Railway
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Edition 1

REGULATOR STANDARD

RAILWAY SAFETY MANAGEMENT

Pedestrian crossings facilities

ISBN 978-0-620-68724-9

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REGULATOR STANDARD
Railway Safety Management

Pedestrian Crossing Facilities

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This standard was researched and developed by the Railway Safety Regulator's Standards Technical Committee (TC RSR-001) and Working Group on Pedestrian Crossing Facilities (WG RSR 00-2-2-2).

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Railway Safety Management

Pedestrian crossing facility

NOTE: It is essential that this document is read together with the South African National Standards: SANS 3000 series of standards.

Table of changes

Edition and version number	Date	Scope

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Foreword

This Regulator Standard was developed and approved by the *Technical Committee for the Development of Regulator Standards for Railway Safety* (TC RSR-001), in accordance with the *National Railway Safety Regulator Act* (Act No 16 of 2002) (as amended), the Railway *Safety Standards Development Regulations, 2006.*

This document extends and augments the "SANS 3000" series of standards pertaining to railway safety that are published by the South African Bureau of Standards on behalf of the Railway Safety Regulator and in particular SANS 3000 series of standards. This document should be read in conjunction with the *National Railway Safety Regulator Act* (Act No16 of 2002*)* (as amended), relevant Regulations and standards.

The SANS 3000 series of standards presently consists of the following parts, under the general title of Railway Safety Management:

Part 1: Railway safety management – General.

Part 2-1: Technical requirements for engineering and operational standards – General

Part 2-2: Technical requirements for engineering and operational standards – Track, civil and electrical infrastructure.

Part 2-2-1: Technical requirements for engineering and operational standards – Track, civil and electrical infrastructure – Level Crossings (in course of revision)

Part 2-3: Technical requirements for engineering and operational standards – Rolling stock.

Part 2-4: Technical requirements for engineering and operational standards – Train authorization, and control, and telecommunication.

Part 2-5: Technical requirements for engineering and operational standards – Operational principles for safe movement on rail.

Part 2-6: Technical requirements for engineering and operational standards – Interoperability, and interface and intrafaces management.

Part 4: Human factors management.

The RSR 00 series of standards presently consists of the following parts, under the general title of *Railway Safety Management:*

Part 2-3-1: Technical requirements for engineering and operational standards – Rolling stock – Wheels, axles and bearing.

Part 2-7: Technical requirements for systemic engineering and operational safety standards – Railway Stations

Part 3: Railway occurrence management.

Part 4-1: Human factors management– Fatigue management.

Part 2-2-2: Pedestrian crossing facility (this standard)

Where reference is made to a specific published date, version or edition of a document, then that version of the document shall apply. Where reference is made to a document without specifying a date, version or edition, then it should be assumed that the latest published version shall apply.

Where reference is made in this document to the “relevant national railway safety regulator”, in South Africa this shall mean the “Railway Safety Regulator” as established in terms of *National Railway Safety Regulator Act (*Act No.16 of 2002) (as amended).

Where reference is made in this document to the “relevant national legislation”, in South Africa this shall mean the *National Railway Safety Regulator Act* (Act No.16 of 2002) (as amended), the *Occupational Health and Safety Act* (Act No. 85 of 1993), the *Mine Health and Safety Act* (Act No. 29 of 1996), and the *National Environmental Management Act* (Act 107 of 1998) including their amendments, regulations and schedules.

Introduction

This document has been developed primarily with a view of achieving uniformity in the management of safety at pedestrian crossing facilities, both as a general principle and with specific reference to ensure the safe usage and management of pedestrian crossing facilities.

Key to safety at pedestrian crossing facilities is an appropriate risk assessment management methodology that aims to ensure that developers/agents or network operators (or a combination thereof) identify their physical environment, technical and operational hazards and manage the resultant risks to pedestrians, property and the environment to a level that is as low as is reasonably practicable (ALARP) with a clear understanding of their accountability, roles and responsibilities.

This approach recognizes that, whilst there is an ideal level of safety, the costs of achieving this might far outweigh the benefits and limit the viability of safe railway operations. However, it is understood that developers/agents or network operators (or a combination thereof) address their commercial and social responsibilities by providing the appropriate level of protection to ensure safety at pedestrian crossing facilities.

This document outlines a common approach to the management of the interfaces between developers/agents, network operators and other interested and effected parties and intrafaces within an operator's activities that are crucial for ensuring safety at pedestrian crossing facilities.

Contents

Railway safety management

Part 2-2-2:

Requirements for systemic engineering and operational safety standards — Track and associated civil infrastructure and installations - Pedestrian crossing facilities

1 Scope

1.1 This standard describes the minimum requirements for pedestrian crossing facilities to be met by developers, agents, network operators, and where relevant train operators, other relevant and affected parties (or any combination thereof) to accomplish the required levels of safety and performance for those operations throughout their life cycle.

1.2 The standard amplifies the requirements for the relevant operator's Safety Management Systems (SMS) in compliance with the relevant national legislation (see foreword) and to meet the requirements of relevant regulations, SANS 3000 series of standards, regulator safety standards and related documents, including the guidance documents for the various types of safety permits.

1.3 This standard applies to developers/agents or network operators, and where relevant train operators, other relevant and affected parties (or any combination thereof), as defined in the relevant national legislation (see foreword).

1.4 It clarifies the role(s) of developers/agents or network operators, and where relevant train operators, other relevant and affected parties (or any combination thereof) in respect of their responsibilities in terms of pedestrian crossing safety.

1.5 This standard applies to proposed pedestrian crossing facilities.

1.6 This standard shall be read in conjunction with the applicable legislation, relevant regulations and other relevant national and regulator safety standards.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies. Information on currently valid national and international standards can be obtained from the SABS Standards Division and the RSR Standards Division.

2.1 Standards

SANS 3000-1: *Railway safety management* -General.

SANS 3000-2-1: Requirements for systemic engineering and operational safety standards – Electrical distribution and overhead traction systems.

SANS 3000-2-2: Requirements for systemic engineering and operational safety standards – Track and associated civil infrastructure and installations.

SANS 3000-2-2-1: Requirements for systemic engineering and operational safety standards – Track and associated civil infrastructure and installations – Level Crossing

SANS 3000-2-3: Requirements for systemic engineering and operational safety standards – Rolling stock.

SANS 3000-2-4: Technical requirements for engineering and operational safety standards – Train authorization, and control, and telecommunication.

SANS 3000-2-5: Technical requirements for engineering and operational safety standards - Operational principles for safe movement on rail.

SANS 3000-2-6: Technical requirements for engineering and operational safety standards –Interface and intraface management, and interoperability.

SANS 3000-4- Human Factors

SANS 10007/ISO 10007, *Quality management systems – Guidelines for configuration management*.

2.2 Other publications

The RSR 00 series of standards presently consists of the following parts, under the general title of Railway Safety Management:

Part 2-3-1: Technical requirements for systemic engineering and operational safety standards – Rolling stock – Wheels, axles and bearing.

Part 2-7: Technical requirements for systemic engineering and operational safety standards – Railway Stations.

Part 003: Railway occurrence management.

Part 4-1: Human factors management– Fatigue management.

3 Definitions

For the purposes of this document, the following definitions apply.

3.1

accountability
obligation or willingness, which cannot be shared, to accept ultimate responsibility or to account for one's actions

3.2

affected party
a person referred to in the relevant National Railway Safety Legislation (see foreword) comprising developers and agents including operators, potential operators, contractors, manufacturers, suppliers, service providers, logistics operators, maintainers, or any other person who may be affected by, or affects, or may affect the safety of railway operations

3.3

agent"
a natural or juristic person, or who acts or has the power and authority to act on behalf of the developer, or other involved parties, by means of a direct contract or a sub-contract, for the performance of any activity related to one or more of the life cycle phases of system or a railway system as applicable and includes an Operator as defined in relevant National Railway Safety Legislation

Note 1: operator means a network operator, train operator or station operator or a combination of two or three of them.
Note 2: Life cycle phases means the concept, design, execution (manufacture or construction), testing and commissioning, operation, monitoring, maintenance, modification, decommissioning and disposal phases of projects, products, processes, procedures and assets which constitute a railway operation;
Note 3: agents including designers, service providers, executors (manufacturers, constructors, developers, and installers), operators and maintainers

3.4

as low as reasonably practical (ALARP) principle
the risk level after mitigation (residual risk) shall be as low as reasonably practicable
Note 1: For a risk to be ALARP it must be possible to demonstrate that the cost involved in reducing the risk further would be grossly disproportionate to the benefit gained.
Note 2: The ALARP principle arises from the fact that infinite time effort and money could be spent on the risk

3.5

competent

having the qualification, knowledge, skills, attitudes and capabilities required to function successfully, effectively and efficiently in a given job

3.6
developer
a natural or juristic person which intends developing or creating a system (or systems) or railway system (or systems) as applicable

Note: natural or juristic person is an amplification of the definition of 'person' in the NRSR Act, which includes an unincorporated body, an organ of state and the Minister

3.7

exclusion criteria (life cycle)
criteria which need to be satisfied for completion of each phase of the life cycle before proceeding to the subsequent phases of the life cycle where applicable

3.8

hazard
a condition, situation, or system state that could lead to a railway occurrence or security incident, resulting in injury or loss of life, or damage to property or the environment (or any combination thereof)

3.9

interested party
a person as defined in relevant National Railway Safety Legislation (see foreword) comprising developers and agents including operators, potential operators, contractors, manufacturers, suppliers, service providers, logistics operators, maintainers, carriers or any other person who may be interested in safe railway operations;

3.10

interface
area, point, or location, either physical or organizational, where the activities or assets (or both) of two or more railway developers or agents or a railway agent and another organization meet, and where the activities or assets (or both) interact or have the potential to affect one another (or both)

3.11

intra-face
area, point, or location, either physical or organizational, where the activities and/or assets (or both) of two or more functional disciplines within a railway operator or developer or agent meet,

and where the activities or assets (or both) interact or have the potential to affect one another (or both)

3.12

life cycle (life cycle phases)
concept, design, execution, operation, monitoring, maintenance, modification, decommissioning and disposal phases of projects, products, processes, procedures and assets which constitute a railway system

3.13

modify

partial or minor changes to any system, sub-system or component, processes or procedures (or any combination thereof) to ensure that the operations are reliable, available, maintainable, safe and sustainable (RAMSS)

3.14

pedestrian crossing facility
railway crossing system over, under or at grade with appropriate safety and security systems, sub-systems or components

3.15
pedestrian level crossing
place approved by the relevant authority where a pedestrian footpath crosses the railway line(s) at grade

3.16

railway reserve
area of the land and associated vertical clearance along a railway line between the proclaimed boundaries, on which railway infrastructure elements are found, including railway running lines, service lines, yards, sidings, stations, freight terminals, depots, other related facilities and parts of station precincts

3.17

risk management
the process of identification of hazards, their quantification in terms of severity and likelihood (probability), the development of a plan/s to tolerate the risk, or transfer the risk, or treat the risk to reduce it to acceptable levels with the necessary controls (ALARP), or terminate the risk, and thereafter to monitor the residual risk to ensure it remains tolerable

3.18

safety management system(SMS)
a formal comprehensive documented system for integrating safety and security, and safety and security improvement into all aspects of the railway system life cycle phases as prescribed or contained in relevant standards;

3.19

validation
confirmation that the system, sub-system or component is appropriate and adequate for its intended use

3.20

verification
testing and evaluation of the system, subsystem or component to assure compliance with its specification or other requirements.

Note 1: Verification is a compliance test and does not address the adequacy of the specification
Note 2: Test and measuring equipment shall be suitably calibrated and certified in terms of relevant national legislation; (see foreword)

4 General

4.1 Approval in principle to construct a new pedestrian crossing, or to modify, re-commission or decommission an existing pedestrian crossing facility

Processes and procedures shall be established, developed or adopted, documented, implemented and maintained by developers/agents or network operators, and where relevant train operators, other relevant and affected parties (or any combination thereof) for the approval in principle by developers, agents or network operators, and where relevant train operators, other relevant and affected parties (or any combination thereof) of a proposal to execute (construct) a new pedestrian crossing facility, or to modify, re-commission or decommission an existing pedestrian crossing facility.

4.2 Application

4.2.1 The following documents shall be part of the submission for approval in principle for pedestrian crossing facilities including:

a) a risk assessment;

b) an integrated development plan for the area served by the pedestrian crossing facility;

c) an environmental scoping report for the area served by the pedestrian crossing facility;

d) a pedestrian traffic impact study;

e) a public awareness communication plan; and

f) a general layout and locality plan for the pedestrian crossing facilities taking into consideration pedestrian friendly needs and requirements.

4.3 Exclusion criteria

If any of the following exclusion criteria exist, the application for a pedestrian crossing facility, shall not be considered:

a) where the physical condition of the network (for example track curvature and cant, and gradient) and geographical considerations will render the execution (construction) of a pedestrian crossing facility impracticable and the resultant risk cannot be mitigated to acceptable levels (ALARP);

b) where the provision or modification of the pedestrian crossing facility does not fit in with the systemic design of the line and route;

c) where a line or route is operated or utilised by more than one operator who will be affected by the pedestrian crossing facility , and its systems, sub-systems, or components are not interoperable and not in accordance with the interoperability interface and intraface management requirements of the relevant parts of the SANS 3000 series with specific emphasis on SANS 3000-2-6;

d) the integration of the proposed at grade pedestrian crossing facility, equipment, systems, sub-systems, or components with the relevant train authorization and control systems into a seamless safe working system with the necessary integrity as defined in national legislation (see foreword) is not possible;

e) where the line speed exceed 80km/h. at, at grade pedestrian crossing facility shall be allowed;

f) where the risk is deemed not acceptable based on the number of railway lines or the train traffic and pedestrian traffic or a combination of the two parameters.

4.4 Life-cycle phases of pedestrian crossing facilities

4.4.1 Processes and procedures shall be established, developed or adopted, documented, implemented and maintained by developers/agents or network operators, and where relevant train operators, other relevant and affected parties (or any combination thereof) for:

a) the construction of a new pedestrian crossing facility;

b) the modification of an existing pedestrian crossing facility;

c) the decommissioning of an existing pedestrian crossing facility; or

d) re- commissioning of an existing pedestrian crossing facility.

4.4.2 The life-cycle process comprises the following phases:

a) concept (see clause 7);

b) design (see clause 8):

   1) conceptual design; and

   2) detailed design;

c) execution (construction) (see clause 9);

d) inspection, testing and commissioning (see clause 10);

e) operations (see clause 11);

f) monitoring and maintenance (see clause 12);

g) modification (see clause 13); and

h) decommissioning (see clause 14);

NOTE The life-cycle phases, monitoring and maintenance, modification, and decommissioning and disposal are an integral part of the operational phase of the life cycle. However, for clarity each will be dealt with separately.

4.4.3 Developers/agents or network operators, and where relevant train operators, other relevant and affected parties (or any combination thereof) shall establish, develop or adopt processes and procedures for the validation and verification, by competent persons, authorized by the developers/agents or network operators, and where relevant train operators, other relevant and affected parties (or any combination thereof) (see SANS 3000-4) and agreed to by the developers, agents or network operators, and where relevant train operators, other relevant and affected parties (or any combination thereof) for the relevant life cycle phases, including:

a) the conceptual design;

b) detail design;

c) execution;

d) testing and commissioning;

e) all other life-cycle phases;

f) all systems, sub-systems and components;

g) all other life-cycle phases including:

- signage,
- surface markings,
- surface geometry,
- track geometry and signage,
- civil and electrical infrastructure and train authorization and control, and telecommunication, where applicable,
- including systems, sub-systems and components.

This is to ensure that the appropriate safety requirements and standards are met for all pedestrian crossing facilities in accordance with the relevant national legislation (see foreword), relevant regulations and the SANS 3000 series of standards and relevant regulator standards.

h) methodologies and procedures associated with a) to g);

i) the applicable portions of national, regulator, industry and local standards, specifications and related documents shall as a minimum comply with the requirements of this standard.

4.4.4 This shall be done in order to ensure that the appropriate safety requirements for pedestrian crossing facilities are met in accordance with the relevant regulations, national and regulator standards.

5 Prioritizing and funding

Processes and procedures for the prioritizing and funding for pedestrian crossing facilities shall include

a) prioritization according to the allocated risk score and preferred option, and

b) allocation of the life-cycle costs as agreed by the developers/agents or network operators, and where relevant by train operators, other relevant and affected parties (or any combination thereof).

6 Common essential requirements for all life-cycle phases

The following common essential requirements for all life cycle phases of any proposal for a pedestrian crossing facility or its systems, sub-systems, components, processes or procedures (or a combination thereof), shall be addressed before the proposal shall be considered:

a) common essential requirements for all life-cycle phases as outlined in SANS 3000 series of standards shall include;

i) involvement of developers/agents or network operators, and where relevant train operators, other relevant and affected parties (or any combination thereof).

ii) elicitation of information from developers/agents or network operators, and where relevant by train operators, other relevant and affected parties (or any combination thereof);

iii) project management practices.

iv) hazard identification and risk assessment.

NOTE: The degree of confidence in the hazards identified and the risks assessed and mitigated to acceptable levels should increase through each subsequent phase of the life cycle.

v) configuration management,

vi) decision gates for each phase,

vii) validation and verification by recognised competent persons,

viii) refinement of the outcomes for successive phases of the life cycle,

ix) concepts for execution of all succeeding life cycle phases,

x) plans and exit criteria for each next phase,

xi) satisfaction of the exclusion and exit criteria for each phase of the life cycle,

xii) developers/agents or network operators, and where relevant train operators, other relevant and affected parties (or any combination thereof) to prepare new, or review, and where necessary amend, or replace all existing pedestrian crossing facility standards.

b) interface and intraface management requirements for interoperability throughout the life cycle where an interface or intraface (or both) exist or is created; (see SANS 3000-2-6);

c) the pedestrian crossing facility shall be interoperable with current and future railway operations and systems, sub-systems , components, processes and procedures as well as other related systems throughout the life cycle where an interface or intraface (or both) exist; and

d) receipt from the relevant national railway safety regulator (see foreword) of an ‘approval certificate’ to proceed to the next phase of the life cycle, with or without conditions.

7 Concept

The concept phase includes the preliminary evaluation of a concept which incorporates risk assessments and evaluation of the safety implications. It also includes evaluation of business imperatives such as time, cost, benefits and performance implications and the generation of preliminary system requirements and alternative feasible design solutions.

7.1 The concept proposal for a pedestrian crossing facility shall take into account the results of the assessment and risk assessment and the common essential requirements in 6 and shall include or confirm the following;

a) the identification of alternative or new concepts that offer new alternatives or capabilities, enhanced overall performance, including safety and security or reduced total costs over the entire life cycle;
b) an assessment of feasibility alternatives or concepts and solutions, including enabling systems, sub-systems and components, processes and procedures over the entire life cycle, to meet safety, security, technical and business objectives;
c) a preliminary estimate of the resources required to ensure the reliability, availability, maintainability, sustainability and safety (RAMSS) of the pedestrian crossing facility over the entire life cycle as described in clause 4.4;
d) consideration of the existence of any exclusion requirements;
e) an assessment of the environmental implications as per national legislation (see foreword) to determine the effect of the geographic, physical, biological, social, economic and cultural aspects on the environment;
f) the preparation of stakeholder requirements and preliminary system, sub-system and component requirements including technical specifications for the selected alternatives or solutions and usability specifications for the envisaged human-system interaction;
g) identification and initial specification of the services needed from enabling systems, sub-systems and components, processes and procedures throughout the entire life-cycle of the system;
h) development of chosen solution/s to a 60% budgetary and project execution confidence level;
i) cost-benefit analyses of the solutions over the entire project life-cycle;
j) approval in principle by all stakeholders to proceed to the design phase; and
k) receipt from the relevant national railway safety regulator (see foreword) of an ‘approval certificate’ to proceed to the next phase of the life cycle, with or without conditions.

8 Design

8.1 Design Requirements

8.1.1 General Requirements

Where relevant provision needs to be made that at all pedestrian crossing facilities, developers, agents or network operators, and where relevant train operators, other relevant and affected parties (or any combination thereof) shall mitigate the relevant risk adequately (ALARP).

8.1.1.1 The design of a pedestrian crossing facility shall take into account the results of the concept phase and the outcome of the risk assessments and include or confirm the following;

a. compliance with the requirements of relevant national legislation (see foreword), relevant regulations and the SANS 3000 series of standards and relevant regulator standards.

b. an acceptable level of risk in accordance with clause 12 (modification) and clause 16 (risk assessments);

c. compliance with the systemic design of the railway operation for the affected line or route on which the pedestrian crossing facility is to be built or the pedestrian crossing facility is to be modified;

d. the integration of the pedestrian crossing facilities operations with the relevant network and train operations (or both) into a seamless safe working system with the necessary integrity as defined in the relevant national legislation (see foreword);

NOTE: “Integrity” refers to a condition where the individual components of a system and the total system as a whole are unified, consistent and fit for purpose

e. current and future patterns and volumes of train traffic and pedestrian usage at the pedestrian crossing facility shall take into account the following including;

i. the broader land use, spatial, and transport planning requirements;

ii. the classification of the line (main line, yard or siding);

iii. pedestrian traffic patterns and volumes;

iv. the line of sight for pedestrians and train drivers;

v. the rail network geometry;

vi. the rail traffic patterns and volumes;

vii. the train operating parameters including: bi-directional traffic,

viii. current and future train lengths,

ix. visibility of the train;

x. current and future section speed and acceleration,

xi. the location of the pedestrian crossing (mainlines, service lines, yards, sidings);

xii. multiple rail lines;

xiii. drainage;

xiv. lighting;

xv. OHTS clearances;

xvi. security;

xvii. prevent high speed bicycle movement across the track

f. safe movement of pedestrians during off-peak and peak hours inclusive of emergency situations;

g. provision for pedestrians with disabilities including persons with reduced mobility or visual or audio impairment;

h. the number of interacting train movements;

i. the safety and security of trains, pedestrians, personnel and equipment at pedestrian facilities;

j. the amount of trains or pedestrian information required for safe movement over and into the pedestrian crossing facility;

k. communication (as defined in SANS 3000 series) with the train crew regarding abnormal, or degraded operations, or emergency conditions;

l. the reliability, availability, maintainability, sustainability and safety (RAMSS) of pedestrian crossing facilities;

m. fail-safe design of all safety critical systems to the appropriate Safety Integrity Level (SIL);

n. where relevant, the fail-safe design of all safety critical systems, sub-systems or components of the system too appropriate SIL

o. environmental impact assessments in terms of the relevant National Legislation (see foreword);

p. provision shall be made for smooth pedestrian flow at pedestrian crossing facilities including:

i. the surge of passengers who enter or leave pedestrian crossing facility;
ii. the presence and movement of pedestrians who carry parcels or goods;
iii. pedestrians with wheeled equipment;
iv. pedestrians that are accompanied by children; and
v. pedestrians with disabilities or special needs (or both).

q. changes in the width or direction of the pedestrian crossing which could cause constriction of pedestrian flow routes or congestion shall be avoided;

r. temporary or permanent obstructions which could cause constriction of pedestrian flow routes or congestion shall be avoided.;

s. vehicles and plant (maintenance machines and equipment) shall not obstruct the pedestrian areas as far as is reasonably practicable.

t. pedestrian crossing facility shall be durable and easy to inspect, maintain and clean. Where cleaning of pedestrian crossing facility is intended whilst it is in use, adequate provision shall be made to ensure that this does not disrupt the functioning of the pedestrian crossing facility.

u. all floors, steps, treads and pedestrian crossing walkways shall be designed taking into account environmental conditions, contamination and cleaning to minimise the risks of slipping and tripping.

v. all areas open to the outside environment shall have adequate means for draining water and prevention of ponding.

w. resources and competencies required to operate and maintain the pedestrian facilities including systems, sub-systems and components (see SANS 3000 series) and all related systems, sub-systems and components;

x. the provision of operating and maintenance plans for pedestrian facilities;

y. protection provided at pedestrian facilities provision of clear and unambiguous warning of the approach of trains (whistle boards) shall be provided by the developers, agents or network operators, other relevant and affected parties (or any combination thereof);

z. adequate arrangements for managing the flow of pedestrians shall be established at the pedestrian facilities;

aa. safety and security of pedestrians, employees, contractors and service providers and assets shall be ensured as far reasonably practicable at pedestrian facilities;

bb. where relevant the provision of suitable monitoring and CCTV equipment at all pedestrian facilities

cc. the headroom in all pedestrian facilities areas shall be in accordance with relevant National Legislation (see foreword) but shall not be less than 2300 mm. Where permitted, overhead equipment or signs shall not reduce headroom to below 2300 mm.

dd. fixed obstructions in pedestrian facilities areas including columns, posts, and seats shall be clearly visible and minimize the risks of accidental injuries to the visually impaired;

ee. where passengers with disabilities or special needs are to have access pedestrian crossing facility, provision shall comply with universal accessibility requirements and relevant National Legislation (see foreword).

ff. the dispersal patterns of pedestrians outside the pedestrian crossing facility shall be considered, as well as assembly points for evacuated employees, and pedestrians.

gg. pedestrian crossing facilities approaches shall include:

- safe access to the pedestrian crossing;
- safe access to the pedestrian crossing facilities or intended road vehicles including special purpose vehicles and emergency services;
- segregation of road traffic, pedestrians and trains;
- areas to which pedestrians have access including facilities footbridges, subways, passages, stairways, steps and ramps where there is no natural light shall be adequately lit.

hh. lighting levels shall comply with the requirements of national legislation (see forword) for comfort, safety, security and monitoring. Abrupt changes in illumination level shall be avoided.

ii. emergency lighting shall be provided in accordance with the relevant National Legislation (see foreword);

jj. the name or asset number (or both) of the pedestrian facilities way-finding information shall be conspicuously shown and shall be generally visible, legible, or observable to pedestrians and emergency responders at all times;

kk. pedestrian-information displays and way-finding displays shall be clearly visible and public address systems shall be clearly audible to all pedestrians where applicable . These shall be provided in accordance with the requirements of SANS 3000-2-4.

8.1.1.2 Factors to be considered

a) the number, position and type of pedestrian crossing facility;

b) whether the pedestrian crossing facility and pedestrian crossing is a public or private crossing;

c) whether the pedestrian crossing facility is a surface (at grade), a sub-surface or an elevated structure (or a combination thereof) as determined by the level of risk at the pedestrian crossing facility;

d) whether the pedestrian crossing facility is to be manned, or unmanned, and the hours of operation;

e) whether the pedestrian crossing facility will be constructed at railway lines designed for unidirectional or bi-directional traffic;

f) whether provision is made for staging trains in the vicinity of the pedestrian crossing facility;

g) resistance to theft and malicious damage that impact on pedestrian crossing infra-structure, and system, sub-systems or components, RAMSS and operation; and

h) methodology for verification and independent validation of the design of pedestrian facilities.

8.2 The design of pedestrian facilities including signage, surface, and track, civil and electrical infrastructure (including systems, sub-systems and components) should aim at mitigating the risks and reducing the impact of occurrences. The design should not only eliminate failures, but also ensure that the consequences arising from any failure will be minimized.

8.3 The design of pedestrian facilities shall be approved by the relevant developers, agents or network operators, and where relevant by train operators, other relevant and affected parties (or any combination thereof) respectively before proceeding with construction.

8.4 Receipt from the relevant national railway safety regulator (see foreword) of an 'approval certificate' to proceed to the next phase of the life cycle, with or without conditions.

9. Execution (construction)

9.1 Processes and procedures shall be established, developed or adopted, documented, implemented and maintained for the construction of pedestrian crossing facility. developers, agents or network operators, other relevant and affected parties (or any combination thereof) shall ensure that such pedestrian crossing are constructed in accordance with the relevant national legislation

(see foreword), relevant regulations, relevant parts of the SANS 3000 series, in particular the aspects of engineering, human factors, interoperability and operations and relevant regulator standards.

9.2 The processes and procedures shall include the following:

a) compliance with the approved design, drawings and specifications;

b) work-site management and operation during construction activities, including:

i. safeguarding of existing railway operations;

ii. safeguarding of pedestrians and employees at new crossing facilities, modified or existing crossing facilities (or any thereof) during construction activities;

iii. clear demarcation of construction and functional or operational areas (or both);

iv. safeguarding of construction train operations;

v. safeguarding of construction personnel;

vi. access control to and protection of the worksite(s);

vii. compliance with construction regulations in accordance with relevant national legislation (see foreword);

viii. environmental management in accordance with relevant national legislation (see foreword); and

ix. appropriate process management in accordance with SANS 3000-1, and SANS 10007/ISO 10007.

c) any temporary work or phases of construction (stage works) shall comply with the requirements of clause 8 (Design) and Clause 10 (inspections testing and commissioning);

d) interface and intraface management requirements for any temporary works or phases of construction (stage works), which shall also comply with the requirements of clause 8 (design) and clause 10 (inspections testing and commissioning);

e) conclusion of the necessary interface or intraface agreements between the affected parties including construction and construction safety permits, where required;

f) any new but uncommissioned equipment that could cause confusion with the pedestrian crossing or train operations (or both) or any other activities shall be clearly marked prior to and up to commissioning;

g) compliance with the interface and intraface management, and interoperability requirements of the approved design, drawings and specifications for interoperability; and

h) risk assessments shall be conducted for all types of occupations (possessions) and other work permissions.

9.3 Any deviation from the approved design during construction shall result in a new risk assessment being conducted and the design revised, verified and validated accordingly.

9.4 Receipt from the relevant national railway safety regulator (see foreword) of an 'approval certificate' to proceed to the next phase of the life cycle, with or without conditions.

10 Inspection, testing and commissioning

10.1 General

10.1.1 Processes and procedures shall be established, developed or adopted, documented, implemented and maintained for the inspection, testing and commissioning of pedestrian facilities and include signage, surface geometry, track geometry and track signage, civil and electrical infrastructure and train authorization and control, and telecommunication where applicable, including systems, sub-systems and components.

10.1.2 Testing and commissioning of the pedestrian crossing facility, shall be conducted to ensure the "integrity" of the new pedestrian crossing facility as a system.

10.1.3 Testing and commissioning are to complement and shall not substitute quality control of the design, execution and installation of the pedestrian crossing and its associated systems, sub-systems and components.

10.2 Testing and commissioning requirements

Testing and commissioning requirements shall include:

a) ensuring the appropriate level of competency of the commissioning organization or the individual (or both) for the type of system or installation, based on complexity and risk (see relevant regulations and SANS 3000 series);

b) demonstrating the level of independence of the commissioning organization or the individual (or both) from the design and execution organizations or individuals for the type of system or installation, based on complexity and risk;

c) ensuring compatibility of the new or modified systems (or both) with the pedestrian crossing facility and infrastructure and rolling stock systems, sub-systems and components;

d) validation and verification of the pedestrian crossing facility and pedestrian crossing pedestrian crossing design, execution and functioning;

Note 1: Validation means confirmation that the system, sub-system or component is appropriate for its intended use.

Note 2: Verification means testing and evaluation of a system, sub-system or component to ensure compliance with its specification or other requirements.

Note 3: Test and measuring equipment should be suitably calibrated and certified.

Note 4: Verification is a compliance test and does not address the adequacy of the specification.

e) validation and verification shall include:

   (i) the conducting of suitable simulations of train, pedestrian access, capacity and flow under normal, abnormal and emergency conditions; and

   (ii) conducting of suitable emergency management services, interface and coordination exercises, and testing of related equipment.

f) the operator and persons participating in such simulations shall conclude the necessary indemnity agreements in terms of the operator's test and commissioning permit;

g) the assurance of safe transition during any commissioning or system change (or both);

h) the handover processes to the relevant operators, including formalized operator training and material for the use and maintenance, where applicable of the pedestrian crossing facility (see relevant regulations and SANS 3000 series and regulator standards);

i) the provision of all relevant documentation (see relevant regulations, SANS 3000 series and regulator standards) including as-built plans, maintenance manuals and operating procedures and the recording in the configuration management system; and

j) conclusion of the necessary interface and intraface agreements between the affected parties.

10.3 Requirements for commissioning

10.3.1 Public awareness

Processes and procedures shall be established, developed or adopted, documented, implemented and maintained for public awareness with regard to the commissioning of pedestrian facilities.

10.3.2 Operational readiness

Processes and procedures shall be established, developed or adopted, documented, implemented and maintained to ensure pedestrian crossing facility are operationally ready during the commissioning phase.

NOTE The main objective of operational readiness is to handover a quality product to the end-user/owner by enabling a seamless transition from the design and execution phase of the project throughout to the close-out phase, where the handover to the owner takes place in an operational environment.

10.3.3 Receipt from the relevant national railway safety regulator (see foreword) of an 'approval certificate' to proceed to the next phase of the life cycle, with or without conditions.

11 Operations

Processes and procedures shall be established, developed or adopted, documented, implemented and maintained for the operation of pedestrian facilities and shall include the following:

a) amendment of the relevant operator's SMS to reflect the changes resulting from the pedestrian crossing facility and systems, sub-systems or components (or combination thereof);

b) the confirmation of risk assessment, and amendment thereof where relevant and necessary;

c) compliance with the train operational principles described in SANS 3000-2-5;

d) appropriate operational and technical resourcing of the pedestrian crossing and its systems in accordance with the approved design and as constructed, tested and commissioned;

e) education and awareness of users, which shall include the affected train crew, pedestrians, employees, contractors, and service providers;

f) development and implementation of relevant operating and occurrence management procedures.

g) conducting of physical assessments;

h) enforcement of safe usage;

i) train operator education and awareness;

j) monitoring usage of the pedestrian crossing , including notification by train operators to network operators of any changes to the property of adjacent land owners that might impact on safety at pedestrian crossing; and

k) receipt from the relevant national railway safety regulator (see foreword) of an 'approval certificate' to proceed to the next phase of the life cycle, with or without conditions.

12 Monitoring and maintenance

12.1 General

The appropriate level of competency of the maintenance organization or the individual (or both),

and the associated standards and procedures shall be ensured for the type of system or installation, based on complexity and risk.

12.2 Monitoring

12.2.1 Standards, processes and procedures for the monitoring and assessment shall be established, developed or adopted, documented, implemented and maintained, auditing and inspection, and occurrences prevention at pedestrian facilities and shall include the following:

a) structure and system availability and “integrity”;

b) faults and incidents;

c) structure, system, sub-system and component condition;

d) compliance with and performance against the approved design, applicable railway safety standards and fail-safe principles;

e) maintenance practices and testing procedures;

f) in-service inspections, which shall be conducted as specified in the operator’s SMS and Safety Improvement Plan (SIP);

g) conditions and events which are likely to result in reduced safety or operating performance or increased risk (or a combination thereof); and

h) occurrences.

12.2.2 Factors to be considered

Factors to be considered shall include:

a) compliance with the train operating principles in accordance with SANS 3000-2-5;

b) generally accepted system availability measurements, mean time between failures (MTBF) mean time to repair (MTTR);

NOTE MTTR means comprises the period from the time that the fault appears for the first time until the time when the system, sub-system or component is reintroduced into service

c) fault and incident reporting system and analysis;

d) effectiveness of maintenance procedures;

e) frequency of scheduled inspections and requirements for special inspections;

f) condition monitoring and analysis;

g) unsafe or ineffective maintenance practices (or both) and testing procedures;

h) determination and mitigation of conditions and events which are likely to result in reduced operating performance and safety;

i) methods of detection and reporting of the onset of sub- standard conditions; and

j) analysis of the causes and consequences of railway occurrences and incidents due to sub-standard acts or conditions or procedures (or a combination thereof), and where appropriate the implementation of corrective actions.

12.3 Maintenance

12.3.1 Processes and procedures shall be established, developed or adopted, documented, implemented and maintained for the maintenance of pedestrian crossing facility and their associated systems, sub-systems and components and shall include the following:

a) preventative or corrective maintenance plan (or both) to maintain or restore performance to the approved design or specifications or standards (or a combination thereof);

b) carrying out of preventative or corrective action, including the following;

i. work site operation and management;
ii. access control and protection of pedestrians, employees and contractors or service providers;
iii. maintenance to the approved design or specifications or standards (or a combination thereof);
iv. restoration after maintenance to the approved design or specifications or standards (or a combination thereof) in terms of the relevant national legislation (see foreword;
v. repair or replacement (or both) of faulty equipment;
vi. periodic training or re-training of technical and operational personnel; and
vii. procedures to ensure restoration of the pedestrian crossing facility to the required standard;
    - including maintenance of the surface,
    - maintenance of the track geometry,
    - erection and maintenance of the signage and markings,
    - maintenance of line-of-sight along the railway line and along the road,
    - installation and maintenance of integrated drainage system,
    - provision and maintenance of train-activated pedestrian crossing warning and protection systems,
    - effective vegetation control,
    - erection and maintenance of the overhead track systems (electric power lines) height gauges, including warning signs, erection and maintenance of track-side warning boards,
    - including whistle and speed boards,
    - installation and maintenance of level crossing advance warning systems,

- provision and maintenance of fences, gates, and
- effective access control;

12.3.2 Factors to be considered shall include:

a) process management in accordance with SANS 3000-1;

b) procedures for configuration management in accordance with SANS 3000-1 and SANS 10007/ISO 10007;

c) the use and effectiveness of appropriate maintenance practices and procedures;

d) RAMSS philosophy and methodology;

e) processes and procedures for the timely adjustment of equipment to maintain safety and performance and prevent faults;

f) availability of manuals and other related documentation such as those that cover operating, maintenance and repair of the pedestrian crossing facility and pedestrian crossing systems, sub- systems and components;

g) availability of spare parts, resources (including human resources), facilities, and appropriate certified and calibrated test and repair equipment;

h) management of the risk of subsequent exposure that follows an occurrence or system failure (or both) and prior to remedial action being performed; and

i) fault history shortcoming in performance that may indicate the need for re-design or modification.

13 Modification

Processes and procedures shall be established, developed or adopted, documented, implemented and maintained for the modification of pedestrian crossing facilities shall include the following:

a) the design, implementation and commissioning of the modification in accordance with clauses 7 to 12 (inclusive);

b) the effects of the proposed modification on safety at the pedestrian crossing during the modification transitional phase;

c) the communication of changes, modifications and transitional arrangements to all role players during the transition and implementation phases;

d) the recording of the modifications in a configuration management system; and

e) receipt from the relevant national railway safety regulator (see foreword) of an 'approval certificate' to proceed to the next phase of the life cycle, with or without conditions.

14 Decommissioning

14.1 General

14.1.1 The decommissioning of an existing pedestrian crossing facility may be the result of

a) the elimination of the pedestrian crossing at grade facility by means of a structure,

b) the closure of the pedestrian path, or

c) the closure of the railway line.

14.1.2 In cases where the residual risk at a crossing is unacceptably high after applying the maximum level of protection, the pedestrian crossing pedestrian path shall be listed for elimination by means of a structure, or where possible, shall be closed.

14.2 Elimination

When an at grade pedestrian crossing facility cannot be closed as described in 14.1, the pedestrian crossing facility shall be eliminated by means of a structure following the life-cycle phases described in 7 to 12 (inclusive). Processes and procedures shall be established, developed or adopted, documented, implemented and maintained for such elimination, and shall include the following:

a) listing the pedestrian crossing facility in the level crossing elimination register maintained and updated by the relevant national railway safety regulator (see foreword);

b) prioritizing of the pedestrian crossing facilities that have to be eliminated on an annual basis by the relevant national railway safety regulator (see foreword) and the relevant national authorities (see foreword) and any other relevant authority requesting the allocation of funds by treasury to the respective authorities and developers, agents or network operators, other relevant and affected parties (or any combination thereof);

c) undertaking the following once the structure has been completed and introduced for operations:

   1) uplifting and removal of the associated pedestrian crossing facility infrastructure elements;

2) removal of redundant pedestrian path infrastructure and signage;

3) environmental restoration in terms of the relevant national legislation (see foreword); and

4) recording the elimination in a configuration management system.

e) receipt from the relevant national railway safety regulator (see foreword) of an 'approval certificate' to proceed, with or without conditions.

14.3 Closure

14.3.1 A pedestrian crossing facility may be closed as a result of

a) the residual risk as given in 14.1.2 being unacceptably high,

b) an alternative access across the railway line being available, and

c) a reduction of pedestrian crossing facility in terms of the SIP. (See SANS 3000-1.)

14.3.2 Processes and procedures shall be established, developed or adopted, implemented and maintained for the closure of pedestrian crossing facilities and shall include the following:

a) public notification of the intention to close the pedestrian crossing facility;

b) uplifting and removal of the associated pedestrian crossing infrastructure elements;

c) removal of redundant infrastructure and signage;

d) environmental restoration in terms of the relevant national legislation (see foreword);

e) recording the closure in a configuration management system

f) uplifting of the track where appropriate and removal of the related civil, and electrical infra-structure, train control and authorization systems where applicable, including systems, sub-systems and components, and prevention of access to that portion of the railway line;

g) reinstatement of the pedestrian path structure and surface to the same standard on both sides of the pedestrian crossing.

h) ensuring that the condition of decommissioned material and equipment is clearly identified and marked either for re-use or to prevent inappropriate re-use; and

i) minimization of environmental risks, including health, safety and pollution hazards associated with the disposal of decommissioned systems, sub-systems and components, considering both short-term and long-term impact.

14.3.3 Closure of the railway line due to it being out of service may be acceptable with the provision that the network operator has the right to reinstate the pedestrian crossing at any time in the future having followed due process as described for the application for a pedestrian crossing facility. (See 4.2)

14.3.4 Receipt from the relevant national railway safety regulator (see foreword) of an 'approval certificate' to proceed to the next phase of the life cycle, with or without conditions.

15 Physical assessments

15.1 Processes and procedures shall be established, developed or adopted, implemented and maintained by developers, agents or network operators, and where relevant by train operators, other relevant and affected parties (or any combination thereof) for the conducting of physical assessments of pedestrian crossing facilities in accordance with the physical assessment model as given in annex A.

NOTE The field sheets specified in annex A for the physical assessments of Pedestrian crossing are available on request from the relevant national safety regulator (see foreword)

15.2 Physical assessments shall be conducted on existing pedestrian crossing facilities in the following circumstances including:

a) after an occurrence resulting in a fatality at the pedestrian crossing;

b) after two or more occurrences at the pedestrian crossing facility in one calendar year;

c) when there are significant changes in pedestrian traffic patterns;

d) when there are significant changes in railway traffic patterns, including the introduction of a new service;

e) when there are changes in land use, including residential, recreational, commercial and industrial developments in the area served by the pedestrian crossing facility;

f) when there is an increase in the maximum operating speed of rail traffic or line speed of the railway at the pedestrian crossing;

g) when there is a proposed development that might impact on the line of sight of both train drivers and pedestrian crossing facility users;

h) when the pedestrian crossing facility is intended to be relocated; and

j) if instructed by the relevant authorities.

15.3 Physical assessments shall be conducted on proposed new pedestrian crossing, modified or existing pedestrian level crossing facilities (or any thereof).

15.4 Physical assessments shall be conducted at least once every five years, jointly between developers, agents or network operators, and where relevant by train operators, other relevant and affected parties (or any combination thereof),

15.5 Physical assessment records shall be retained for review by the relevant national railway safety regulator (see foreword).

16 Risk management

16.1 Further to the operational risk management processes described in SANS 3000-1, developers, agents or network operators, and where relevant by train operators, other relevant and affected parties (or any combination thereof), shall establish, develop or adopt, implement and maintain policies and procedures to conduct risk assessments for new pedestrian crossings, modified or existing pedestrian level crossing facilities including:

a) identification of hazards associated with the life cycle phases (7 to12) including those arising from:

   1) occurrences on a particular section including pedestrians being injured or fatally injured .
   2) railway traffic,
   3) pedestrian traffic,
   4) the railway network,
   5) the pedestrian crossing layout and condition,
   6) adjoining property, and
   7) geographical considerations;

b) evaluation of the hazards identified in (a) (i.e. quantification in terms of frequency, probability and severity, resulting in risk ranking);

c) determination of the level of control required to mitigate the risks to acceptable levels; and

d) implementation of the controls and monitoring of the effectiveness thereof in accordance with the information obtained from the pedestrian crossing physical assessment with full appreciation of the need to balance costs, benefits and opportunities.

16.2 Risk assessments shall be conducted jointly by developers, agents or network operators, and where relevant by train operators, other relevant and affected parties (or any combination thereof) at least once every five years.

16.3 The records of risk assessments shall be retained for review by the relevant national railway safety regulator (see foreword).

17 Signage

17.1 Processes and procedures shall be established, developed or adopted, implemented and maintained by developers, agents or network operators, and where relevant by train operators, other relevant and affected parties (or any combination thereof) to ensure that pedestrian crossing facilities warning and regulatory signs, pedestrian path markings and pedestrian signals are erected and maintained in accordance with the requirements of 7-12.

17.2 The level of pedestrian crossing protection shall be as determined by the outcome of the risk assessment of the pedestrian crossing. Certain circumstances might require a higher level of protection than prescribed. The residual risk after applying the appropriate level of protection shall necessitate the elimination of an at grade pedestrian crossing facility by closure or the construction of a bridge or subway.

17.3 Processes and procedures shall be established, developed or adopted, implemented and maintained by developers, agents or network operators, and where relevant by train operators, other relevant and affected parties (or any combination thereof) to ensure that:

a) whistle boards are erected alongside the railway line to inform train drivers to sound the locomotive whistle, and

b) provision is made for the erection of height gauges and warning signs at pedestrian crossing on electrified railway lines.

18 The national database

18.1 Processes and procedures shall be established, developed or adopted, implemented and maintained by developers, agents or network operators, other relevant and affected parties (or any combination thereof) to ensure that all pedestrian crossing facilities are recorded on the national database, which shall be readily available and accessible to all developers, agents or network operators, other relevant and affected parties (or any combination thereof).

18.2 This database shall be submitted to the national relevant safety regulator (see foreword)

18.3 This database shall include the following information:

a) a unique identification number (asset number);

b) the location of the pedestrian crossing facility:

   1) the province,

   2) geo-tags (GPS co-ordinates),

   3) year of execution (construction),

4) the railway network (main line, yard, siding)

5) between which stations and kilometre point,

c) the classification of the pedestrian crossing facility;

d) the developers, agents or network operators, and where relevant by train operators, other relevant and affected parties (or any combination thereof) name and contact details;

e) records of physical and risk assessment data of each pedestrian crossing facility;

k) the occurrence history; and

l) the status of the pedestrian crossing facility.