describing scope, clause 2 the 'normative reference', and clause 3 referring back to ISO 55000 for terms and definitions. The three clauses can be quickly read and understood and do not define any specific requirements for compliance with ISO 55001.

Clauses 1 - 3 are not considered further in this document, other than to note that 'Clause 1 Scope' clarifies that ISO 55001:

- Defines the requirements for an Asset Management System
- Is applicable to all types and sizes of assets and organisations, although it notes that its intent is for physical assets in particular
- Does not specify financial, accounting or technical requirements for managing specific asset types

2.3 SECTION STRUCTURE – CLAUSES 4 - 10

For clauses 4 – 10, which include all 72 of the ‘shall’ statements or requirements, the remainder of the sections in this Part 2 of the UIC ISO 55000 Guidelines Document have the following structure:

- Each clause is divided into the relevant sub-clauses, e.g. clause 4 contains sub-clauses 4.1, 4.2, 4.3 and 4.4.
- For each sub-clause, the overall definition and intent of the sub-clause is briefly explained to provide understanding or verification of the reader’s existing understanding
- For each ‘shall’ statement, or group of ‘shall’ statements, within each sub-clause, a table has been provided which includes:
- Considerations and practical guidance for Railway Infrastructure Organisations; and
- Recommended Evidence – an outline of the potential evidence or artefact/s that an auditor may seek to assess a railway infrastructure organisation’s compliance with ISO 55001.

2.4 CLAUSE 4: CONTEXT OF THE ORGANISATION

2.4.1 Clause 4.1 – Understanding the organisation and its context

This clause relates to the identification and understanding of organisation drivers, requirements and constraints, both externally and internally, which may affect the ability of the organisation to achieve its organisational and Asset Management objectives.

‘Shall’ Statement 4.1-1 Issues Identification	
Considerations for Railway Infrastructure Organisations	<ul style="list-style-type: none"> • Consider the full range of the often wide-ranging and complex factors which enable and constrain the activities of the organisation. • These can be internal or external and impact on the inputs to railway activities, the outputs or performance of the railway or the internal activities and processes of the organisation. • Sources are likely to include stakeholders (see Section 2.4.2) such as funders, regulators, legislators, operators, customers, the media and the general public, as well as geographical, technical, resource, culture and competency, process, asset performance, risk management and technological constraints. • Internal factors will also include the overall vision, mission and objectives of the organisation or parent organisation(s). • Common railway specific factors include ever increasing operational demands on the railway and the associated reduction in engineering access, extensive modernisation of traction power and signalling & control systems, the economics of lightly used lines in the network, competing pressures on costs and performance, increasing demands for real-time customer information, customer satisfaction and reputation, sustainability and environmental performance and media interest and pressure on performance and delivery.
Recommended Evidence	<ul style="list-style-type: none"> • Asset Management System definition or manual • Asset Management System review process and responsibilities • Mapping of Asset Management Objectives to Organisational Objectives to Stakeholders/Context (see UIC Asset Management Framework - Figure 4) • Core Asset Management System documentation, including a SAMP which defines how the organisation identifies and considers internal & external factors in the development and continual improvement of its Asset Management System and Asset Management Plans

‘Shall’ Statement 4.1-2 AM Objectives Aligned with Organisational Objectives**Considerations for Railway Infrastructure Organisations**

- Organisational objectives can define the vision for both the type of railway and the railway infrastructure organisation, in terms of culture, competence and capability, the organisation is mandated to, or wishes to, deliver.
- Organisational objectives for railway infrastructure organisations may also include high-level funding statements, output performance specification and the long-term integration and enhancement of the network.
- High-level Asset Management objectives may include specific railway factors such as traffic growth, punctuality and railway related safety, as well as generic considerations such as sustainability, technology adoption, Asset Management capability, cost efficiency, resilience, and customer satisfaction.
- Network or Route Objectives should disaggregate the Asset Management Objectives to the network and route level respectively and provide the specification of targets, funding and constraints covering a period of at least five years.
- Route Objectives relevant for infrastructure assets are likely to include:
 - Route capability
 - Route capacity
 - Route availability, including the track access regime
 - Traffic
 - Number of trains
 - Vehicle characteristics
 - Line speed
 - Route infrastructure performance (punctuality, safety, environmental impact)
 - Route budgets.

Recommended Evidence

- Asset Management objectives
- Mapping of Asset Management Objectives to Organisational Objectives to Stakeholders/Context (see UIC Asset Management Framework - Figure 4)
- How these relate to the organisational strategic plan / business plan / vision or equivalent, and other organisational policies
- Core Asset Management System documentation, including how the organisation identifies, implements and reviews Asset Management objectives, how they are integrated together and aligned with corporate objectives

2.4.2 Clause 4.2 – Understanding the needs and expectations of stakeholders

ISO 55001 focuses strongly on the requirements of stakeholders and their integration into objectives and outputs of the Asset Management System. This is to assure alignment of top-level requirements to activities and expenditure on the ground.

‘Shall’ Statement 4.2-1 Determine Stakeholders and Requirements	
Considerations for Railway Infrastructure Organisations	<ul style="list-style-type: none"> • Consider the full range of stakeholders associated with national or major regional railways, such as funders, regulators, legislators, regional authorities, operators, interconnecting infrastructure, oversight developers, customers, passenger focus groups, land owners and neighbours, the media and the general public. • Funding, legislation and regulation, if applicable, will often be related to national governments and/or regional or state authorities. • Stakeholders will also include internal functions, teams and roles as well as any contractors or service providers used. • The organisation should seek to understand the criticality of each stakeholder in terms of achieving organisational and Asset Management objectives and establish appropriate analysis and management processes based on this ranking. • A simple matrix of key stakeholders with references to further details of engagement plans, interaction histories, requirements, interfaces, etc. is often a useful tool for monitoring and evidencing alignment with ISO 55001. • Consolidation can often be enabled by categorisation of each stakeholder’s involvement with the railway, such as, infrastructure performance monitoring, health and safety, technical compliance, funding approval, expenditure profiles, asset health or sustainability. • The impacts of the stakeholder identification and analysis, such as key inputs and outputs to the Asset Management System), their impact on priorities, activities or resources for Asset Management and any associated decision making criteria or constraints, should be captured in the SAMP.
Recommended Evidence	<ul style="list-style-type: none"> • Regular stakeholder meeting agendas / minutes / actions • Stakeholder analysis process and evidence of application • Stakeholder management processes • Stakeholder Engagement Plans or equivalent strategies • Mapping of Asset Management Objectives to Organisational Objectives to Stakeholders/Context (see UIC Asset Management Framework - Figure 4)

2.4.3 Clause 4.3 – Determining the scope of the Asset Management system

Defining the scope and boundaries of the Asset Management System (AMS) is critical to demonstrating compliance with later clauses in ISO 55001, and the integration of stakeholder requirements and delivery of objectives. Not all assets or Asset Management activities have to be included, but there must be clear definition, management and control of these boundaries.

‘Shall’ Statement 4.3-1 – AMS Scope – Boundaries

‘Shall’ Statement 4.3-2 – AMS Scope Aligned with SAMP & AMP Policy

‘Shall’ Statement 4.3-3 – Scope Considerations

‘Shall’ Statement 4.3-4 – AMS Scope - Assets Covered

‘Shall’ Statement 4.3-5 – AMS Scope Documented

Considerations for Railway Infrastructure Organisations

- The two main factors that determine the scope of the Asset Management System for railway infrastructure organisations are:
 - The scope of the physical (or non-physical) assets to which it will be applied.
 - The geographical scope of its application, including the network and routes or regions.
 - The decisions, processes and activities that link the organisational objectives to the asset interventions on the ground to assure alignment throughout the organisation.
- The UIC Asset Management Framework provided in Figure 4 effectively defines the scope of an Asset Management System for railway infrastructure organisations. Certain railway infrastructure organisations may wish to remove or add certain components of the framework for their specific Asset Management System but should be able to clearly explain why this is appropriate for their particular business.
- The UIC Asset Management Framework provides guidance on the key activities and interfaces to achieve the alignment and completeness required of an ISO 55001 compliant plan-do-check-act Asset Management system. However, as well as these key activities, the scope should include the consideration of specific assets, geography, functions, roles and responsibilities, people, supply chain and competence, processes, data and systems.
- The Asset Management System definition should also include clarity of formal outputs, if appropriate, for stakeholders. For a railway infrastructure organisation this may include funding submissions, regulatory reporting, compliance statements, and investment options.
- It should duly consider the interfaces and overlaps with any relevant external stakeholders and their management systems, such as Regulators, Operators, integrated railway infrastructure, contractors and service providers.

‘Shall’ Statement 4.3-1 – AMS Scope – Boundaries

‘Shall’ Statement 4.3-2 – AMS Scope Aligned with SAMP & AMP Policy

‘Shall’ Statement 4.3-3 – Scope Considerations

‘Shall’ Statement 4.3-4 – AMS Scope - Assets Covered

‘Shall’ Statement 4.3-5 – AMS Scope Documented

Recommended Evidence

- Scope and alignment in Asset Management System definition or manual, including graphical representation of scope, boundaries, documentation and assets (represented by the dotted line in the UIC Asset Management Framework - Figure 4)
- Definition of how the Asset Management System interfaces with other management systems such as Finance, Health & Safety, external systems
- Definition of roles and responsibilities in core AMS documentation

2.4.4 Clause 4.4 – Asset Management System

This clause defines the specific need for maintaining, appropriately reviewing and continually improving the documented plan-do-check-act style Asset Management System and associated SAMP. This is particularly important with respect to how the SAMP will deliver the Asset Management objectives.

Statement 4.4-1 – AMS Defined and Implemented

<p>Considerations for Railway Infrastructure Organisations</p>	<ul style="list-style-type: none"> • Ensure clarification of the role and interfaces of key documentation; this will include the alignment of route, corridor and asset strategies, which can be complex for railway infrastructure organisations. • Asset Management Systems for railway infrastructure organisations are often complex and difficult to capture diagrammatically or concisely. An overarching diagram is useful, supported by relevant documentation, such as the definition of scope (see Section 2.4.3), relevant processes, IT system architectures, detailed roles and responsibilities, interfaces and stakeholder requirements, etc. Mature operators often consolidate supporting descriptions and references into an ‘Asset Management System Manual’, or similar. • The Asset Management Framework provided in Figure 4 and Figure 5 of this document should provide a good starting point for railway infrastructure organisations. • The complexity of managing railway infrastructure places significant demand on clear processes being defined to underpin, link and enable the implementation of the Asset Management System defined by the framework. • The components of the Asset Management System should have associated and more detailed business processes which define the inputs and outputs, the key steps in translating the inputs into outputs and the owners of each element of the process.
<p>Recommended Evidence</p>	<ul style="list-style-type: none"> • Asset Management System definition document or manual, including graphical representation of scope, boundaries, documentation and assets (represented by the dotted line in the UIC Asset Management Framework - Figure 4) • Core Asset Management System documentation such as Asset Management policies, strategies and objectives and route, corridor and asset strategies and plans • Definition of key accountabilities and responsibilities, for example in a RACI structure (responsible, accountable, consulted, informed) • Definition of the detailed business processes associated with each component of the Asset Management System and the use of IT tools to support these processes, where relevant • Asset Management System review process

‘Shall’ Statement 4.4-2 – SAMP Documented**Considerations for Railway Infrastructure Organisations**

- A SAMP can take many forms depending on the scale, structure, complexity and context of an organisation. It can vary from a single document, in a small organisation, to a collection of documents, processes and systems.
- Figure 4 in this document identifies that the key elements for a railway infrastructure organisation may include Network Objectives, Route Objectives, Asset Strategies and the Operation Strategy. This is not a fixed scope but provides a basis for consideration.
- It is recommended that the SAMP includes definition of the relevant decision making criteria (see Section 1.5.2).
- The SAMP should be readable and not repeat the content of other documents unnecessarily, but should allow the reader a clear understanding of the Asset Management System and alignment between documents and activities.
- Rail infrastructure organisations often have a ‘public facing’ SAMP and a more detailed internal version.
- Creating a SAMP is an iterative cycle, carried out by top management and supporting teams. Typically, several revisions would be required to get it right.
- It would be expected that a SAMP would include due consideration of, or reference to, the following, though not necessarily in one document:
 - Scope of Asset Management at the organisation
 - Stakeholder Engagement
 - The organisation’s Asset Management Policy statement(s)
 - Asset Management objectives
 - Definition of the Asset Management Framework
 - An overview of the Asset Management System,
 - Clarification of the current state, including:
 - Demand, Asset Performance and Condition.
 - Asset Management Capability.
 - Benchmarking.
 - Future state requirements
 - The Asset Management decision making criteria

'Shall' Statement 4.4-2 – SAMP Documented	
	<ul style="list-style-type: none"> - Delivery strategies, such as: <ul style="list-style-type: none"> • Asset Strategies • The asset lifecycle approach • Route or corridor strategies <ul style="list-style-type: none"> Funding scenarios and timescales Planned work volumes, costs timescales Expected outcomes o Enabling strategies, such as: <ul style="list-style-type: none"> Asset Management capability Technical competence and capability Organisational risk appetite and management Asset information o Communication plans o Continual review and improvement
Recommended Evidence	<ul style="list-style-type: none"> • The SAMP itself, which does not all have to be in one document, but as defined in the UIC Asset Management Framework in Figure 4, should include or refer directly to: <ul style="list-style-type: none"> - Asset Management Policy - Asset Management (Network and Route) Objectives - Asset Strategies - Operational Strategy • Asset Management System manual or equivalent to show how the AM strategy and planning documents relate to each other – often shown as a pyramid from top level SAMP, lower level asset strategies and Asset Management plans • Asset Strategy and Operational Strategy

2.5 CLAUSE 5: LEADERSHIP

2.5.1 Clause 5.1 – Leadership and commitment

This clause consists of a single but lengthy ‘shall’ statement which is focused on organisational management teams demonstrating commitment to the Asset Management System and achievement of objectives. This demonstration should be through outcomes and review & improvement actions rather than simple intent.

‘Shall’ Statement 5.1-1 – Demonstrate Leadership and Commitment

Considerations for Railway Infrastructure Organisations

- The phrase ‘top management’ is used by ISO 55001 to define top level or executive decision makers in an organisation. Nominally, for a rail organisation, this would include CEO, Board and Executive level sponsorship, governance, continual review and authorisation of the Asset Management System, Asset Management Policy and SAMP.
- Many organisations have a single ‘top management’ sponsor, often a Director of Engineering, Director of Finance, Director of Maintenance or Director of Operations, or even a Director of Asset Management. However, due to the cross business nature of Asset Management, it is good practice to have multiple Board or Executive level sponsors to ensure the Asset Management system is fully embedded and continually improved across its entire scope.
- The best individuals or function leads for these roles will vary by organisation but the specifics are not critical, as long as the business-wide Asset Management approach is sponsored at the right level and is not seen as the preserve of a single function.
- A common approach for many organisations is the establishment of an Asset Management Committee, or similar mechanism, with top management attendance, to drive, govern and oversee all aspects of Asset Management within the organisation.

Recommended Evidence

- Clear ownership, governance and continual improvement of the Asset Management System at a senior level within the organisation, usually through a cross-functional Asset Management Committee or equivalent.
- Asset Management Policy physically signed-off by the CEO, or equivalent & SAMP
- Asset Management Objectives signed-off by the CEO or a member of the organisation’s Executive
- SAMP signed-off by a member of the organisation’s Executive
- Awareness at senior (top level) management
- Corporate Vision / Objectives and how/ whether there is reference to assets and good Asset Management

'Shall' Statement 5.1-1 – Demonstrate Leadership and Commitment

- Senior management behaviours and attitudes
- Evidence of appropriate cross-functional committees, multidisciplinary teams
- Feedback from staff about top management leadership
- Management review documentation, including plans, agenda and attendees and evidence of application of findings
- Documented ownership of the Asset Management System and its key components

2.5.2 Clause 5.2 – Policy

This clause seeks to ensure an Asset Management Policy is in place to define and commit the organisation to appropriate good practice Asset Management principles and overall approach to Asset Management. It should also allow the traceability of all Asset Management activities within the organisation back to the policy statements.

'Shall' Statement 5.2-1 – AM Policy Established**'Shall' Statement 5.2-2 – AM Policy Contents****Considerations for Railway Infrastructure Organisations**

- The Asset Management Policy should provide a high-level statement of intent by the organisation's top management, demonstrating commitment to the adoption of Asset Management principles and showing the role of the Asset Management System in delivering the organisational objectives.
- For railway infrastructure organisations these core principles may include key statements relating to whole-life cost, transparency, the management of risk and sustainability and definition of, or reference to, the associated decision making criteria (see Section 1.5.2).
- The Asset Management Policy should be clearly endorsed by top management, for example by including a signature and supporting statement from the CEO or equivalent for the organisation.
- The Asset Management Policy should be formally communicated throughout the organisation and relevant stakeholders, including service delivery organisations and contractors where appropriate.
- The principles should be demonstrably and consistently applied in all Asset Management activities, from strategic decision making, through tactical decision making and planning to asset interventions on the ground.
- The Asset Management Policy is conventionally a short document (1-2 pages) that can easily be communicated to internal and external stakeholders.

'Shall' Statement 5.2-1 – AM Policy Established 'Shall' Statement 5.2-2 – AM Policy Contents	
	<ul style="list-style-type: none"> • ISO 55001 does not require the Asset Management Policy to be a standalone document (for example, it can be part of the SAMP). However, it is often kept separate to better facilitate communication and distribution to stakeholders where appropriate. Some organisations have it in a one-page format that can be hung on walls. • Internal communication of new or revised Asset Management Policies may involve roadshows across the network, or be a core component to an Asset Management training programme, for example in a short introductory course that different functions attend.
Recommended Evidence	<ul style="list-style-type: none"> • Asset Management Policy – as per the UIC Asset Management Framework in Figure 4, this is not a key part of the alignment requirements of ISO 55001 but should support the definition of Asset Management Objectives from Organisational Objectives • Associated Asset Management decision making criteria • Process for Asset Management Policy development, review and update processes and triggers • Communication plans and mechanisms to ensure Asset Management Policy is understood and accepted, and any measures of their effectiveness • Awareness of the policy throughout the organisation and relevant stakeholders • Evidence of Asset Management Policy impacting on strategies, plans, processes, behaviours and attitudes

2.5.3 Clause 5.3 – Organizational roles, responsibilities and authorities

This clause seeks to ensure that the necessary roles and responsibilities for implementing, monitoring and reviewing the Asset Management System are defined and documented, and the responsibilities are assigned to functions, roles or individuals with appropriate authority – i.e. the legitimacy and capability – to carry them out.

‘Shall’ Statement 5.3-1 – Organizational Roles, Responsibilities and Authorities

‘Shall’ Statement 5.3-2 – Responsibilities Requiring Assignment

Considerations for Railway Infrastructure Organisations

- Alignment or compliance with ISO 55001 does not require a restructure of the organisation but it does seek to ensure that roles and responsibilities for the Asset Management System are suitably defined within the organisation.
- The design of the organisation should aim to increase its capability to achieve its Asset Management Objectives by centralising what needs to be coordinated across the network and devolving route/corridor accountabilities, where appropriate.
- Mechanisms should be defined to assure that:
 - Centralised and devolved activities are effectively coordinated
 - Competent people are in place to make relevant decisions at the various levels of the organisation
- In defining the roles, responsibilities and authorities the organisation should consider the overall organisation and stakeholders, such as the asset owner, asset steward and service deliverer (i.e. potentially contractors) model shown in Figure 7 when defining and implementing their Asset Management Systems. Are the interfaces and boundaries of each element clearly defined and documented? Are clear control mechanisms, such as service level agreements and audits, established across all key interfaces and subject to regular review processes?



Figure 6 High-level Organisational Roles

'Shall' Statement 5.3-1 – Organizational Roles, Responsibilities and Authorities 'Shall' Statement 5.3-2 – Responsibilities Requiring Assignment	
	<ul style="list-style-type: none"> • A RACI (Responsible – Accountable – Communicate – Inform) or equivalent analysis for all key activities within the organisation’s Asset Management System is advised.
Recommended Evidence	<ul style="list-style-type: none"> • AMS roles and responsibilities defined in the AMS manual, SAMP or equivalent documents (see UIC Asset Management Framework in Figure 4) • Governance Arrangements, such as Asset Management Committee Terms of Reference and/or minutes • Technical and financial authorities and any associated delegations • Performance review process and criteria • Appropriate personal objectives • Appropriate role/ job descriptions – particularly for Asset Management itself and for delivery functions

2.6 CLAUSE 6: PLANNING

2.6.1 Clause 6.1 – Actions to address risks and opportunities for the Asset Management system

This Clause refers directly to Clauses 4.1 and 4.2 such that the risks associated with the organisation and its effective delivery of its organisational objectives are appropriately identified and managed.

'Shall' Statement 6.1-1 - AMS Risk Identification

'Shall' Statement 6.1-2 - AMS Risk Actions

Considerations for Railway Infrastructure Organisations

- The rail industry is generally regarded and managed as a high-hazard sector and needs a more formal safety risk management approach than some other sectors. Risks can be both direct asset-related risks (i.e. asset failures, health, safety, and environment) and indirect asset risks (i.e. competency, processes, resources, systems), but should be considered within a consistent risk management system which establishes the most critical risks to the achievement of the organisation's objectives.
- Many key, strategic risks will be critical to rail organisations across the scope of their Asset Management System, including risks to safety, capacity, capability, punctuality, finance, reputation, funding and efficiency of delivery. The most critical risks identified for a specific rail organisation – and these may change over time – should be assessed through every component of the Asset Management system to ensure appropriate levels of mitigation, control and monitoring are in place. The Asset Management framework in Figure 4 is intended to provide a baseline guide for considering where strategic risks may impact across a rail organisation's Asset Management activities.
- The organisation should establish a consistent, cross-function risk management approach which ensures appropriate risk analysis and measures are detailed in all relevant strategy documents, such as:
 - Asset Strategies should define the appropriate intervention activities to manage strategic failure modes of specific assets or asset groups throughout the asset lifecycle, based on whole lifecycle cost and criticality.
 - The Operational Strategy should assess and mitigate the existing and future risks to performance and network access which could impact the achievement of Asset Management and organisational objectives. Typically, this would be based on modelling of operational performance and train punctuality.
 - Route Asset Plans and Route Operational Plans should consider the route specific tactical risks and their management in accordance with the Asset Strategies and access requirements for local asset interventions, or justify tactical exceptions where relevant to assure the achievement of Asset Management and organisational objectives.

‘Shall’ Statement 6.1-1 - AMS Risk Identification**‘Shall’ Statement 6.1-2 - AMS Risk Actions**

- Route Delivery Plans and Timetable & Access Planning should optimise the balance of output performance risks and the safe and efficient delivery of asset interventions necessary to sustain output performance.
- The execution of work should consider all relevant safety risks and the efficient and effective completion of work in accordance with the agreed requirements and access arrangements.
- The risk management processes should consistently address both strategic and operational risks within a single framework. This does not mean that all risks must be registered in detail in one risk register - the framework should enable the consistent management of risks at the right place by the right people.
- This requires the integration of the top-down and bottom-up identification, evaluation and control of all major risks relating to the infrastructure.
- Some railway infrastructure organisations have moved towards quantification of risk in terms of cost, for example putting a financial value on consequences such as ‘lost customer hours’ or ‘train delay minutes’. This is particularly useful to evaluate different investment scenarios as risks can be included in whole life cost models and used in cost risk optimisation techniques, including performance risks. The chosen approach should be consistent with the Asset Management Policy and documented in the SAMP.
- Lifecycle costing tools should support the optimisation of decisions on maintaining and renewing infrastructure based on the optimal balance of performance, cost and risk. They should also provide the basis for route and/or network forecasts of performance, work volumes, cost and risk. The tools should include a good understanding of the risks of asset degradation and failure, for example with age or usage, and how the degradation or failure risk impacts on train service and the safety of passengers, workers and members of the public. The tools should also be able to model different maintenance and renewal options to provide decision makers with funding and output choices.
- ISO 55001 explicitly relates to the ISO standard on Risk Management, ISO 31000, and a rail infrastructure organisation may well want to make use of this standard in conjunction with ISO 55001.

'Shall' Statement 6.1-1 - AMS Risk Identification**'Shall' Statement 6.1-2 - AMS Risk Actions****Recommended Evidence**

- Risk management framework, processes and risk assessment criteria
- Risk management governance and escalation processes
- Corporate risk matrix (combines risk assessment criteria)
- Risk registers at various levels of the organisation
- Alignment of risk assessments and risk registers
- Lifecycle cost models and outputs relating to costs, work volumes, performance and risk
- Evidence of active use of risk management techniques, e.g. use of FMEA, HAZOP and HAZID studies and reliability engineering methods
- Process(es) for monitoring and assuring risk treatment actions and, where appropriate, closure of risks through appropriate planning and execution of work
- Traceability back to a common risk management approach and Asset Management decision making criteria (of which the risk assessment criteria are one example)

2.6.2 Clause 6.2 - Asset management objectives and planning to achieve them**2.6.2.1 - Subclause 6.2.1 Asset management objectives**

This clause seeks to assure development of Asset Management objectives which:

- Fully align with corporate objectives
- Consider all relevant stakeholder requirements
- Are appropriately disaggregated across functions and roles
- Are regularly reviewed and updated
- Are appropriately documented

‘Shall’ Statement 6.2.1-1 – AM Objectives Identification

‘Shall’ Statement 6.2.1-2 – Develop AM Objectives Considering Stakeholder Needs

‘Shall’ Statement 6.2.1-3 – AM Objectives Development

‘Shall’ Statement 6.2.1-4 – AM Objectives Documentation

Considerations for Railway Infrastructure Organisations

- At a high level, Asset Management objectives are the goals or desired outputs that an organisation establishes an Asset Management System to deliver through relevant planning, work execution and operational process (see Figure 4).
- For railway infrastructure organisations, Asset Management Objectives should be considered at the network and route/corridor level as appropriate (see Figure 4).
- Asset Management Objectives should be SMART (Specific, Measurable, Assigned, Realistic, Time-bound).
- Common considerations for Asset Management objectives in railway infrastructure organisations include but are not limited to:
 - Organisational Asset Management capability and maturity
 - Customer satisfaction and train performance
 - Infrastructure capability, capacity and availability
 - Infrastructure performance and condition
 - Whole-life cost and budget compliance
 - Asset intervention delivery against plan
 - Environmental impact and sustainability
- However, Asset Management objectives should align with but not simply repeat the organisational objectives (see 4.1-2). They should disaggregate the organisational objectives into tangible and measurable objectives which can be further disaggregated at all levels of the Asset Management System.
- Specific examples could include changes to capacity or capability of the network or route(s), reduced headways, increased delivery efficiencies or the achievement of specific reliability, availability, maintainability and safety targets to assure delivery of overall punctuality or performance objectives.
- Asset Management objectives should consider network, route/corridor and asset criticality.
- Note that Asset Management objectives and the SAMP may be developed in parallel and iteratively, or the Asset Management objectives defined first.

'Shall' Statement 6.2.1-1 – AM Objectives Identification 'Shall' Statement 6.2.1-2 – Develop AM Objectives Considering Stakeholder Needs 'Shall' Statement 6.2.1-3 – AM Objectives Development 'Shall' Statement 6.2.1-4 – AM Objectives Documentation	
	<ul style="list-style-type: none"> • Lower-level disaggregated Asset Management objectives, such as at the route/corridor or asset level, may be defined in the relevant level of documentation, such as Route Operational Plans and Route Asset Plans for example, and clearly referenced in the SAMP.
Recommended Evidence	<ul style="list-style-type: none"> • SMART Asset Management objectives at the network and route level • Relationship of Asset Management objectives to the SAMP and vice versa • Alignment of Asset Management objectives to the organisational objectives in the organisational strategy or equivalent • Clear processes for developing and managing Asset Management objectives • Demonstrable monitoring and review of progress and necessary actions for Asset Management objectives • The capture of data and information to support the achievement of Asset Management objectives • Demonstration of alignment of execution of work to Asset Management objectives as per the 'Asset' element of the UIC Asset Management Framework in Figure 4

2.6.2.2 - Subclause 6.2.2 Planning to achieve Asset Management objectives

This clause considers the continuation of the line-of-sight from Asset Management objectives to the development of specific Asset Management Plans to achieve them.

‘Shall’ Statement 6.2.2-1 – AMP Planning Business Integration

‘Shall’ Statement 6.2.2-2 – AMPs Developed

‘Shall’ Statement 6.2.2-3 – Align AMPs with AM Policy and SAMP

‘Shall’ Statement 6.2.2-4 – AMPs External Requirements

‘Shall’ Statement 6.2.2-5 – AM Planning Processes and Outcomes.

‘Shall’ Statement 6.2.2-6 – Asset Risk Management

Considerations for Railway Infrastructure Organisations

- The concept of an AMP originally stems from the earliest days of modern Asset Management in Australian and New Zealand, and in many ways can be considered the heart of good practice Asset Management along with the SAMP or Asset Management Strategy.
- The existence of one, co-ordinated planning process to cover all asset interventions is one step, but the AMP should also include plans for continual improvement of the organisation’s Asset Management capability.
- Figure 4 identifies that the nominal Asset Management Plan for a railway infrastructure organisation consists of the Route Asset Plans and Route Delivery Plans, supported by and aligned with Route Operational Plans and Timetabling and Access Planning. Definitions for each of these nominal documents is provided in Table 2 of this document.
- The Route Asset Plans should:
 - Specify the asset intervention activities for the route to deliver the relevant Asset Management objectives
 - Consider the asset intervention activities throughout the lifecycle of the assets
 - Identify and mitigate risks to the plan delivering objectives.
- The Route Delivery Plans should translate the specified work into a detailed plan for execution, to:
 - Optimise the delivery of asset interventions, grouping work spatially, by skills, by access arrangements and combining work to be delivered at the same time
 - Provide a detailed design for construction projects
 - Confirm the availability and source of funding
 - Agree the delivery programme with customers and stakeholders
 - Align the delivery programme with the local track access regime and the delivery capability of suppliers

‘Shall’ Statement 6.2.2-1 – AMP Planning Business Integration**‘Shall’ Statement 6.2.2-2 – AMPs Developed****‘Shall’ Statement 6.2.2-3 – Align AMPs with AM Policy and SAMP****‘Shall’ Statement 6.2.2-4 – AMPs External Requirements****‘Shall’ Statement 6.2.2-5 – AM Planning Processes and Outcomes.****‘Shall’ Statement 6.2.2-6 – Asset Risk Management**

- Both plans should be developed to demonstrably achieve the relevant Asset Management objectives, including:
 - Clear alignment of the Route Delivery Plan with the Route Asset Plan
 - Clear alignment of the Route Asset Plan with the Asset Strategies, SAMP and Asset Management Policy.
- A full ‘Asset Management Plan’ for a large rail infrastructure organisation is as much an on-going planning process as a document or series of documents, and may have a full time team of asset planners co-ordinating it (for example at Sydney Trains). As with the SAMP, there may be a summary document (such as the Line Asset Network plans of London Underground), but much of the details of the typically five or ten year plans will not be in documents at all, but held in the work/maintenance management and capital planning systems.
- Note: for all but very small rail infrastructure organisations, asset-related planning should be a significant process of co-ordination, and the resulting plan/s key drivers for all asset delivery functions.

Recommended Evidence

- Route Asset Plans and Route Operational Plans
- Demonstrated use of decision-making criteria and Asset Management strategies in the planning processes, e.g. WLC and value analyses, risk-based techniques
- Demonstration of alignment of planned work to Asset Management objectives as per the ‘Asset’ element of the UIC Asset Management Framework in Figure 4
- Capital planning or investment processes (or equivalent)
- Maintenance requirements analyses
- Resourcing plans
- Possession/ outage plan and planning processes
- Emergency / contingency planning
- Relationship with strategic business planning outputs
- Risk and uncertainty analysis

2.7 CLAUSE 7: SUPPORT

2.7.1 Clause 7.1 – Resources

This clause tests that there are sufficient suitable resources in place to develop and maintain the Asset Management System, including strategic planning, implementation, monitoring, review, and improvement. It also tests that sufficient and appropriate resources are in place to implement the activities identified in the Asset Management Plan/s.

‘Shall’ Statement 7.1-1 – AMS Resources

‘Shall’ Statement 7.1-2 – AMP Implementation Resources

Considerations for Railway Infrastructure Organisations

- Note that this includes resourcing for all asset delivery (operations, maintenance and projects), whether internal or third party.
- Railway infrastructure organisations have diverse arrangements for the work that is carried out internally or outsourced to contractors. Management of the supply chain is key to the effective delivery of work on the infrastructure and the control of costs. Supply chain management should address:
 - The scope of potential activities for outsourced processes and activities
 - The business case for outsourcing work versus retaining in-house
 - The interfaces with external processes and activities, including the accountabilities and responsibilities for managing the outsourced processes and activities
 - The flows of information between the infrastructure manager and the contractor
- Asset Management System resource requirements include:
 - Policy development
 - Strategy development
 - Asset management planning
 - Implementation of Asset Management Plans
 - Asset management capability development
 - Risk management and performance improvement
 - Asset knowledge management
- Resources should be demonstrably established to enable the creation (as necessary), implementation, monitoring and control, governance and continual improvement of the Asset Management System and delivery of the Asset Management Objectives.

'Shall' Statement 7.1-1 – AMS Resources**'Shall' Statement 7.1-2 – AMP Implementation Resources****Recommended Evidence**

- Assessment of resources required to establish and sustain the Asset Management System as a whole and for each component of the overall framework shown in Figure 4
- Definition of roles and responsibilities for the Asset Management System as a whole and for each component
- Competence management system, competence register or matrix mapped to Asset Management System roles and responsibilities
- Resourcing and procurement strategies
- Contractual management responsibilities
- Relationship with strategic resource planning
- Resource planning processes and tools

2.7.2 Clause 7.2 – Competence

Competency refers to the ability of an individual to perform a task consistently, based on the knowledge, skills and behaviours of the individual. This clause seeks to test that specific positions within the overall Asset Management system are filled by people that are appropriately competent for the defined role. This clause is closely related to Clause 7.1 but specific to the suitability of the human element of resources.

‘Shall’ Statement 7.2-1 – Competency Identification, Evaluation, Improvement, Documentation and Reviews	
Considerations for Railway Infrastructure Organisations	<ul style="list-style-type: none"> • The establishment of a Competency Management System to identify and maintain competences to meet the Asset Management System requirements. • Plans should include risk assessment of competences based on both internal and external factors, such as service delivery suppliers and contractors that may affect the organisation’s overall competence management. • Common railway infrastructure organisation strategic competency issues, such as loss of technical knowledge due to an aging workforce and awareness of the value of asset information, should be identified and managed. • As well as technical and lineside safety competences, which are very likely already to be managed comprehensively in a rail infrastructure organisation, consideration should be given to more strategic Asset Management skills, such as strategic planning, whole-life cost analysis, Asset Management Plan development. Many organisations do not initially provide sufficient consideration to Asset Management specific competencies, and the approach can be rudimentary and generic when compared to longer established frameworks such as lineside technical and safety competences. The IAM Asset Management Competency Framework (August 2014) is also a good reference here.
Recommended Evidence	<ul style="list-style-type: none"> • Asset management competency strategy • Asset management training programme and metrics • Competency management system (CMS) • Competency register or matrix mapped to roles and responsibilities • Annual performance review process / procedure and evidence of application • Forecast of competence requirements mapped to Asset Management Strategy • Clear appropriate role / job descriptions • Training requirements analysis • Application of CMS to recruitment

2.7.3 Clause 7.3 – Awareness

This clause focuses on the organisation's processes and arrangements for ensuring all stakeholders in the Asset Management system are aware of their role, their interfaces with other stakeholders, and the value and contribution they provide in achieving the Asset Management objectives. It is closely related to the following clause and should be read alongside it.

'Shall' Statement 7.3-1 – AMS Awareness

<p>Considerations for Railway Infrastructure Organisations</p>	<ul style="list-style-type: none"> • The natural tendency of many organisations is initially to consider the ISO 55000 series as a subject for the Maintenance department. The involvement of Projects, Engineering, Finance, Procurement, Contract and Strategy departments is an essential requirement to make Asset Management work. • One critical area for awareness in a rail infrastructure organisation is awareness of the consequences of adhering or not adhering to procedures and processes at their relevant level – such as the updating of asset information following a lineside visit. • Despite being an arguably broad and subjective clause, experience shows that good organisational awareness can be established by demonstration of the following factors: <ul style="list-style-type: none"> - Good communication and consultation processes and practices between stakeholders. - A positive culture focused on engagement and alignment. - Effective processes and systems to ensure that stakeholders are informed by accurate and up-to-date information. - Good understanding by individuals, teams and functions of their roles, responsibilities and interfaces within the Asset Management System. - Strong and unambiguous communication of the performance of the organisation and the Asset Management System.
<p>Recommended Evidence</p>	<ul style="list-style-type: none"> • Display/dissemination of Asset Management Policy in organisation • Recognition by staff • Clear role and responsibility definitions • Asset Management explicit in business improvement projects and change programs

2.7.4 Clause 7.4 – Communication

This clause seeks to ensure organisations are clear on the necessary communication of information to support the achievement of Asset Management objectives.

‘Shall’ Statement 7.4-1 – Asset & AMS Internal / External Communication	
Considerations for Railway Infrastructure Organisations	<ul style="list-style-type: none"> • This includes internal and external communications. The latter is often particularly relevant to railway infrastructure organisations who often have multiple funder, regulator, compliance and supplier stakeholders. • This is clearly closely allied to the previous clause – communications plans to achieve appropriate awareness.
Recommended Evidence	<ul style="list-style-type: none"> • Asset Management communications plans • Two-way or multiple function communication forums and processes, e.g. between asset planners and maintenance • Stakeholder engagement plans or equivalent

2.7.5 Clause 7.5 – Information requirements

This is a complex and demanding clause. There are six shall statements that, in effect, require an organisation to have relatively highly defined asset data and information requirement specifications to support and enable its Asset Management System, at the specific attribute level of granularity. It is closely related to the next clause and should be read in conjunction with it.

‘Shall’ Statement 7.5-1 – Asset & AMS Information Requirements Determination

‘Shall’ Statement 7.5-2 – AM Information Requirements Development

‘Shall’ Statement 7.5-3 – AM Information Attributes, Quality and Collection Processes

‘Shall’ Statement 7.5-4 – Information Management Processes

‘Shall’ Statement 7.5-5 – Requirements for the Alignment of Asset Financial & Non-Financial Data

‘Shall’ Statement 7.5-6 – Alignment of Asset Financial & Non-Financial Data

Considerations for Railway Infrastructure Organisations

- This clause requires the organisation to have a good understanding of its assets, their performance, health, costs, risks, underlying relationships between each other, and criticality to the Asset Management system. In particular, it requires that financial and non-financial data related to assets is aligned and provide sufficient clarity for decision making.
- Fit for purpose asset information is essential for developing the appropriate strategies and producing and implementing work and operational plans. The scope of asset information is defined by the requirements of the components of the UIC Asset Management Framework - Figure 4.
- For a rail infrastructure organisation, the information types required to support Asset Management decision making include but are not limited to:
 - Information on the physical asset
 - Location information
 - Asset and system relationship/hierarchy information
 - Intervention history information
 - Performance and service impact information
 - Asset health information
 - Geospatial information
 - Financial information.

<p>‘Shall’ Statement 7.5-1 – Asset & AMS Information Requirements Determination</p> <p>‘Shall’ Statement 7.5-2 – AM Information Requirements Development</p> <p>‘Shall’ Statement 7.5-3 – AM Information Attributes, Quality and Collection Processes</p> <p>‘Shall’ Statement 7.5-4 – Information Management Processes</p> <p>‘Shall’ Statement 7.5-5 – Requirements for the Alignment of Asset Financial & Non-Financial Data</p> <p>‘Shall’ Statement 7.5-6 – Alignment of Asset Financial & Non-Financial Data</p>	
	<ul style="list-style-type: none"> • Those organisations that start with an IT system rather than the actual asset information requirements typically struggle to demonstrate compliance with this clause. • One way to demonstrate asset information requirements is to define them in terms of the types and forms of decisions made on assets, for example what information is required to decide on replacement priorities or for maintenance optimisation processes. • Note that other clauses make explicit or implicit requirements about what you need to know about your assets, particularly clauses 8.1, 8.2, 9.1, 10.1 and 10.2.
Recommended Evidence	<ul style="list-style-type: none"> • Asset Information Strategy • Demonstrable linkages between the organisation’s Asset Management Policy, strategy and objectives, and the documented Asset Information Strategy • Relationship to SAMP/ asset class strategies that define the decision making criteria and decisions required, and hence what information is required to support these decisions • Specification of asset information requirements, including both financial and non-financial information • Governance processes for asset information • Data quality standards, evidence of data quality activities such as data audits and corrective actions • Information process documentation, for example for the flow of information between maintenance, operations and asset planning • Presence of management information AND availability to key stakeholders requiring it • Linkage between financial and non-financial data – that is, ability to access costs by asset at appropriate asset level

2.7.6 Clause 7.6 – Documented information

This clause assesses the organisation’s approach to the capture of documented information to support its Asset Management System and related legal, financial and technical requirements.

7.6.1 – General (requirements)

‘Shall’ Statement 7.6.1-1 – Asset & AMS Information Documentation

7.6.2 – Creating and updating

‘Shall’ Statement 7.6.2-1 – Asset & AMS Information Identifiers, Format and Reviews

7.6.3 – Control of documented information

‘Shall’ Statement 7.6.3-1 – Documented Information Availability and Protection

‘Shall’ Statement 7.6.3-2 – Documented Information Controls

‘Shall’ Statement 7.6.3-3 – External Information Identification and Management

Considerations for Railway Infrastructure Organisations

- Whilst clause 7.5 (Information Requirements) concerns the specification of information requirements generally, this clause pertains to the manner in which this information is collected, documented, captured, stored, and disseminated or accessed in alignment with the requirements set out in clause 7.5.
- For the term ‘documented information’ – read ‘any information’, not just documentation.
- Although the scale and complexity of the documented information will vary according to the needs, scale, complexity and context of each railway infrastructure organisation, the need for core documented information, such as maintenance records, are fundamental to all organisations that manage physical assets.
- IT systems are an important element of the overall asset information strategy and capture & storage of and access to data, but they are not enough on their own, and especially not if they are not aligned to decision-making processes.
- Good practice organisations often establish the relevant Asset Management function as the ultimate ‘owner’ of the asset data and potentially any specific IT system, as this leads to the IT system ‘evolving’ to support the Asset Management System, and not the other way around.
- In Asset Management organisations where the Asset Management function has no influence on the information management system, or is disconnected from the IT function, there can be misalignment, and the information management system may not properly support the achievement of the Asset Management objectives.

7.6.1 – General (requirements)

‘Shall’ Statement 7.6.1-1 – Asset & AMS Information Documentation

7.6.2 – Creating and updating

‘Shall’ Statement 7.6.2-1 – Asset & AMS Information Identifiers, Format and Reviews

7.6.3 – Control of documented information

‘Shall’ Statement 7.6.3-1 – Documented Information Availability and Protection

‘Shall’ Statement 7.6.3-2 – Documented Information Controls

‘Shall’ Statement 7.6.3-3 – External Information Identification and Management

Recommended Evidence

- Asset Management System definition / manual
- Asset Management System review processes
- Definition of relevant documented information and control mechanisms for the Asset Management System as a whole and for each component of the overall framework shown in Figure 4
- Responsibilities and accountabilities for Asset Management System documentation for each component of the overall framework
- Governance arrangements for Asset Management System documentation for each component of the overall framework
- Definition of core information repositories to meet the asset information requirements defined under Clause 7.5 (see Section 2.7.5), examples may include Asset Registers, intervention plans, asset condition assessments, intervention histories, as-built drawings, O&M manuals, etc.
- Document management system
- Asset IT strategy aligned to the Asset Management System
- Asset IT systems in place to hold, analyse and disseminate appropriate asset data

2.8 CLAUSE 8: OPERATION

2.8.1 Clause 8.1 – Operational planning and control

This clause seeks to establish that the organisation has appropriate and systematic control of its operational activities to deliver the Asset Management Plans and ultimately the Asset Management objectives. With respect to the UIC Asset Management Framework in Figure 4 the Route Asset Plans are the equivalent of the generic Asset Management Plans identified in ISO 55001 and it is our interpretation, for railway infrastructure organisations, that this clause encompasses Route Delivery Plans and Timetable & Access Planning, as well as the Execution of Work and Network Operation.

‘Shall’ Statement 8.1-1 – Planning Actions Processes, Documentation, Risk Management and Controls

Considerations for Railway Infrastructure Organisations

- In this context the term ‘Operations’ means all actions undertaken by the organisation to implement the Asset Management Plans. This includes design, construction, maintenance and what most rail infrastructure organisations would call Operation of assets, as well as enablers. It effectively requires the organisation to implement the defined plan through the design and implementation of effective management controls.
- This topic is large in its own right and closely related to other clauses, particularly clauses 6, 9 and 10, and what those clauses cover is not repeated here
- Some key guidelines that the organisation should observe to meet the requirements of this clause include:
 - Those functions implementing the Asset Management plans – often called the ‘delivery’ functions - should adequately understand the organisation’s Asset Management strategies, plans, frameworks, processes, and procedures, as required by their roles and responsibilities.
 - Operational plans should be consistent and aligned to the Asset Management Plans and decision making criteria.
- For a rail infrastructure organisation this clause is likely to cover a large number of functions and processes – many of which may already work effectively, even in an organisation new to Asset Management. Most important in this context is the relationship between planning and delivery, co-ordination between functions, and alignment of decision processes to asset interventions.

'Shall' Statement 8.1-1 – Planning Actions Processes, Documentation, Risk Management and Controls

Recommended Evidence

- Generally, evidence about lifecycle processes and strategies from design, construction, procurement, handover, operations, maintenance, refurbishment, decommissioning to disposal, and their alignment with Asset Management strategies, objectives and plan
- Demonstration of alignment of execution of work to Asset Management objectives as per the 'Asset' element of the UIC Asset Management Framework in Figure 4
- Formal requirements process / approach / analysis (RAMS or other approach)
- Example programme business cases and supporting assessment and studies
- Evidence of bundling or optimisation of activities
- Programme management processes or approach
- Project management processes or approach
- Systems Engineering Management Plan (SEMP) or equivalent
- Maintenance Requirements Analysis process
- Maintenance work management control process or system
- Appropriate 'missed maintenance' guidance in maintenance standards or procedures
- Flow of information back from the field, e.g. through completed forms or via mobile devices, and including close-out of work orders
- Management of 'defects' - reports, targets and review cycles
- Evidence that front line staff understand and interpret the standards consistently
- Outage management planning processes and approaches
- Post investment appraisal reports
- Processes for the disposal of assets

2.8.2 Clause 8.2 – Management of change

This clause relates to the identification, assessment, mitigation and monitoring of any risks associated with change, whether that be to the asset base, the organisation, stakeholder requirements or any other factor that could affect the Asset Management System and the achievement of overall corporate objectives. It seeks to ensure that where projects are implemented or any other changes occur, a formal and consistent risk management approach is applied (see Clause 6.1) to manage any related uncertainty of impact on objectives. The organisation should also learn from changes it implements and ensure this is captured in the overall plan-do-check-act format of the Asset Management System.

‘Shall’ Statement 8.2-1 – Planned Change Risk Identification and Evaluation

‘Shall’ Statement 8.2-2 – Planned Change Risk Controls and Implementation

‘Shall’ Statement 8.2-3 – Planned Changes Control and Post Implementation Assessments

Considerations for Railway Infrastructure Organisations

- The basic requirement is to risk assess and manage any changes that might affect the ability of the Asset Management System to achieve its objectives.
- Changes to be considered should include but may not be limited to:
 - Change factors external to the Asset Management System (such as political and physical environmental factors, regulatory requirements, competition).
 - Change factors internal to the Asset Management System (such as employees’ expectations and needs, training requirements, culture or mind-set shifts).
 - Asset-based change (such as changes from the initial design during construction, components changes, technology obsolescence).
 - Non-asset change (such as changes to route or corridor criticality, or development of best appropriate Asset Management practices).
 - Changes that are anticipated / planned, in other words structured and planned changes to organisational structure, strategy, and objectives.
 - Changes that are unanticipated / unplanned, such safety incidents or adverse weather affecting passengers or others.
- A good general approach is ‘plan-do-check-act’, where this clause refers to how an organisation ‘acts’ on change or requirements to change.

<p>‘Shall’ Statement 8.2-1 – Planned Change Risk Identification and Evaluation ‘Shall’ Statement 8.2-2 – Planned Change Risk Controls and Implementation ‘Shall’ Statement 8.2-3 – Planned Changes Control and Post Implementation Assessments</p>	
<p>Recommended Evidence</p>	<ul style="list-style-type: none"> • Change management policy, process and guidance, including the assessment, evaluation and control of planned change risks • Specification of changes that have to be formally managed by the Management of Change process • Criteria for identifying a material change • Specific change management procedures or process at the asset level (e.g. asset registration or configuration updates) • Examples of risk assessments associated with projects • Examples of management of risks and integration into other aspects of the organisation’s management systems • Examples of formal change control from identification of risks through to closure

2.8.3 Clause 8.3 – Outsourcing

This clause relates to the third party delivery of Asset Management activities such as operations, maintenance, or capital projects, which are relatively common in railway infrastructure organisations. It seeks to ensure that outsourcing and third party management is undertaken in a controlled manner, risk assessed, appropriately specified, monitored and that accountability for the outsourced activities remains within the organisation itself.

<p>‘Shall’ Statement 8.3-1 – Outsourced Activities Risks ‘Shall’ Statement 8.3-2 – Outsourced Activities Controlled ‘Shall’ Statement 8.3-3 – How Outsourced Activities are Controlled ‘Shall’ Statement 8.3-4 – Outsourced Activities Scope, Roles & Responsibilities, and Knowledge Sharing ‘Shall’ Statement 8.3-5 – Outsourcing Performance</p>	
<p>Considerations for Railway Infrastructure Organisations</p>	<ul style="list-style-type: none"> • There are a broad range of outsourcing models across railway infrastructure organisations, from all asset intervention activities being outsourced to all activities being undertaken ‘in-house’ and numerous variants in between. • The basic requirement is to ensure control of outsourced activities is at least as good as control on internally delivered activities. • The language of this clause suggests the major issue is about the decision to outsource an Asset Management activity to a third party, but equally important is how third party suppliers and contractors are managed once an activity is outsourced.

‘Shall’ Statement 8.3-1 – Outsourced Activities Risks**‘Shall’ Statement 8.3-2 – Outsourced Activities Controlled****‘Shall’ Statement 8.3-3 – How Outsourced Activities are Controlled****‘Shall’ Statement 8.3-4 – Outsourced Activities Scope, Roles & Responsibilities, and Knowledge Sharing****‘Shall’ Statement 8.3-5 – Outsourcing Performance**

- Key factors for consideration include:
 - Clear definition of contractual boundaries and responsibilities
 - Clarity of exactly what activities are being outsourced and that there is clear alignment with relevant Route Plans, Asset Strategies and overall objectives
 - The definition and flow of asset information between the service provider and the railway infrastructure organisation and vice-versa, including compatible procedures, formats, systems and ownership
 - Assessment of risks associated with outsourcing and appropriate control of the outsourced activities which should be effectively integrated into the railway infrastructure organisation’s Asset Management System to assure they contribute to achieving Asset Management objectives
- Regardless of the reasons for outsourcing, the rail infrastructure organisation will ultimately own the service risks (to stakeholders and customers) of the elements outsourced, managing residual risks after the elements have been outsourced, and also assume risks from outsourcing itself.

Recommended Evidence

- Outsourcing policy
- Outsourcing strategy and requirements
- Business cases, risk assessments and contractual assurance arrangements for outsourcing
- Contract monitoring processes, metrics and incentive/penalty mechanisms
- Evidence of application within specific contracts
- Procurement or Outsourcing Policy or equivalent/s
- Place of 3rd party in Resourcing strategy or equivalent
- Examples of risk assessment for outsourcing

2.9 CLAUSE 9: PERFORMANCE EVALUATION

2.9.1 Clause 9.1 – Monitoring, measurement, analysis and evaluation

This clause seeks to ensure appropriate processes, requirements and technology, as appropriate, are in place to enable the monitoring and measurement of the delivery of Asset Management Plans, the implementation of the Asset Management System, the achievement of Asset Management objectives and, subsequently, overall objectives.

‘Shall’ Statement 9.1-1 – Performance Measurement Scope and Method

‘Shall’ Statement 9.1-2 – Performance Evaluation & Reporting

‘Shall’ Statement 9.1-3 – Performance Evaluation Effectiveness Reviews

‘Shall’ Statement 9.1-4 – Performance Evaluation Documentation

‘Shall’ Statement 9.1-5 – Performance Evaluation Linkage to Stakeholder Requirements

Considerations for Railway Infrastructure Organisations

- Typical top level performance evaluation for rail organisations is focused around safety, delivery against plan, capacity, journey time, connectivity, punctuality, customer experience, delivery and enhancements, network availability and train paths and, increasingly, environmental sustainability.
- A comprehensive suite of performance measures should be implemented in order to:
 - Provide a measure of how effectively each component of the Asset Management System is being implemented, for example, the execution of work against plans and budgets
 - Provide measurements of the impact of the implementation of the Asset Management System on the performance of the infrastructure, for example, condition, failures, capability, service impact, costs, etc.
- The measures should be selected to provide leading and lagging indicators and to provide insight into the impacts of strategic decisions and their tactical implementation.
- Many rail infrastructure organisations will already have in place a developed performance management framework for Operations and for asset performance. Compliance with this clause will then be to ensure those performance management measures and reporting align with both the corporate objectives and the Asset Management objectives, strategies and plans.
- More challenging can be to show how the organisation measures the effectiveness of the Asset Management policy, strategies and plans, and any specific Asset Management teams, and how to demonstrate not only whether the assets are performing today, but have confidence that they will continue to perform in the future, e.g. through ‘asset stewardship’ or ‘asset health’ reports.

‘Shall’ Statement 9.1-1 – Performance Measurement Scope and Method

‘Shall’ Statement 9.1-2 – Performance Evaluation & Reporting

‘Shall’ Statement 9.1-3 – Performance Evaluation Effectiveness Reviews

‘Shall’ Statement 9.1-4 – Performance Evaluation Documentation

‘Shall’ Statement 9.1-5 – Performance Evaluation Linkage to Stakeholder Requirements

Recommended Evidence

- Work delivery measures and regular reports
- Financial performance measures and regular reports
- Asset Performance measures and regular reports
- Asset Condition measures and regular reports
- Asset Stewardship/ Health measures and regular reports
- Evidence of forecasts of the asset performance and health measures
- Use of performance evaluation to drive corrective, preventative and continual improvement actions across the Asset Management System (see Figure 4).

2.9.2 Clause 9.2 – Internal Audit

This clause seeks to establish that a co-ordinated, systematic and risk based approach to Asset Management system audit is established, implemented and the outputs fully closed out.

‘Shall’ Statement 9.2.1-1 – AMS Audits	
‘Shall’ Statement 9.2.2-1 – AMS Audit Programme	
Considerations for Railway Infrastructure Organisations	<ul style="list-style-type: none"> • The intention of internal audits is to assure that what is defined within the Asset Management System is being implemented and that any non-conformities are identified, captured, prioritised and managed through to completion. • A systematic programme of audits should be implemented in order to confirm that: <ul style="list-style-type: none"> - The major components of the Asset Management System have been implemented and are being maintained - The target levels of capability for each component are being achieved - Asset management standards are being complied with • The audit regime should be risk based, focussing on areas where gaps in the Asset Management System or non-compliances have a material impact on organisational or Asset Management objectives. • Many rail infrastructure organisations will already have effective internal technical and financial auditing in place. • Though this section is titled ‘internal’ audit, these audits do not need to be conducted by employees of the organisation. These audits can be completed by external providers against the specification and audit program developed by the organisation.
Recommended Evidence	<ul style="list-style-type: none"> • Internal audit process and procedure • Audit findings register and evidence of follow-up and closure • Audit reports • Evidence of communication and agreement of audit findings • Use of audits to drive corrective, preventative and continual improvement actions, as per the UIC Asset Management Framework in Figure 4 • Internal auditor training

2.9.3 Clause 9.3 – Management Review

This clause is closely related to clauses 5.1 and 10.3 and seeks to ensure the appropriateness and fitness-for-purpose of the Asset Management System is subject to top management scrutiny in a systematic and regular manner.

‘Shall’ Statement 9.3-1 – Management Reviews

‘Shall’ Statement 9.3-2 – Management Review Scope

‘Shall’ Statement 9.3-3 – Management Review Outcomes

‘Shall’ Statement 9.3-4 – Management Reviews Documentation

<p>Considerations for Railway Infrastructure Organisations</p>	<ul style="list-style-type: none"> • The outputs of audit regimes, performance evaluation and other key sources of feedback should be regularly reviewed by management to: <ul style="list-style-type: none"> - Identify gaps in the implementation of the Asset Management System - Identify the root causes of deviations in performance measures against target values - Confirm that the implementation of the Asset Management System is driving sustainable performance, costs and risk levels - Identify actions for short-term improvements of the performance of the infrastructure, where required, and longer-term continual improvement of the components of the Asset Management System, including any changes to the overall framework • Many rail infrastructure organisations will already have substantial management reporting and ‘reviews’ – such as regular daily, weekly or monthly meetings where reports are reviewed and acted upon - in place for Operational performance, expenditure, safety and other key objectives.
	<ul style="list-style-type: none"> • Reviews of the Asset Management System should include: <ul style="list-style-type: none"> - Key changes to the organisation’s environment and their impacts on the Asset Management System that need to be evaluated and actioned - Performance monitoring of Asset Management Objectives and other key metrics (see also 9.1) • An Asset Management Steering Committee or equivalent that comprises senior executives and managers across the key functional departments of the Asset Management System would typically be responsible for ensuring the fitness for purpose of the Asset Management System through a periodic (typically annual) management review process.

<p>‘Shall’ Statement 9.3-1 – Management Reviews</p> <p>‘Shall’ Statement 9.3-2 – Management Review Scope</p> <p>‘Shall’ Statement 9.3-3 – Management Review Outcomes</p> <p>‘Shall’ Statement 9.3-4 – Management Reviews Documentation</p>	
<p>Recommended Evidence</p>	<ul style="list-style-type: none"> • Management review documentation and evidence of application of findings • Review plans/programmes, including previous findings, required actions and corresponding organisational responses • Use of management review to drive continual improvement actions across the Asset Management System, as defined in the UIC Asset Management Framework - Figure 4 • Relevant quality system plan and quality manual • Board risk and review committee reports

2.10 CLAUSE 10: IMPROVEMENT

2.10.1 Clause 10.1 – Nonconformity and corrective action

This clause seeks to ensure organisations have established and practices processes in place to deal with identified non-conformities and incidents, and ensure close-out of corrective actions.

<p>‘Shall’ Statement 10.1-1 – Asset or AMS Nonconformity Corrective Actions</p> <p>‘Shall’ Statement 10.1-2 – Corrective Actions - Risk Approach</p> <p>‘Shall’ Statement 10.1-3 – Corrective Actions - Documentation</p>	
<p>Considerations for Railway Infrastructure Organisations</p>	<ul style="list-style-type: none"> • A process for managing corrective actions arising from audits, management reviews and other sources should be implemented to remove non-compliances, address short-term improvements in the performance of the infrastructure and deliver longer-term continual improvement of the Asset Management System itself. • The benefits from implementing corrective actions should exceed their costs. The actions should be planned and coordinated with mitigating actions derived from the risk management process.

'Shall' Statement 10.1-1 – Asset or AMS Nonconformity Corrective Actions**'Shall' Statement 10.1-2 – Corrective Actions - Risk Approach****'Shall' Statement 10.1-3 – Corrective Actions - Documentation**

- Although non-conformities and corrective actions can apply across the Asset Management System and include people, process and technology, railway infrastructure organisations are often strong in the area of service incident management. However, a similarly robust approach should be applied across all potential non-conformities in the Asset Management System.
- Non-conformity and corrective actions can apply to assets themselves, to people as they work on the assets, and to any other process within the Asset Management System. For example, many rail infrastructure organisations will have robust process in place to identify and manage asset 'non-conformities' (e.g. asset condition, defect and failure management), and non-conformities in delivery processes, such as failure to close out work orders in the maintenance management system, through technical audits.
- However, the organisation should be able to demonstrate the processes to identify, respond, mitigate and close out both classes of non-conformities at all levels of the Asset Management System. One example is in asset strategies: technical standards or Asset Strategies (see Figure 4) which are non-compliant with current legislation, or non-aligned with the corporate objectives or the Asset Management Policy.
- High performing organisations often have in place electronic information system(s) for tracking types of non-conformities as and when they are identified. These systems are also used to manage these through to action and implementation.

Recommended Evidence

- Corrective action register or database
- Evidence of monitoring and closure of corrective / preventive actions
- Examples of root cause analysis process application in reliability engineering, fault and failure response, and maintenance and defect management
- Contingency or emergency plans

2.10.2 Clause 10.2 – Preventative action

This clause covers the organisation’s proactive targeting of potential asset failures for identification and management, but it also includes proactive management of processes, for example whether there may be issues in planning (i.e. there are not enough resources for the next planning cycle).

‘Shall’ Statement 10.2-1 – Proactive Identification of Potential Performance Failures ‘Shall’ Statement 10.2-2 – Corrective Actions for Potential Performance Failures	
Considerations for Railway Infrastructure Organisations	<ul style="list-style-type: none"> • The first shall statement in Clause 10.2 is testing that organisations are able demonstrate that they have in place processes to identify potential incidents and non-conformities before they occur. • The second shall statement is testing the appropriate application of corrective actions (see Clause 10.1 - Section 2.10.1). • Railway infrastructure organisations often have strong processes in place for asset risks, such as reliability engineering, understanding of strategic failure modes, FMEAs and maintenance requirements analysis. These would nominally be captured in the relevant Asset Strategy (see Figure 4). • There are likely to be multiple ways that a rail infrastructure organisation identifies potential incidents and non-conformities across all phases of the life cycle of the assets, including planning and design (e.g. design standard development based around asset and system reliability), maintenance (e.g. reliability centred maintenance techniques or tracking condition over time) and operations (e.g. tracking degrading asset performance over time). • In relation to the management of the assets, relevant practical actions may include the following: <ul style="list-style-type: none"> - Demonstrate an understanding how the assets / systems fail – such as failure modes and effects analysis - Demonstrate a proactive approach through reliability engineering functions, continual trend analysis, etc. • Demonstrate the relative risk of each of the events leading to a failure, how they relate to service delivery performance and how risk is used to determine what should be monitored – bow-tie diagrams are an option.
Recommended Evidence	<ul style="list-style-type: none"> • Asset Strategies • Reliability analysis (qualitative or quantitative) • Reliability review meetings / minutes • Use of deterioration or degradation modelling • Requirements analysis for preventative maintenance, e.g. through RCM and FMEAs • Condition monitoring of assets

2.10.3 Clause 10.3 – Continual improvement

This clause seeks to close the loop on the Asset Management system and ensure that continual review and improvement are built in to the plan-do-check-act overall management system.

‘Shall’ Statement 10.3-1 – Continual Improvement

<p>Considerations for Railway Infrastructure Organisations</p>	<ul style="list-style-type: none"> • Continual improvement (that is, the process of continually self-evaluating and improving) should be embedded in all processes within the Asset Management System, rather than a stand-alone process. It must be clear that it is part of the culture of the organisation. • It should be considered at all levels, from local ‘problem assets’, through the review and development of asset group and route/corridor strategies, planning and decision making processes, right through to the overall Asset Management system, SAMP, Asset Management Policy and alignment with corporate objectives. • The organisation should actively seek and acquire knowledge about new Asset Management related technology and practices, including new tools and techniques (e.g. development of reliability and predictive technologies during the procurement of new assets or the design of modified assets). • It is often supported by how the organisation identifies improvement opportunities outside of the standard review processes, such as benchmarking, research and development, innovation programmes, etc.
<p>Recommended Evidence</p>	<ul style="list-style-type: none"> • Actions to identify and implement improvement opportunities • Benchmarking reports / initiatives • Management review documentation and evidence of application of findings across the Asset Management System, as defined in the UIC Asset Management Framework - Figure 4 • Membership of industry / sector groups • Innovation/R&D plans

PART 3: IMPLEMENTATION GUIDE

3.1 INTRODUCTION

ISO 55001 requires the commitment of the organisation's top management to make real business changes. Railway infrastructure organisations that are not really interested in improving asset decisions are unlikely to realise the benefits that it can bring.

The real benefits come from implementing an Asset Management System that is aligned and oriented at every point to meeting the organisation's objectives in the most effective and sustainable way. This is likely to mean some profound changes in processes and even in people. This is likely to take significant commitments in time and resources. However, the accrual of benefits can continue well beyond ISO 55001 alignment or certification.

3.2 INDICATIVE IMPLEMENTATION PROCESS

Note: *much of this section has been sourced from the Water Services Authority of Australia (WSAA) ISO 55001 Implementation Guidelines (2015), with kind permission of WSAA.*

The Asset Management framework and system, both its development and implementation, will almost always require both a top down and a bottom up approach. This is because many of the key elements for strategies, plans and delivery will already be in place, if not necessarily aligned.

Experience across high performing rail infrastructure organisations strongly suggest the best way to start is to do a benchmarking assessment of the organisation's Asset Management maturity level – internal or external, quick or thorough. After gaps are identified, the organisation then needs to prioritise improvements in line with corporate priorities, and develop a staged plan for development and implementation over what is usually several years.

In addition, either before, during or after assessment, ensuring that key people have received some training is usual essential in order for them to have a clear and shared picture of what the whole field of Asset Management looks like. Assuming they can find this out on their own is perhaps naïve.

Once an organisation has decided it wishes to move forward, it can also decide whether ISO 55001 compliance is a useful step for them.

An indicative implementation flowchart for implementing ISO 55001 is provided as Figure 7 overleaf.

A generic implementation guide such as this for railway infrastructure organisations requires some base assumptions. There will be different functions, sizes and regulatory regimes, and organisations will be at different stages of maturity with respect to ISO 55001 and Asset Management as a whole. The flowchart is based on the assumptions that the railway infrastructure organisation has:

- Some form of Asset Management framework in place
- Developed and documented many of its Asset Management processes for life cycle management of assets, for example in Operations and Engineering
- Not yet developed an Asset Management System as defined in ISO 55001
- Not yet developed a Strategic Asset Management Plan (SAMP), and requires significant restructuring of existing Asset Management planning processes to achieve the Asset Management objectives.

The implementation flowchart is based on common experiences and starting points, but should not be treated as a fixed process. It should be tailored to the needs of the organisation, its level of maturity and existing degree of alignment with ISO 55001.

For example, an organisation with a high level of maturity in life cycle Asset Management may need to focus more on the management system elements, whereas a less mature organisation or operator is more likely to require a broader approach that deals with all of the elements described in the flowchart. Organisations or operators with a commitment and/or certification to other management systems such as ISO 9001 will need to focus on the extension of management system principles to asset lifecycle processes.

The flowchart commences with defining the initial Asset Management leadership arrangements and roles and responsibilities as a basis for managing and undertaking an initial ISO 55001 Compliance Review. Making the case for change is important – what are the perceived benefits to the organisation and its stakeholders in terms of delivering value from assets? This can be contained in a business case or other justification, which should be approved by the leadership group before progressing to development of an ISO 55001 Implementation Plan.

It then includes all the requirements of ISO 55001 to result in an ISO 55001 Certification Audit. Certification may or may not be an objective of the organisation, but is included for completeness. A ‘roadmap’ beyond ISO 55001 compliance is also recommended, since compliance in itself corresponds to competent, rather than, world-class Asset Management.

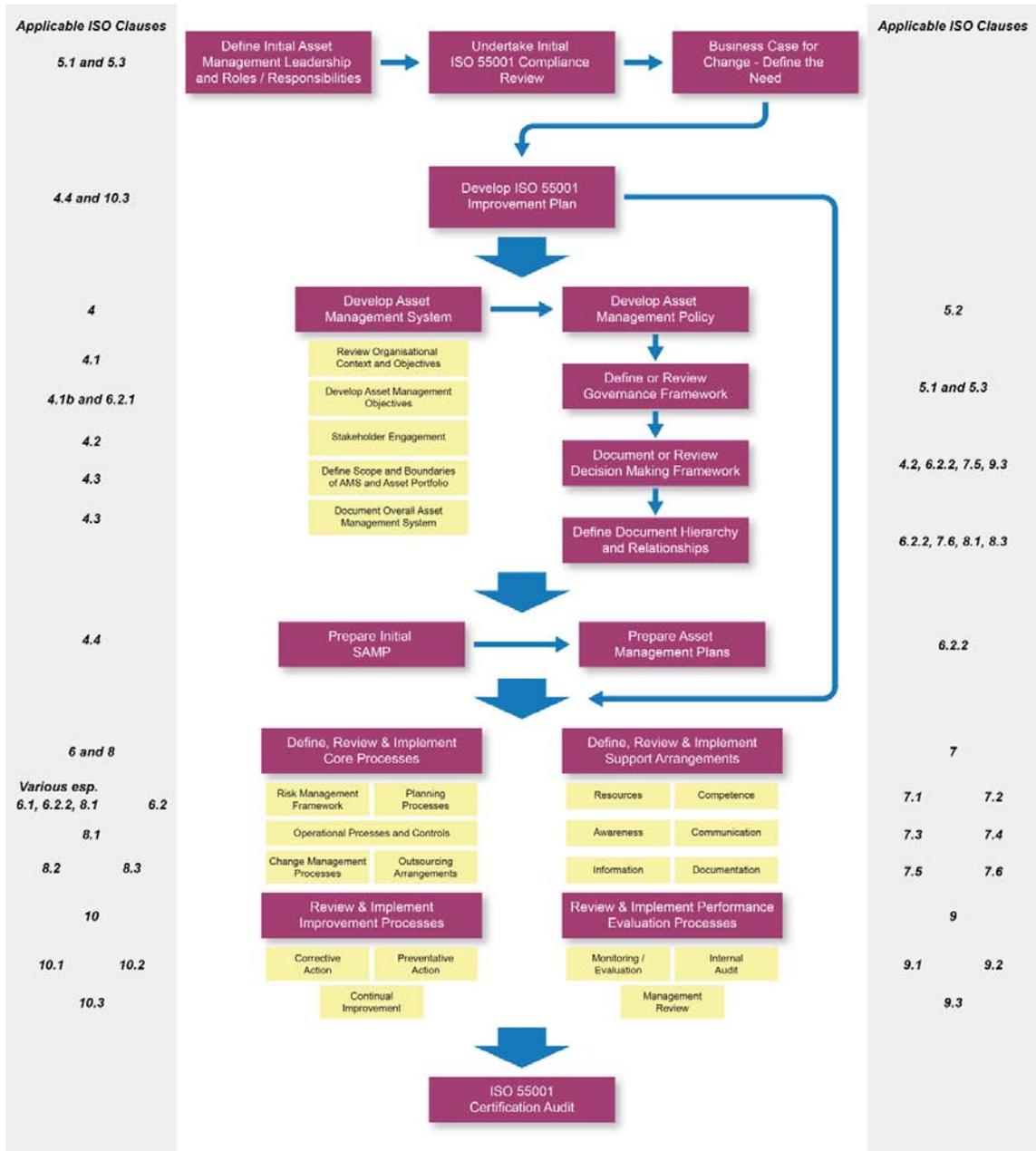


Figure 7: Indicative ISO 55001 Implementation Flowchart

3.3 IMPLEMENTATION TIPS

These implementation tips were identified by WSAA during the development and piloting of its comparable guidelines for the water industry. A number of tips directly relate to the predominant potential nonconformities identified in the pilot test compliance assessment process.

- Demonstrate the benefits. The cost to implement ISO 55001 is a small fraction of a rail infrastructure organisation's capital and operating expenditure. The driver should be business improvement and Asset Management maturity, rather than achieving ISO certification – this is the means rather than the goal.
- Take the leadership team on the journey. Ensure that the leadership team is committed to implementation of ISO 55001. Having a champion for ISO 55001 in the leadership team is a significant advantage. Awareness and understanding by leadership of the benefits and value that an Asset Management system can bring to the agency is an important precursor to this commitment, as well as identifying the expected resource requirements. A stepwise approach may be necessary – treat it as a journey, implementing those aspects that appear to provide the greatest benefits initially to provide the momentum to continue.
- Establish the governance arrangements for the Asset Management system. Line management arrangements are commonly in place for most asset lifecycle processes. Cross-business integration on Asset Management can, however, be limited, for example, to a Capital Works Committee or similar. Review the committee arrangements to determine what governance arrangements best meet the needs of the organisation with respect to decision-making, awareness, communication and management review of the Asset Management system. A Strategic Asset Management Committee or Asset Management Steering Group involving cross-business leadership is a typical approach. Feedback from early adopters of PAS 55 and ISO 55001 is that putting these governance arrangements in place early in the implementation is a significant advantage.
- Define the scope based on what makes sense to the organisation. Develop a good initial definition and description of the Asset Management system (AMS) specifically in terms of its scope, boundaries, functions and processes, and interfaces with other management systems and external service providers and stakeholders. Assess what scope and asset portfolio components will derive most value. This will require interaction and engagement across the full breadth of the organisation, and probably a level of iteration as well to arrive at a reasonable and accepted scope and portfolio.
- Integrate with other management systems where possible. If the organisation is certified to other management systems, or have implemented / seeking to implement an Integrated Management System (IMS), then consider the Asset Management system as complementary to these systems and able to be integrated. The basic Plan-Do-Check-Act (PDCA) process will apply to all of them.

This should reduce time and effort in creation of the Asset Management system and improving cross-functional coordination.

- Understand the document hierarchy. Establish key document relationships and make sure the Asset Management framework fits the purpose and the intended audience for each of them. This will define their scope. Consider the static and dynamic aspects of documents – things that will stay relatively constant, and those things that change constantly (costs, budgets, and performance) to avoid unnecessary updating.
- Consider an Asset Information Strategy. This or a similar document is critical to meeting the requirements of ISO 55001, and will capture and help to ensure that relevant Asset Management information requirements are defined and aligned with Asset Management objectives. The strategy should include documented information management processes (including means of collection, availability, protection and control), a consistent and clear hierarchy and structure (format, attributes, quality) for asset-related information, and the appropriate alignment of financial and non-financial information.
- Invest in people. Competency and capability of people are the means to deliver Asset Management outcomes. Awareness training puts Asset Management in context, and executive briefings can help to gain buy-in from leadership. But also consider what kind of people will succeed, considering:
 - Their ability to co-ordinate, facilitate and even ‘sell’ new processes (or at least their willingness to learn such soft skills)
 - How confident they are in working with technical functions such as Maintenance and Engineering
 - Their business sense
 - Their willingness to change and explore new ways of doing things
 - How comfortable they are with risk – Asset Management is all about planning for the future, so the key people need to ‘embrace uncertainty’
 - Their wiliness to think longer term, and a certain degree of objectivity about asset strategies
- Make a start! Even if you are not aiming for certification, there will be aspects of ISO 55001 that will provide immediate benefits and improve your business. Make a start on these and work to continually improve.

3.4 CERTIFICATION AND AUDIT GUIDE

Note: this section has been sourced from the WSAA ISO 55001 Implementation Guidelines, with kind permission of WSAA.

3.4.1 ISO 55001 Certification Overview

Certifying an organisation's Asset Management system (not the organisation itself) to ISO 55001 requires an external and independent auditor to judge that the organisation has all the basic elements of the standard in place. In many cases this is a straightforward judgement (for example – does the organisation have an Asset Management Policy?) In others it is a more difficult – has the organisation correctly specified the method and criteria for decision making and prioritising its Asset Management Plans? for instance. The following provides guidance on what auditors typically look for, and how agencies should prepare for an audit.

3.4.2 What an ISO 55001 Auditor will typically seek

The approach of individual auditing bodies and auditors will vary. The following provides an overview of the generic focus during an ISO 55001 audit, as identified by a number of experienced auditors:

- **Top-down strategic framework.** ISO 55001 defines a 'top-down' approach to Asset Management, driven by a clear understanding of the organisation's context and stakeholders' needs. To an ISO 55001 auditor, the coherence of this strategic framework, and evidence that it is fostering a long-term, consistent, risk-based and justified approach to the management of the asset portfolio, carries more weight in an audit than the detailed management of individual assets or asset types.
- **Senior level commitment.** An ISO 55001 auditor will expect to see senior-level (or 'top management' as ISO 55001 calls it) commitment to the Asset Management system. Ideally, this commitment should be demonstrated at the most senior level in the organisations (such as the chief executive) but more importantly it should be clear that the scope and management review of the Asset Management system is at a high enough level for it to make a difference to achieving corporate objectives. This is usually at least at the senior executive level.
- **Clear scope.** ISO 55001 requires the organisations to '*establish, implement, maintain and continually improve*' an Asset Management system. It is very important that the scope of this Asset Management system is clearly defined, as if it is not its implementation, maintenance and review will become problematic. An auditor will look for scope definition with respect to physical assets, geography, organisation, suppliers and the relationship to other management systems. This not only clarifies the accountabilities and responsibilities for the

organisation, but helps scope the audit activities (e.g. a supplier does not need to be audited if the boundary of the Asset Management system is set at the outsourcing interface between organisation and supplier).

- **Management system approach.** ISO 55001 is a management system standard and an auditor should be satisfied that all elements are in place, even if imperfectly. It is important that the principles of ‘Plan, Do, Check, Act’ (PDCA) are evident at the correct level in the agency – i.e. that the Asset Management Policy and strategy (or SAMP) are defined and being implemented, that this implementation is being effectively monitored, and that there is a level of management review taking place which considers the full scope of the Asset Management system as defined above.
- **Alignment.** A core requirement within ISO 55001 is for ‘alignment’ between documents and objectives. An auditor will expect to see evidence of this throughout the Asset Management system documentation. For example, the corporate plan or equivalent should be demonstrably aligned to the Asset Management Policy and the SAMP, and these documents aligned to any lower level strategies and plans.
- **Continual improvement.** Continual improvement is a cornerstone of the management system approach described above, and an ISO 55001 auditor would expect to see evidence of continual improvement throughout the organisation. This may be formalised – for example in the continual improvement activities identified through formal management review – or it may be simply evident during interviews that controlled and demonstrable continual improvement is occurring.
- **Enablers.** There are a range of ‘enabling’ strategies or approaches that are important to the implementation of a successful Asset Management system. These include the organisation’s approach to identifying and managing risk, its strategy for resources and competency, its approach to the specification and implementation of asset information systems and the way it engages and communicates with internal and external stakeholders. The auditor will expect to see these enablers clearly defined with respect to the Asset Management system scope, aligned to the achievement of its objectives, and positively contributing to its operation.

3.4.3 How an Organisation should prepare for an ISO 55001 Audit

- **Assign an audit project manager or coordinator.** It is this person’s responsibility to organise and prepare the organisation for the audit. This person may also have been integral in the creation or alignment of the Asset Management system or may be integral to its functioning. It is, however, important they understand their role, and when supporting interviews to allow the auditor to interview without harassment or interruption.

- **Work with the auditor.** During an audit, the job of an organisation is to demonstrate to the auditor that it is compliant with the clauses of ISO 55001. This can be a balance, and is a little dependent on the auditor's style. However, a general rule is that auditors are suspicious if they are spoon fed, but can be frustrated if an organisation makes understanding the truth difficult. The following points will help strike this balance.
- **Develop the audit plan in conjunction with the auditor.** To ensure full coverage of all ISO 55001 clauses, and to ensure that sufficient space is available between interviews and for summing up at the end, work with the auditor to develop the plan. Ensure the full scope of the Asset Management system is included (and no more) and that sufficient weight is applied to each interview. Think about the order of the interviews – it is usual to start with the owner of the Asset Management system and to set the strategic context of the organisation before descending into the detail of planning and delivery. Make time for opening and closing meetings, think what the objectives of these are, who will attend, and ensure the auditors have time prior to the closing meeting to prepare their findings and certification recommendation.
- **Don't hide anything.** A good auditor will test and question things that don't sound right, cross-correlate individual interviewees, and request evidence to back up statements. In general, do not try to hide anything or try to bluff. If you know there are gaps in your Asset Management system compliance, it is much better to acknowledge that, and have a clear plan for rectification in place to present as evidence. You are likely to pick up nonconformities, but are unlikely to fail.
- **Ensure everyone understands what's required of them.** Preparation is very important to ensure that the pitfalls and guidance set out above are understood by everyone who is to be interviewed. It is good practice to ensure all interviewees are briefed and to ask that each interviewee comes prepared with a short presentation and supporting evidence. However, also ensure the session is long enough and the interviewee is flexible enough to allow the auditor to develop lines of questioning to ensure he or she is fully satisfied they have been able to cover the scope required.
- **Keep track of session attendance and evidence requested.** As the audit progresses, evidence is likely to be requested and interview attendance is likely to change, or additional interviews are likely to be identified. The audit project manager or coordinator should be sufficiently organised to track all of this and provide information promptly when requested.

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