

MANAGING OPERATIONAL SAFETY IN ALL PHASES OF THE LIFE CYCLE OF RAILWAY OPERATIONS

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ABSTRACT

The National Railway Safety Regulator Act, 2002 was developed to create the Railway Safety Regulator to oversee the safety of railway operations. In the intervening years since its promulgation the need has been identified for the Railway Safety Regulator to be informed and involved throughout the life cycle of the operation, and in particular in the phases of design, construction and commissioning. This paper addresses the need for regulations covering these aspects and the advantages to both Permit Holders (Operators) and the Railway Safety Regulator.

1. BACKGROUND TO THE CREATION OF THE RSR

The Railway Safety Regulator (RSR) came into existence in 2002 by virtue of the National Railway Safety Regulator Act, 2002 (Act 16, 2002) (NRSR Act). The Department of Transport had recognised the need for a safety regulator for the rail sector because the dominant operator, Spoornet, could no longer be both “player” and “referee” in a changing railway landscape, and the existing safety legislation did not cater adequately for the dynamics associated with railway operations. Both the Occupational Health and Safety Act (Act 85, 1993) and Mines Health and Safety Act (Act 29, 1996) are therefore complemented by the NRSR Act.

2. MANAGING AND OVERSEEING SAFETY

2.1. BRIEF OVERVIEW OF RELEVANT FEATURES OF THE NRSR ACT

The NRSR Act embraces one fundamental principle: railway operators are responsible for managing safety and security, and the RSR will oversee safety and fulfil a supporting role in respect of security.

In order to manage safety in a structured and formalised way, operators are required to have a fully documented and implemented Safety Management System (SMS). The content of the SMS is directly proportional to the size and complexity of the railway operations, which in turn determine the risks to be managed.

The NRSR Act requires all operators to be in possession of a Safety Permit, which is currently valid for a period of 3 years.

Based on his SMS, the operator has to develop a SMS Report for submission to the RSR

together with his application for a Safety Permit. The RSR assesses the application and once satisfied with the content of the SMS Report issues a Safety Permit, with or without conditions.

At this point the RSR is in a position to oversee the safety of the railway operations, by:

- Conducting inspections and audits;
- Receiving information on railway occurrences;
- Undertaking occurrence investigations;
- Monitoring implementation of corrective actions arising from audits, inspections, and investigations;
- Receiving and monitoring implementation of undertakings in the annual Safety Plan; and
- Monitoring the operator addressing the conditions of the Safety Permit.

2.2. REGULATIONS

2.2.1. At the time of writing, the only regulations that have been published are the Railway Safety Management Regulations, 2004.

These Regulations cover the following:

1. The elements of the operator's SMS;
2. The elements of the operator's SMS Report, which is to accompany the application for a safety permit;
3. The conditions that require amendment of the SMS and SMS Report;
4. The reporting of railway occurrences to the RSR;
5. Information to be provided in order to assess the safety performance of the operator.

2.2.2. Several additional regulations are envisaged, which are listed for completeness:

2.2.2.1. Dangerous goods regulations to amplify the functions of the RSR as the competent authority for the transportation of dangerous goods by rail;

2.2.2.2. Safety Permit Fee regulations which will indicate the basis of the calculation of the fee for a safety permit for various risk categories of railway operator.

2.2.2.3. Railway safety standards development regulations which explain the processes to be followed in the development of standards. The publication of these regulations is imminent.

2.2.2.4. Railway design, construction and commissioning regulations which will address the involvement of the RSR in the life cycle phases prior to the

commencement of operations. [It is the content and implications of these proposed regulations that will be discussed later in this paper].

2.3. STANDARDS

The RSR has embarked on a programme in collaboration with the railway industry, and in terms of a Memorandum of Understanding with Standards South Africa, to develop a series of high level standards for the management of safety. This series will form the backdrop for the development of more detailed technical and operational standards, including human factors management.

2.3.1. The South African National Standard: Railway Safety Management: Part 1: General (SANS 3000-1: 2005). This standard provides the detail of the elements contained in the Railway Safety Management Regulations, 2004 (see 2.2.1 above).

2.3.1.1. Chapters 6 to 11 describe the elements of a SMS, and provide guidance for development of these elements as part of the operator's SMS.

2.3.1.2. Chapters 12 and 13 describe what has to be included in the SMS Report for submission to the RSR in order to obtain a Safety Permit.

2.3.1.3. Chapter 14 covers the need to advise the RSR of changes to the SMS and SMS Report.

2.3.1.4. Chapter 15 describes the categories that occurrences are to be captured and reported to the RSR.

2.3.1.5. Chapter 16 describes the information to be provided and the frequency that such information has to be supplied.

2.3.1.6. Of particular relevance for this paper is the need to have procedures for the management of safety prior to the operational phase, i.e. from design through construction to commissioning and testing prior to the operational phase; i.e. the entire life cycle. This basic shortcoming in the Railway Safety Management Regulations, 2004 and SANS 3000-1 that does not adequately address the need to involve the RSR at the beginning of the life cycle of a project has given rise to the development of draft regulations for the design, construction, and commissioning of new rolling stock, infrastructure and stations.

2.3.1.7. What is currently provided for are the following:

- In the case of a new operator, the RSR needs to receive the application for a Safety Permit 90 days prior to the operation commencing. Such an

application would require full details of the operation as provided for in the above regulations and standards.

- For an existing operator, the RSR has to be advised of any material changes that impact on the SMS and SMS Report 30 days before implementation. A new line, or new rolling stock, or new train control systems are examples of material changes.

2.3.1.8. Clearly these provisions place both the operator or prospective operator and the RSR at risk insofar as the adequacy of the documentation submitted and the RSR's expectations may not be aligned.

2.3.1.9. To date, the RSR has accepted the bona fides of the existing operators and issued permits, with or without conditions, on the basis that the railway operations are "going concerns", and any shortcomings in the SMS and SMS Report will be addressed as per an agreed programme, or as determined as a result of audits, inspections, occurrence investigations, or negative occurrence trends.

2.3.2. With reference in particular to Chapter 10.1 of SANS 3000-1, provision is made for engineering and operational standards covering:

- Track, other civil engineering infrastructure, and electric traction infrastructure;
- Rolling stock;
- Train control systems and equipment;
- Operational systems;
- Railway interface with other modes and utilities.

A series of standards covering these aspects is in the course of preparation, which makes provision for the operator to involve the RSR throughout the life cycle, namely design, construction, commissioning, operation, modification, and decommissioning.

Diagrammatical representation of safety standards is shown on Annex A.

Annex B shows the relationship between SANS 3000-1 and the various standards in the SANS 3000-2 series, as well as the Human Factors Standard, SANS 3000-3.

Annex C indicates the typical life cycle elements that are required to be managed

2.4. THE RAILWAY DESIGN, CONSTRUCTION AND COMMISSIONING REGULATIONS

2.4.1. Introduction

2.4.1.1. To recap, the Railway Safety Management Regulations, 2004 and the South African National Standard: Railway Safety Management: Part 1: General (SANS 3000-1: 2005) focus on existing operations, whilst making provision for changes to the operations, which necessitate changes to the SMS and SMS Report. The RSR needs only to be notified of the changes leaving little or no opportunity to influence or add value to the process. Similarly, new operations to be undertaken by a new operator who has yet to be granted a Safety Permit are inadequately catered for, as the RSR currently needs only to be informed 90 days prior to the operation commencing when the application for a Safety Permit and submission of the SMS Report is due.

2.4.1.2. With the foregoing in mind, it has been realised that for proper governance and enforcement, regulations are required that address the issues.

2.4.2. These regulations are to apply to:

2.4.2.1. Existing permit holders who plan to introduce additional and/or new technology on to their existing operations, or extensions to their existing operations, or for a new operation.

2.4.2.2. Prospective permit holders who plan a new railway operation using new or existing technology;

2.4.2.3. Existing or prospective permit holders who plan to re-introduce dormant or mothballed infrastructure, rolling stock or stations using new or existing technology.

2.4.3. Confidentiality

It is desirable that the RSR should be made aware of such projects at concept stage. The reality is that a permit holder or prospective permit holder may be hesitant to make this information available as it may risk his competitive advantage. A confidentiality provision is envisaged to address this matter.

2.4.4. Design, construction and commissioning life cycle requirements

2.4.4.1. In addition to the requirements of SANS 3000-1 regarding safety standards for engineering and operational systems, the permit holder or

prospective permit holder is required to have systems and documentation covering all phases of the life cycle in terms of SANS 3000-2-1.

2.4.4.2. In particular, the permit holder or prospective permit holder will be required to undertake safety hazard identification and safety risk assessments during the phases prior to the railway operation commencing, namely the design, construction and commissioning phases.

2.4.4.3. In each of the design sub-phases of concept design, preliminary design and detail design, the permit holder or prospective permit holder should undertake a safety risk assessment.

2.4.4.4. During the construction phase, the permit holder or prospective permit holder will need to re-evaluate the hazards/ risks identified in the design phase and update the safety hazard/risk register accordingly.

2.4.4.5. In the commissioning phase, the permit holder or prospective permit holder shall re-affirm the hazards/ risks identified in the design and construction phases, and where modifications to the system are found to be necessary, the associated safety hazards are to be identified and risk assessments conducted. The safety hazard/risk register shall be updated accordingly.

2.4.4.6. At the request of the regulator, a register of the safety hazards/risks identified in each of the life cycle phases shall be provided, including the measures proposed to address these identified hazards/risks;

2.4.4.7. During each life cycle phase, the regulator may request additional information until satisfied that all the safety risks are appropriately addressed.

2.4.4.8. The regulator may issue a statement confirming that there is no objection, from a safety point of view, to proceeding to the next phase of the project.

2.4.5. Operation, maintenance and monitoring, modification, and decommissioning life cycle phases

For completeness, permit holders are then required to comply with the provisions of the Railway Safety Management Regulations, 2004 and SANS 3000-1 for the remaining phases of the life cycle.

2.4.6. Utilisation of appropriate technology

- 2.4.6.1. Prior to the testing of new or modified technology, the permit holder or prospective permit holder has to provide the Regulator with a schedule of the tests, the scope of the tests, a detailed risk analysis including mitigation of the risks. Once satisfied, the Regulator will issue a notice to the effect that the tests may be proceeded with.
- 2.4.6.2. Permit Holders have to ensure that the technology proposed is appropriate for the intended use by obtaining a certificate signed by a registered professional engineer, or by competent organisation recognised and approved by the Regulator.
- 2.4.7. Safety Permits for construction and material trains for new works
 - 2.4.7.1. It is accepted that the risks associated with the operation of construction and material trains are different from the normal operation of trains.
 - 2.4.7.2. Prior to the operation of construction and material trains for new works, including heavy on-track equipment and inspection trolleys, the operator of this rolling stock shall be in possession of a Construction Train Safety Permit. The details of the terms and conditions of such a safety permit are under development.
- 2.4.8. Safety Permits for commissioning of new infrastructure, rolling stock or stations
 - 2.4.8.1. This issue is under debate at present. There may be a need for a Commissioning Safety Permit, particularly in the case of a new operator who still has to apply for a safety permit for his ultimate railway operation. The alternative, which could apply to an existing operator, is to provide the RSR with details of the testing of the new infrastructure, rolling stock or station, as the case may be to comply with the provisions of 2.4.6 above.
 - 2.4.8.2. A further option under consideration is that the permit holder or prospective permit holder should include the commissioning phase in his application for a Safety Permit in the case of a new operator, or as a modification to his existing Safety Permit. The pros and cons are presently under discussion.
- 2.4.9. Advantages to the RSR and Operators
 - 2.4.9.1. The RSR is in a position to positively influence safety issues at all phases of the life cycle;

2.4.9.2. The RSR will not be confronted with “surprises” that will be difficult or extremely expensive to address;

2.4.9.3. It will engender a discipline of hazard identification and risk assessment throughout the life cycle of the railway;

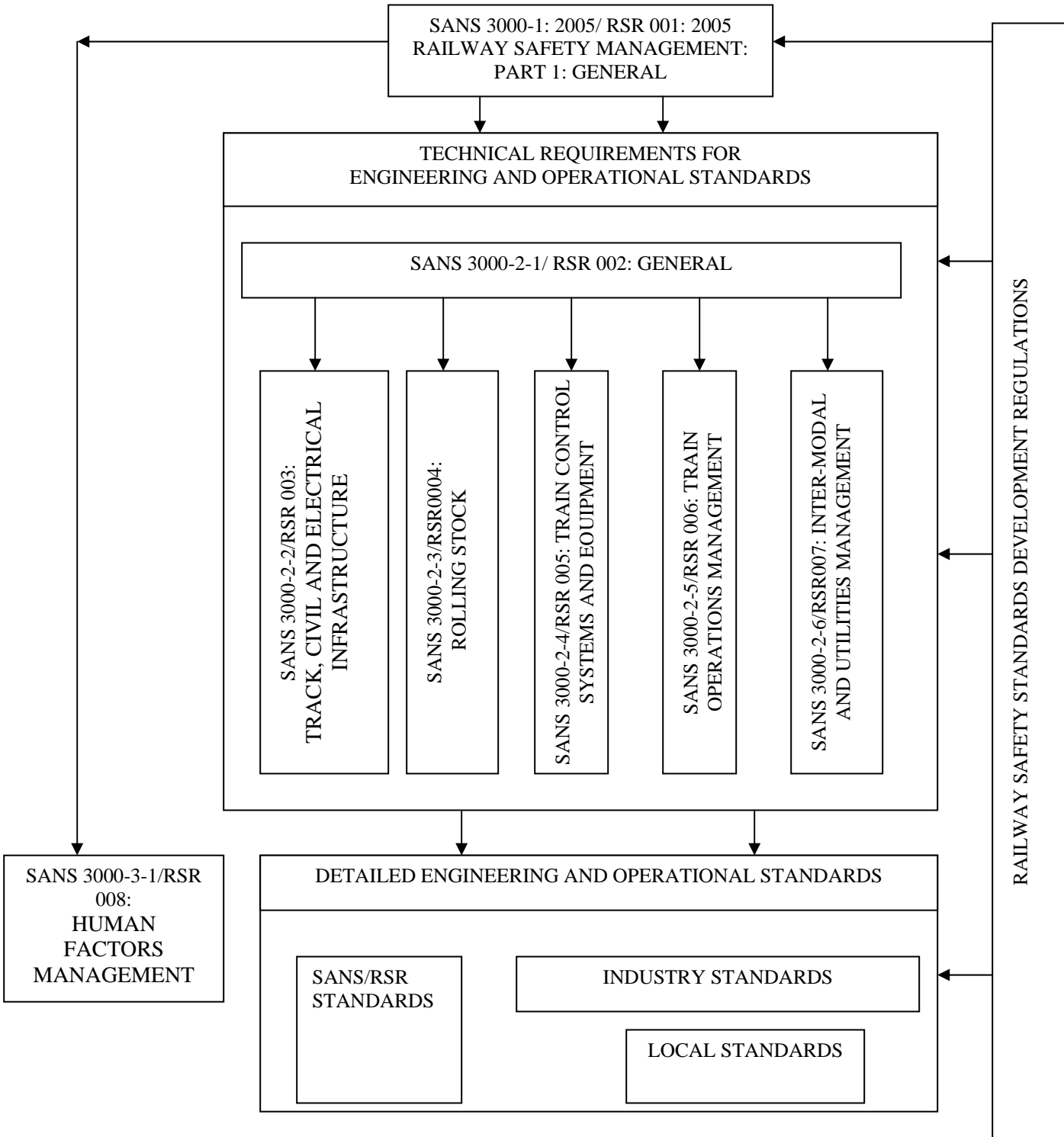
2.4.9.4. It should provide the operator with additional comfort that an independent institution has viewed the safety hazards from another perspective.

2.5. Conclusion

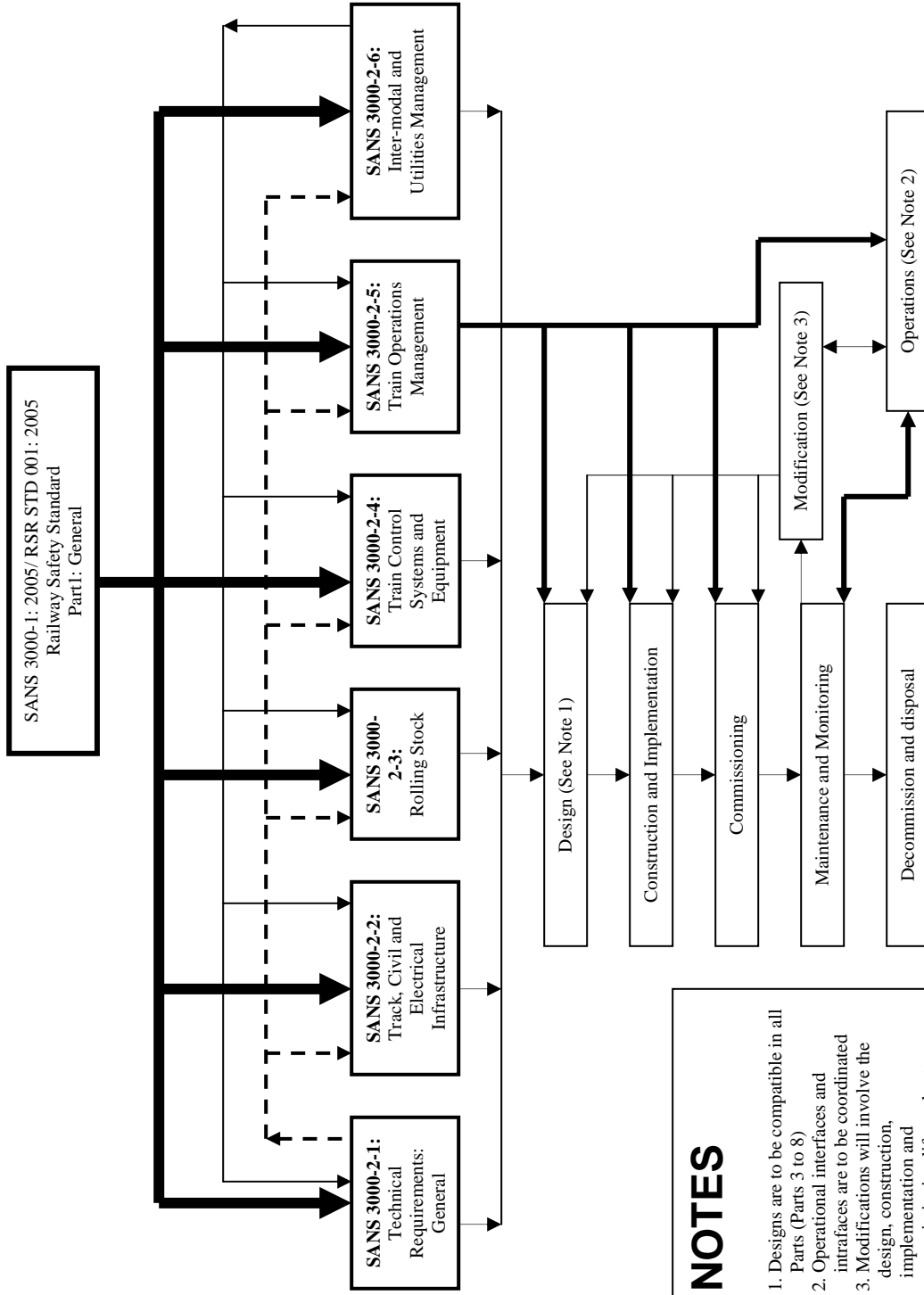
The management of safety throughout the entire life cycle of a project is advantageous to both the RSR and operators and should be viewed as an opportunity by all parties as a fundamental process to reduce railway occurrences thereby improving safety performance of railways in South Africa.

Annex A

CASCADE OF STANDARDS ON RAILWAY SAFETY



Annex B



NOTES

1. Designs are to be compatible in all Parts (Parts 3 to 8)
2. Operational interfaces and intrafaces are to be coordinated
3. Modifications will involve the design, construction, implementation and commissioning life cycle stages

ANNEX C

TYPICAL LIFE CYCLE PHASE DESCRIPTIONS AND DOCUMENTATION REQUIREMENTS

Life cycle phase	Description	Documentation Requirements (where applicable)
Design	The period during which a design for a system is created and documented.	User Requirement Specification System specification Product Specification Process specification Material specification Detail design documents Engineering drawings Type test results Hazards register Risk assessment and control register
Construction/ manufacture	The period in which the system is procured and physically constructed.	Safe working procedures in accordance with safety, health and environmental legislation Manufacturing drawings Construction drawings Evaluation of deviation from design parameters Re-evaluation of hazards, updating hazards register Risk assessment and control register
Commissioning	The period in which the system is integrated into its operational environment and tested in its environment.	Safe working procedures in accordance with safety, health and environmental legislation Test and commissioning procedures and instructions Integration and test phase report Test/Acceptance certificates 'As-built' system documentation Re-affirmation of hazards, updating of hazards register Risk assessment of modifications during commissioning
Operations	The period during which the system is utilized in its operational environment	Safe working procedures in accordance with safety, health and environmental legislation Operational standards Inter/Intra and Inter modal interface agreements Training manuals Training courses Inspection reports Audit reports On-going risk assessment
Maintenance & monitoring	The period during which the system is maintained and monitored in line with business, operational and safety requirements	Safe working procedures in accordance with safety, health and environmental legislation Maintenance standards Inter/Intra and Inter modal interface agreements Maintenance procedures Maintenance manuals Drawings Training manuals Training courses Inspection reports Audit reports On-going risk assessments
Modification	The period during which the system undergoes modification if required	The required documents, depending on the scope of work, are the same as those for design, construction/ implementation and commissioning. Revised applicable operational documents Revised applicable maintenance documents Risk assessment of proposed changes
Decommissioning and disposal	The period during which the system is removed from active service and disposed of.	Safe working procedures in accordance with safety, health and environmental legislation Decommissioning and disposal strategy. Test and decommissioning procedures and instructions. Decommissioning and disposal report Risk assessment of implication to existing operations