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REGULATOR STANDARD

RAILWAY SAFETY MANAGEMENT

Part 4-1: Human Factors Management – Fatigue Management

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Part 4-1: Human Factors Management – Fatigue Management

NOTE: It is essential that this standards document is read together with the South African National Standards, SANS 3000-1 and SANS 3000-4.

Table of changes

Edition and version number	Date	Scope

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Foreword

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

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 (SABS) on behalf of the Railway Safety Regulator and, in particular, SANS 3000-4:2011, *Human Factors Management*. This document should be read in conjunction with those standards.

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

SANS 3000-1:2009 – Part 1: General.

SANS 3000-2-1:2008 – Part 2-1: Technical requirements for engineering and operational standards – General.

SANS 3000-2-2:2008 – Part 2-2: Technical requirements for engineering and operational standards – Track, civil and electrical infrastructure.

SANS 3000-2-2-1:2012 – Part 2-2-1: Technical requirements for engineering and operational standards – Track, civil and electrical infrastructure – Level crossings.

SANS 3000-2-3:2008 – Part 2-3: Technical requirements for engineering and operational standards – Rolling stock.

SANS 3000-2-4:2013 – Part 2-4: Technical requirements for engineering and operational standards – Train authorization and control, and telecommunications.

SANS 3000-2-5:2013 – Part 2-5: Technical requirements for engineering and operational standards – Operational principles for safe movement on rail.

SANS 3000-2-6:2013 – Part 2-6: Technical requirements for engineering and operational standards – Interoperability, and interface and intraface management.

SANS 3000-2-4:2011 – 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:*

RSR 00-2-3-1:2016 – Part 2-3-1: Requirements for systemic engineering and operational safety standards – Rolling stock – Wheels, axles and bearings.

RSR 00-2-7:2016 – Part 2-7: Requirements for systemic engineering and operational safety standards – Railway Stations.

RSR 00-3:2016 – Part 3: Occurrence management.

RSR 00-4-1:2016 – Part 4-1: Human factors management – Fatigue management (this document).

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

Reference is made in this document in clause 8.6.3 to the “relevant national railway safety regulator”. In South Africa this shall mean the “Railway Safety Regulator” (RSR) as established in terms of *National Railway Safety Regulator Act* (NRSRA) (Act No. 16 of 2002).

Reference is made in this document in clauses 1.1, 4.5, 6.1, 8.5, 8.5.1.2, 8.5.2.2, 9.2.4.1 and Annex B to the “relevant national legislation”. In South Africa this shall mean the *National Railway Safety Regulator Act* (NRSRA) (Act No. 16 of 2002), the *Occupational Health and Safety Act* (OHSA) (Act No. 85 of 1993), the *Mine Health and Safety Act* (MHSA) (Act No. 29 of 1996), the *Basic Conditions of Employment Act* (BCEA) (Act No. 20 of 2013), the *Labour Relations Act* (LRA) (Act No. 66 of 1995) including their amendments, regulations and schedules and to any other applicable legislation or regulations.

Annexes A through *F* are provided for information only.

Contents

1 Scope

1.1 This standard provides minimum requirements for the management of fatigue for employees undertaking safety-related work. It is to be read and implemented in conjunction with the relevant national legislation and other applicable standards (see Foreword).

1.2 This standard amplifies and augments clause 6.10 of SANS 3000-4:2011: *Human Factors Management* (HFM).

1.3 This standard provides requirements for systemic management of fatigue risks in order to improve safety in railway operations.

1.4 This standard applies to all railway operators with employees, contractors and visitors undertaking safety-related work in the railway operational environment.

1.5 This standard sets out the key requirements for the implementation of a *Fatigue Risk Management Policy* (FRMP) and an effective *Fatigue Risk Management System* (FRMS), and illustrates how to incorporate them into the operator's *Safety Management System* (SMS) and *Safety Improvement Plan* (SIP) (refer to SANS 3000-1: *Railway Safety Management – Part 1: General*).

2 Normative references

2.1 The following referenced documents are indispensable for the understanding and application of this standard. For undated references, the latest edition of the referenced document (including any amendments) shall apply:

SANS 3000-1: Railway safety management – Part 1: General.

SANS 3000-4: Railway safety management – Human factors management.

SANS 10400 series (suite) of standards: Code of practice – The application of the National Building Regulations.

2.2 Information on current, valid national (SANS) and international standards (ISO) can be obtained from the South African Bureau of Standards (SABS), Standards Division. Website: *https://www.sabs.co.za/.*

2.3 Information on current, valid Regulator Standards can be obtained from the Railway Safety Regulator, South Africa. Website: *http://rsr.org.za/.*

3 Definitions and abbreviations

3.1 Definitions

For the purposes of this document, the definitions provided in SANS 3000-1, SANS 3000-4 and the following shall apply.

NOTE: In the case of duplicated or differing definitions, the definitions provided here shall prevail for the purposes of this standard.

3.1.1 cognitive
the mental process of knowing including aspects such as awareness, perception, alertness, reasoning and judgement.

3.1.2 exceedance
non-compliance with or exceeding a standard or specified limits.

3.1.3 fatigue
tiredness, reduced physical ability, reduced mental alertness and reduced performance that results from prolonged physical or mental effort without adequate rest or from a medical condition or illness.

3.1.4 fatigue risk management system
systematic and co-ordinated processes and procedures an operator puts in place to manage or mitigate (or both) the risks arising from persons becoming fatigued.

3.1.5 fixed shifts
working the same shift time-period on a permanent basis.

3.1.6 standby
waiting to respond to an emergency call-out or answering queries from people working in the field.

3.1.7 period of duty
duty which consists wholly, or partly, of safety-related activities as defined in SANS 3000-1, including overtime, meal and rest breaks.

NOTE: Where a split-shift system is in operation, the total length of time between the start of the first and the end of the last part of that split shift counts as one period of duty for the purpose of this document.

3.1.8 rest
cease work or activity in order to revitalise and recover the energy lost from activities that required physical and mental effort.

3.1.9 rest period
interval between the time when a person signs off-duty and the time when that person signs on-duty for the next work period or shift.

NOTE: This means the time during the shift roster of that person where the person is not working and is at home to rest and prepare for the next shift schedule to start.

3.1.10 rotating shifts
work pattern or schedule where employees regularly move through a cycle of working day, evening and night shifts.

3.1.11 visitor
any person that is temporarily permitted to enter the railway operator's premises

3.2 Abbreviations

For the purposes of this document, the abbreviations provided in the *National Railway Safety Regulator Act* (NRSRA), SANS 3000-1, SANS 3000-4 and the following shall apply.

NOTE: In the case of duplicated or differing abbreviations, the abbreviations provided here shall prevail for the purposes of this standard.

FFD:	Fit for duty
FFW:	Fit for work
FRA:	Fatigue risk assessment
FRI:	Fatigue risk index
FMP:	Fatigue Management Program
FRMP:	Fatigue Risk Management Policy
FRMS:	Fatigue Risk Management System
HFM:	Human Factors Management
HR:	Human Resources
NRSRA:	National Railway Safety Regulator Act (Act No. 16 of 2002)
RSR:	Railway Safety Regulator
SABS:	South African Bureau of Standards
SANS:	South African National Standard
SIP:	Safety Improvement Plan
SM:	Senior Manager
SMS:	Safety Management System

4 General

4.1 The operator shall ensure that employees, contractors and visitors undertaking safety-related work do not carry out their work while impaired by fatigue.

4.2 The operator shall develop or adopt, document, implement and maintain a Fatigue Risk Management Policy (FRMP) and a Fatigue Risk Management System (FRMS) to ensure the effective management of fatigue risks.

4.3 The operator shall conduct Fatigue Risk Assessments (FRAs) to identify potential fatigue risks to which its employees, contractors and visitors may be exposed.

4.4 The operator shall include Fatigue Risk Management as an element of its SMS in accordance with clause 6.10.5 of the *Human Factors Management* (HFM) standard (SANS 3000-4).

4.5 In relation to Fatigue Risk Management, reference shall be made to relevant national legislation (see Foreword). Factors to be considered shall include:

a) working hours;
b) shift work;
c) rest periods;
d) provision of leave;
e) health assessments for employees.

5 Introduction to fatigue management

5.1 General

5.1.1 In accordance with SANS 3000-4, fatigue refers to the accumulated physiological and psychological conditions that occur when an employee's maximum physical and mental capacities have been exceeded. Fatigue involves a general feeling of tiredness resulting in a reduced ability to perform work effectively thereby affecting safety in railway operations.

5.1.2 Potential signs of fatigue include the following:

a) uncharacteristic irritability or impatience;
b) red or swollen eyes;
c) frequent yawning;
d) lack or loss of concentration;
e) inability in following instructions;
f) lateness or absenteeism;
g) substance dependency;
h) micro sleeps; and
i) unexplained body-weight loss or gain.

5.2 Factors that contribute to fatigue

Factors that contribute to fatigue include the following:

5.2.1 Individual and personal factors including:

a) reduction in physical and mental acuity, e.g. in advanced age;
b) physiological factors, e.g. degree of physical activity (under and over-exertion);
c) health and physical status, e.g. chronic illnesses or other medical conditions; and
d) psychological factors, e.g. stress (as defined in clause 6.1.1 of SANS 3000-4) or depression (or a combination thereof).

5.2.2 Organizational and job-related factors including:

a) work schedules or rosters that limit the time and ability for employees undertaking safety-related grades to physically and mentally recover, e.g. early starting times or late finishing times;
b) work load;
c) short breaks between shifts;
d) shifts lengthened by overtime;
e) double shifts;
f) insufficient rest breaks during a shift period;
g) working at night when the body is biologically programmed to sleep. This can disrupt an employee's body-clock and circadian rhythms;

h) organisational policies and practices, e.g. excessive or uncontrolled overtime; and
i) performance of work activities that require mental concentration for extended periods of time, including repetitious or monotonous work that requires continued physical or mental effort.

NOTE: People can be mentally and physically fatigued at the same time. Work which is reactive and performed under high pressure, e.g. in emergency services, may also increase the risk of fatigue.

5.2.3 Sleep-related factors including:
a) length of sleep time;
b) quality of sleep; and
c) the interval since previous sleep period.

NOTE 1: Whilst tired muscles can recover with rest, the brain can only recover with sleep. The most beneficial sleep is a deep, undisturbed sleep taken in a single continuous period.
NOTE 2: The optimum amount of sleep varies for each person, however, an adult generally requires seven to eight hours of sleep daily.
NOTE 3: When individuals get less sleep than they need, they build up a sleep debt which accumulates until they can get enough sleep to overcome the sleep debt. Each extra day without enough sleep increases the debt. When that debt becomes large enough, fatigue can occur. It may take several days before a person recovers from such sleep debt. Sleep debt is common with night shift workers as they often experience difficulty getting enough undisturbed sleep during the day.

5.2.4 Environmental factors including:
a) working in extreme physical environmental conditions, e.g. excessive heat or cold; and heavy vibration or noisy workplaces.

5.2.5 Psychosocial factors and non-work-related factors including:
a) activities not related to an employee's work, but which may cause fatigue to the employee, e.g. lifestyle, family responsibilities, external work commitments, substance abuse and extended commuting time between work and home.

5.3 Identification of contributory factors to fatigue

5.3.1 The operator shall establish, develop or adopt, document, implement and maintain policies, processes and procedures to identify factors that contribute to or increase the risk of fatigue.

5.3.2 The operator shall engage with all employees undertaking safety-related work, their representatives, supervisors and managers about the impact of fatigue contributory factors, including workloads, work schedules, and non-work-related factors that can impact on safe railway operations.

5.3.3 The operator shall examine work practices and systems of work, including:
a) the degree of choice and control that employees have over their work hours,

b) the pace of their work and the number and length of rest breaks, and
c) the type of work culture, e.g. an accepted practice of working long hours;

5.3.4 The operator shall examine employees' records, including shift rosters to determine the potential impact of excessive working hours or fatigue-induced working patterns.

5.3.5 The operator shall conduct a review of fatigue-related incident data, occurrences and any other data, taking the following into consideration:
a) the likelihood that fatigue contributed to occurrences;
b) time of day that such occurrences happened;
c) how long the employee or employees involved had been working; and
d) any recent changes in shift patterns of the employee or employees involved.

5.3.6 The operator shall conduct a review of human resource data, including trends in absenteeism and staff turnover and their correlation to fatigue.

5.3.7 Where required, the operator shall obtain the services of subject-matter experts for the identification of factors that contribute to fatigue.

6 General requirements for fatigue management

6.1 The operator shall establish, develop or adopt, document, implement and maintain policies, processes and procedures to manage fatigue risks in accordance with the relevant national legislation (see Foreword).

6.2 The fatigue management requirements shall, in accordance with SANS 3000-4, include the following:

a) roles and responsibilities;
b) education and training;
c) risk assessments;
d) controls; and
e) monitoring, evaluation and review.

6.3 Further to the requirements outlined in SANS 3000-4, the operator shall develop or adopt, document, implement and maintain a FRMP and a FRMS as elements of the operator's SMS.

7 Fatigue Risk Management Policy (FRMP)

7.1 The operator shall establish, develop or adopt a Fatigue Risk Management Policy (FRMP) which shall set out the operator's commitment to manage the risk of fatigue in employees undertaking safety related work.

7.2 The FRMP shall guide and give effect to the operator’s FRMS and FMIP and it shall form an element of the operator's SMS (See Annex A).

7.3 The FRMP shall be formally adopted, ratified and published by the operator and shall provide the basis and authority for the development and implementation of a Fatigue Risk Management System.

7.4 The operator's FRMP shall include the following:

a) an acknowledgement and recognition of the impact and contribution of fatigue to railway occurrences and other incidents;
b) a commitment by the operator to identify the causes of fatigue and to manage and mitigate the risks of fatigue in the execution of safety-related tasks;
c) a commitment to provide resources and support to senior management and leadership in managing fatigue risks;
d) a commitment to a appoint a person responsible for the implementation and management of the FRMP;
e) a commitment to develop and implement an effective FRMS and the commitment of adequate resources to sustain the FRMS on an on-going basis;
f) a commitment to support all the organisation's stakeholders in the management of fatigue risks;
g) a commitment that the FRMP shall apply to all employees undertaking safety-related work, including contractors and visitors in the workplace;
h) a commitment to review the FRMP in line with clause 7.5 below; and
i) a statement or confirmation that this FRMP has been adopted and ratified by the owners, board and executive of the company and that it forms part of the operator's official company policy.

7.5 The operator shall review the FRMP and, where required, update it:

a) whenever the operator's activities, structure, environment or circumstances change; and
b) periodically at intervals not exceeding two years.

7.6 The operator's FRMP shall be designed to ensure that the expectations of all interested and affected parties are considered.

NOTE 1: The FRMP should set out the operator's fatigue management philosophy for the management of fatigue risks, and the establishment of a Fatigue Risk Management System.

NOTE 2: To maximize the commitment to manage fatigue risks, the Fatigue Risk Management Policy should be approved at the highest level of the operator's management structure.

8 Fatigue Risk Management System (FRMS)

8.1 General

8.1.1 Further to fatigue risk management outlined in SANS 3000-4, the operator shall establish, develop or adopt a Fatigue Risk Management System (FRMS) which shall document, implement and maintain processes and procedures for a systematic approach for identification, assessment, management and mitigation of the risks of fatigue.

8.1.2 The operator shall appoint a person with the relevant authority and responsibility for the FRMS, and shall provide the necessary resources.

8.1.3 The FRMS shall outline formal processes and procedures, including the identification, evaluation and control of fatigue risks, in order to prevent or minimise occurrences where fatigue could be a contributing factor.

8.1.4 The FRMS shall be based on a comprehensive understanding of fatigue mechanisms thereby managing fatigue in a way that is appropriate to the risks and to the nature of the railway operations.

8.1.5 The FRMS shall be a dynamic, evidence-based, data-driven and documented process that is driven by the measurement of potential fatigue risks.

8.1.6 The FRMS shall be consistent with the nature, size and complexity of the railway operations and any other activities that may impact on the safety of railway operations.

8.2 Principles for the development of an FRMS

8.2.1 The following principles shall be considered in the development of an FRMS:

a) the integration with the operator's SMS and SIP;
b) an understanding of current conditions within the operator’s organisation;
c) fatigue information collected from the operator's own railway operations and feedback from employees undertaking safety-related work;
d) information and training to be given to employees on the identification and management of fatigue risks;
e) relevant best practice for fatigue control measures; and
f) the implementation of continuous improvement processes for monitoring and managing fatigue risks.

8.3 Fatigue risk assessments

8.3.1 The operator shall establish, develop or adopt, document, implement and maintain processes and procedures to identify, assess and mitigate the risks associated with fatigue's contributory factors, including:

a) individual and personal factors;
b) organizational and job-related factors;
c) sleep-related factors;
d) physical and environmental factors; and
e) psychosocial and non-work-related factors.

NOTE: The Fatigue Risk Assessment (FRA) shall establish the extent to which each factor contributes to the overall risks of fatigue within the operator's organisation.

8.3.2 The FRAs shall be used to assist the operator to detect and determine the following:

a) the number of employees, contractors and visitors undertaking safety-related work and their location;
b) the likelihood of fatigue-related incidents;
c) the severity of fatigue-related incidents;
d) the effectiveness of current controls;
e) the proposed controls to reduce the risk of fatigue; and
f) the urgency of the controls required.

8.3.3 The FRAs shall be reviewed and, where required, updated as follows:

a) whenever the operator's activities, structure, environment or circumstances change;
b) periodically at intervals not exceeding two years; and
c) after a railway occurrence where fatigue may have been a contributing factor.

8.3.4 The operator shall establish, develop or adopt, document, implement and maintain processes and procedures to identify, measure and assess the levels of fatigue in employees who undertake safety-related work. This shall be aligned to fatigue's contributory factors as outlined in clause 5.2 and include the following:

a) individual and personal factors:
    1) age of employee;
    2) personality;
    3) metabolism and circadian rhythm; and
    4) general fitness and health.
b) organizational and job-related factors:
    1) policies and practices;
    2) job design and responsibilities;
    3) workload; and
    4) shift work and rostering.
c) sleep-related factors:
    1) sleeping patterns;

d) physical and environmental factors:
   1) noise;
   2) vibration;
   3) lighting;
   4) temperature; and
   5) biological or hazardous substances (or both).
e) psychosocial and non-work-related factors:
   1) commuting arrangements;
   2) domestic life;
   3) lifestyle and stress; and
   4) hobbies, moon-lighting or external work.

8.3.5 The operator shall establish, develop or adopt, document, implement and maintain processes and procedures to conduct individual fatigue assessments for employees undertaking safety-related work as follows:
a) during medical examinations;
b) at the time of roster preparation;
c) daily at employee sign on;
d) whilst on duty; and
e) after a railway occurrence where fatigue of an employee may have been a contributing factor.

8.3.6 The operator shall ensure that when conducting FRAs, the various contributors to fatigue are not considered in isolation.

8.3.7 The operator shall establish, develop or adopt, document, implement and maintain processes and procedures to identify, measure and assess information about fatigue-related risks obtained from:
a) its railway operations including fatigue reports and surveys and the incidence of fatigue-related errors and occurrences;
b) employees undertaking safety-related work including physical and cognitive duties, and workload assessments.

8.3.8 The operator shall establish, develop or adopt, document, implement and maintain processes and procedures to educate and train management and employees in its FRMS and to provide the necessary resources.

8.3.9 The operator shall establish, develop or adopt, document and maintain processes and procedures for identifying the root causes of fatigue by modelling and analysing the associated fatigue risks as follows:
a) fatigue risks shall be assessed and be related back to the contributory factors of fatigue; and
b) the fatigue risk analysis shall consider possible consequences and the severity of the effect of fatigue.

8.4 Fatigue risk management for contractors and visitors

8.4.1 The operator shall implement process and procedures to ensure that contractors and visitors undertaking safety-related work or otherwise involved in safety-related work comply with the operator's FRMP and FRMS.

8.4.2 The operator shall, prior to commencement of any work at the operator's site by a contractor or visitor, provide such contractor or visitor with at least the following:

a) the operator's FRMP and any other "fitness for duty" procedures;
a) the contractor's or visitor's obligations in terms of the operator's FRMP;
b) the procedures to measure and evaluate fatigue risk management compliance; and
c) the consequences of a failure to comply with the operator's FRMP and FRMS.

8.4.3 The operator shall ensure that all contractors and visitors undertaking safety-related work comply with the operator's FRMP and FRMS through the following:

a) conducting a review and audit of the contractor's or visitor's procedures and practises prior to the commencement of the project; and
b) requiring contractors and visitors to collect data and report on their management of fatigue as outlined in clause 8.3 above, during the project.

8.5 Controls

The operator shall establish, develop or adopt, document, implement and maintain policies, processes and procedures for the implementation of controls to manage fatigue in compliance with the relevant national legislation (see Foreword).

8.5.1 General controls to manage and mitigate fatigue risks

8.5.1.1 The operator shall establish, develop or adopt, document and maintain processes and procedures to devise and set up controls to reduce or mitigate the factors that contribute to fatigue.

8.5.1.2 The controls shall be aligned with relevant national legislation (see Foreword) and shall consider the following:

a) recruitment and selection processes;
b) employees' "fitness for duty" declarations;
c) shift patterns and, whenever possible, scheduling of safety-critical work outside the low body-clock periods of between 02:00 and 06:00 and between 14:00 and 16:00;
d) designing working hours and rosters to allow for good sleep opportunities and enough recovery time between workdays or shifts for employees' travelling and personal needs;
e) developing a working hours policy on daily work hours, maximum average weekly work hours, total hours over specified periods, on-call work and work-related travel;

f) developing procedures to manage and limit excessive working hours;
g) ensuring workers have and take adequate and regular breaks to rest, eat and rehydrate;
h) managing changes in workload and work-pace;
i) avoiding work arrangements which provide incentives to work excessive hours;
j) managing overtime, shift-swapping and on-call duties;
k) managing accrued leave balances and requests for leave;
l) considering future rosters and schedules when approving request for leave or shift swaps, and ensuring leave is reflected in rosters;
m) having access to on-call workers for unplanned leave, emergencies or where workload increases;
n) developing plans to deal with workload changes due to absenteeism; and
o) filling vacant positions as soon as reasonably practicable and maintaining a pool of relief staff in high-demand areas where fatigue is a risk.

8.5.2 Specific controls for contributory factors

8.5.2.1 Individual and personal factors

The operator shall establish, develop or adopt, document, implement and maintain policies, processes and procedures to implement specific control measures for individual and personal factors that could contribute to fatigue.

8.5.2.2 Organisational and job-related factors

The operator shall establish, develop or adopt, document, implement and maintain policies, processes and procedures to implement specific control measures for organizational and job-related factors that could contribute to fatigue. These shall include:

a) structuring shifts and designing work plans to mitigate fatigue;
b) setting shift rosters ahead of time and avoiding last-minute changes;
c) allocating shift and night workers sufficient time-off (including weekends where practical) as outlined in the relevant national legislation (see Foreword);
d) avoiding overtime allocation after afternoon or night shifts;
e) rearranging schedules so non-essential work is not carried out at night;
f) keeping sequential night shifts to a minimum; and
g) providing information to shift workers on the prevention and management of the risk of fatigue.

8.5.2.3 Sleep-related factors

The operator shall establish, develop or adopt, document, implement and maintain policies, processes and procedures to implement specific control measures for sleep-related factors that could contribute to fatigue.

8.5.2.4 Physical and environmental factors

The operator shall establish, develop or adopt, document, implement and maintain policies, processes and procedures to implement specific control measures for extreme physical and environmental conditions that could contribute to fatigue. These include:

a) avoiding the scheduling of work and minimising employees' exposure during periods of extreme temperature;
b) providing a cool area where employees can take a rest break and rehydrate;
c) installing heating, ventilation and air-conditioning in the workplace;
d) providing adequate facilities for rest, sleep, meal breaks, onsite accommodation (if practical); and
e) providing and maintaining a workplace which is sufficiently illuminated, safe and secure.

8.5.2.5 Psychosocial and non-work-related factors

The operator shall establish, develop or adopt, document, implement and maintain policies, processes and procedures to implement specific control measures for psychosocial and non-work-related factors that could contribute to fatigue. These include:

a) avoidance of potential conflicts between personal and work demands;
b) developing a fatigue policy for all employees; and
c) providing consultation and training to employees on how to manage fatigue including the risks of fatigue and how fatigue relates to their personal health and safety responsibilities.

8.6 Monitoring and review

8.6.1 The operator shall establish, develop or adopt, document and maintain processes and procedures to monitor, review and record evidence which shall be used to establish whether fatigue risk controls have successfully reduced fatigue risks.

8.6.2 Evidence to be gathered shall include the following:

a) comparisons of fatigue risk assessment scores and employee fatigue survey findings before and after implementation of fatigue controls; and
b) comparisons of the numbers of reported fatigue-related incidents and occurrences before and after the implementation of fatigue controls;

8.6.3 The evidence record for fatigue risk assessments, employee fatigue surveys and fatigue-related incidents shall be available for review by the relevant national railway safety regulator (see Foreword) and shall be retained for at least 5 years.

9 Fatigue Management Programme (FMP)

9.1 General

9.1.1 The operator shall establish, develop or adopt, document and maintain a Fatigue Management Programme (FMP).

9.1.2 The operator's FMP shall outline the roles and responsibilities of critical stakeholders to ensure effective fatigue management.

9.1.3 The operator's FMP shall describe the overall organisational approach for the management of fatigue and all risks related to fatigue.

9.2 Roles and responsibilities

9.2.1 Fatigue Risk Manager

9.2.1.1 The operator shall appoint in writing, a competent person to be known as the nominated *Fatigue Risk Manager* who shall be responsible and for implementation, monitoring and evaluation of the operator's FRMP, FRMS and FMP.

9.2.1.2 The appointed person may, where necessary delegate some of his or her responsibilities to other persons at the depots or plants, without derogating from his or her overall accountability.

9.2.1.3 The nominated Fatigue Risk Manager shall:

a) report directly to the head of the organization, or
b) be a member of the executive management team (or both).
c) have relevant railway operational knowledge and a comprehensive understanding of fatigue management.
d) ensure that fatigue controls are adequately and effectively developed and implemented in a co-ordinated manner,
e) ensure that fatigue controls comply and give effect to the operator's FRMP and FRMS and form part of the organization’s SMS.

NOTE: Provision should be made for the appointment of an acting fatigue risk manager (with full authority and with adequate hand-over arrangements) in the event that the fatigue risk manager is unable to fulfil his duties.

9.2.2 Senior Managers

9.2.2.1 The operator's Senior Managers shall be responsible to ensure the adoption and implementation of the FRMS and FMP at all levels of the organisation, and shall include the provision of relevant resources.

9.2.3 Managers and supervisors

9.2.3.1 Managers and supervisors shall be responsible for the following:

a) facilitating compliance with the FRMS and FMP;
b) assessing fitness for duty or work;
c) taking appropriate actions when an individual is fatigued or not fit for duty; and
d) minimising and controlling the impact of fatigue.

NOTE: Managers and supervisors of employees undertaking safety-related work are responsible for assessing the fatigue levels and fitness for work of individuals under their control when commencing work and throughout the work period.

9.2.4 Employees

9.2.4.1 Employees shall have the responsibility to:

a) report on duty fit for work;
b) take reasonable care of their own health and level of fatigue as outlined in relevant national legislation (see Foreword);
c) declare to their immediate supervisor any actual or potential impairment of fitness for duty or work, including fatigue (see Annex D); and
d) cooperate with the operator's processes and procedures relating to fatigue management.

9.3 Education and training

9.3.1 The operator shall establish, develop or adopt, document and maintain a fatigue risk education and training programme to ensure that persons undertaking safety-related work have the required skills and knowledge for the successful implementation of the FRMP, FRMS and FMP.

9.3.2 The fatigue risk education and training programme shall be carried out by a trainer with the necessary competencies including expertise in fatigue issues, shift work and sleep patterns.

9.3.3 The fatigue risk education and training programme shall be integrated with the employee's training and development, including induction programmes.

9.3.4 The fatigue risk education and training program shall provide appropriate and sufficient information for employees undertaking safety-related work to evaluate their own level of fatigue and risk factors (see Annex E).

9.3.5 Education and training of supervisors and managers of shall be integrated with their safety training and induction programmes; and shall include the following:

a) strategies to assess, monitor, and manage fatigue-related risks and employee fatigue levels on an ongoing basis; and
b) the assessment of fatigue as a possible contributor to railway occurrences and other incidents.

9.4 Participation

The operator shall ensure that all interested and affected parties and all employees undertaking safety-related work are involved in the development and implementation of the FRMS and FMP.

9.5 Risk assessment

The operator shall implement processes and procedures for conducting fatigue risk assessments as described clause 8.

9.6 Controls

The operator shall continuously implement control strategies to manage fatigue risks as described in clause 8.

9.7 Monitoring and review

The operator shall establish, develop or adopt, document and maintain processes and procedures to monitor, review and record evidence which shall be used to establish whether fatigue risk controls have successfully reduced fatigue risks and fatigue-related occurrences (see Annex C).

9.7.1 Evidence to be gathered shall include the following:

a) comparisons of fatigue risk assessment scores and/or persons fatigue survey findings before and after implementation of fatigue controls; and
b) the number of reported fatigue-related incidents and occurrences.

10 Audits and reviews

10.1 The operator shall conduct audits and reviews to assess the relevance and effectiveness of the organisation's FRMS and FMP at intervals not exceeding 12 months.

10.2 Factors that shall be considered when conducting the audit and review shall include the following:

a) fatigue-related occurrences;
b) reports of fatigue;
c) improvement strategies in fatigue management;
d) results of fatigue surveys.
e) the findings of the fatigue audit and review process shall be used to update the FRMP, FRMS and FMP to ensure that fatigue controls continuously improve;
f) a review shall be conducted on how effective the FRMS and FMP are in managing fatigue-related risks; and
g) the outcomes of the FRMS and FMP shall be communicated to all interested and affected parties, to encourage cooperative participation in managing fatigue.

Annex A

Informative

A.1 Example of a Fatigue Risk Management Policy

NOTE 1: This template is provided as an example to assist the operator in preparing a Fatigue Risk Management Policy (FRMP).

NOTE 2: This template should be considered, edited and changed as may be required or necessary to suit the organisational structure, requirements and policies of the operator to which it applies.

[*Name of operator*]

Fatigue Risk Management Policy (FRMP)

[*Name of operator*] (herein the company) has an obligation under the National Railway Safety Regulator Act, 2002 (Act No. 16 of 2002), the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993), the Basic Conditions of Employment Act, 2013 (Act No. 20 of 2013, and the Labour Relations Act (Act No. 66 of 1995) to provide a working environment that contributes to safe railway operations and minimises potential risks, including the risks of fatigue.

The company hereby acknowledges that fatigue can have impact on safe railway operations and that fatigue risks shall be identified and managed to avoid fatigue-related occurrences.

To achieve this, the company, in consultation with all relevant stakeholders, has adopted this Fatigue Risk Management Policy.

In terms of this FRMP, the company is fully committed to implement and give effect through the provision of human resources, facilities, finances and relevant training to ensure that fatigue risks are identified and managed.

The company is therefore fully committed to develop, adopt, implement, maintain and support an effective Fatigue Risk Management System (FRMS). The system shall be integrated with and supplement the company's overall Safety Management System.

This FRMP and the company's Fatigue Risk Management System shall:

a) apply to all the company’s sites and activities, and
b) apply to all employees, contractors and visitors undertaking or otherwise involved in safety-related work.

The FRMP shall be reviewed whenever the organisation's activities, structures, environment or circumstances change; and also periodically at least once every two years.

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The FRMP shall be reviewed whenever the organisation's activities, structures, environment or circumstances change; and also periodically at least once every two years.

This Fatigue Risk Management Policy is agreed and adopted:

For and on behalf of [*name of operator*],

Signature and date:

Name and position.

Annex B

Informative

B.1 Example of a Letter of Appointment of a Fatigue Risk Manager (FRM)

NOTE: This template is provided to assist the operator in preparing a letter of appointment for a nominated Fatigue Risk Manager. This letter should be considered, edited and changed as may be required or necessary to suit the organisational structure and policies of the operator to which it applies.

[Company logo]

Date:

To: *[name of appointee]*

Letter of Appointment, Nominated Fatigue Risk Manager

Dear *[name of appointee],*

I, *[name and position of person making the appointment]*, hereby appoint you, [name of appointee] as the company's Fatigue Risk Manager in terms of clause 7 of the Railway Safety Regulator's Standard RSR 00-4-1:2015, Railway Safety Management, Human factors management, part 4-1: Fatigue management.

You shall be responsible for the development, adoption, implementation, monitoring and evaluation of the company's Fatigue Risk Management Policy, Fatigue Risk Management System and Fatigue Management Program and for all other matters pertaining to the management of fatigue within the company and its employees.

In this regard you shall ensure that for any period of absence (either temporary or permanent) a responsible person is appointed in writing in your place to perform your duties.

You shall further ensure the company's compliance to *RSR 004-1: Fatigue Management Standard, SANS 3000-4: Human Factors Management Standard, SANS 3000-1: General Safety Management Standard*, and any other relevant legislation.

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In accepting this appointment and without detracting from your responsibility as described herein, you may in writing assign any duties, functions or portions thereof to any other competent person who shall carry out the assigned duties subject to your control and direction.

Signed _____

Name: _____

Title: _____

Date _____

I, the undersigned, accept the appointment as set out above and confirm my understanding of the duties and responsibilities involved.

Signed _____

Name: _____

Position/Title: _____

Date: _____

Annex C

Informative

C.1 Example of Fatigue Incident Report

NOTE: This template is provided as an example to assist the operator in creating a Fatigue Incident Report Form that should be completed:

a) by an employee when he or she is believed to be fatigued; or
b) after an incident or occurrence where fatigue of an employee may have played a role).

NOTE 2: The operator should consider this form and modify or use it to design a form that is suitable for its own operations.

Fatigue Incident Report			**Confidential: yes / no**	
Name:	Position:	ID Number:	Employee number:	
This form is being completed in relation to a fatigue incident associated with: (tick one)				
A reported safety incident or event	A non-reported safety incident or event	A general concern regarding fatigue	Other (state)	
When did this event occur?	Date:	Time:	How long have you been on duty?	Hrs: Mins:
Where were you at the time of the event?				
At home	Going to work	At work	Going home	Other (state)
If relevant, on what train did this occur?			**If not on a train, where did this occur?**	
Train number:	Location:	Train type:	Location:	
Fatigue details:				
Description:				
Cause:				
Action taken and results:				
Remedies and suggestions:				

Contributory factors (tick all that contributed to the event (or your concerns)	
Commuting time	Early start time
Delays	Late finish time
Health issues	Long duty day or shift
Home or domestic issues	Long term fatigue
Insufficient home rest	Excessive overtime
Insufficient hotel rest	Roster disruption
Insufficient rostered rest time	Illness or medication
Early to late shift change	Don't know
Late to early shift change	Other: (describe)
Overslept or rushed to work	
Underslept or could not sleep	

Sleep inventory: For the 72 hours prior to the event, record the start and finish times for all sleep periods (including naps)			**Commuting time:**
	Date:	Time:	Home to work
Start:			Hrs: Mins:
End:			Work to home
Start:			Hrs: Mins:
End:			
Start:			
End:			
Start:			
End:			
Start:			
End:			

Start:				
End:				
Tick all physical and cognitive signs of fatigue that were apparent in the 2 hours leading up to the event and any counter-measures you used				
Physical signs:	**Cognitive (mental) signs:**	**Countermeasures taken:**		
None noticed	None noticed	None taken		
Fidgeting	Impaired attention	Advised colleague of my fatigue		
Rubbing eyes	Impaired memory	Advised manager of my fatigue		
Yawning	Negative mood	Coordinated or reduced workload		
Frequent blinking	Reduced communication	Increased communication		
Staring blankly	Impaired problem solving	Drank coffee or caffeine		
Long blinks	Increased risk taking	Took food or drink		
Difficulty in keeping eyes open	Impaired situational awareness	Napped whilst on duty		
Head nodding	Missed a period of time	Listened to radio or music		
Other (state)	Other (state)	Other (state)		
How alert did you feel immediately prior to the event? (tick one)				
Fully alert, wide awake	Alert, lively, responsive but not at peak	OK, somewhat fresh	A little tired, less than fresh	Moderately tired, let down
Extremely tired, unable to concentrate	Completely exhausted			
Signature:	Date:	Time:	Place"	

Annex D

Informative

D.1 Example of an Employee Fitness for Duty Declaration

NOTE 1 This template is provided as an example to assist the operator in creating a “Fitness for Duty Declaration” to ensure that its employees take responsibility and report for work fit for duty as prescribed in clause 9.2.4 above.

NOTE 2: Where either a mechanical clock-card system or a computerised, biometric clocking system is used, the operator should consider placing a similar declaration and appropriate notices in the vicinity informing employees that by clocking-in, they are automatically and irrevocably declaring themselves not to be fatigued and to be “fit for duty”.

[Name of Company or Operator]

SIGN-ON DUTY DECLARATION

I the undersigned hereby declare that I meet all the requirements for "fitness for duty" as outlined in the company's fatigue risk management policies and procedures.

I declare that I am mentally and physically fit and that I have had sufficient sleep and rest, have not worked excessive hours in the last two days and that I am not taking or using any medications that have potential impact on my fitness for duty, except those that have been disclosed to the company and the use of which has been specifically approved by the company or its medical practitioner.

I hereby declare that I am not currently under the influence of any impairing substances, and that I have not taken any such within the last 8 hours.

I certify that I am aware of the importance of being fit for duty, of not being fatigued whilst undertaking safety-related work. I acknowledge that making an erroneous or false declaration may render me subject to the company's disciplinary procedures or other legal action.

Date and time of last major sleep period:

Date and time of last alcohol intake:

Name and signature of declarant:

Employee or ID number:

Date and time:

Location:

Result of breathalyser test (if conducted):

Name and signature of person conducting test:

Employee or ID number:

Date and time:

Annex E

Informative

E.1 Personal Fatigue Checklist

Note: This template form is provided as an example to assist the operator in creating a suitable "personal fatigue checklist" to enable employees to assess their own current fitness status and thus report to work "fit for duty" as prescribed in clause 9.2.4 above.

Personal fatigue checklist

The purpose of the personal fatigue checklist is to enable you to assess and review how you are feeling before starting work. You should also use this checklist to assess and rate your own personal fatigue status if you feel tired or start to doubt of your ability to perform your work safely.

Rating		**Low**	**Moderate**	**High**
How much sleep did you have in the last …	24 hours?	7 or more hrs	6 to 7	Less than 6
	48 hours?	More than 14 hrs	12-14 hrs	Less than 12 hrs
How many hours will you have been awake at the end of your shift?		Less than 14 hrs	14-16 hrs	More than16 hrs
How many alcoholic drinks have you had in the last 12 hours?	Males	0 - 4	5 - 6	More than 6
	Females	0 - 2	3 - 4	More than 4
Are you taking medication or other substances that may affect your fitness of duty?		No		Yes
Did you have an afternoon sleep before your first night shift?		Yes		No
Are there any other health or personal factors that may be affecting your fitness for duty?		No		Yes
Do you feel rested and focused on the job? (Rate yourself on the Alertness Scale below)		1 or 2	3	4 or 5
ACTION		**Self-monitor**	**Implement fatigue mod-eration strat-egies**	**Contact your manager to discuss**

ALERTNESS SCALE		
Description	**Signs**	**Rating**
Highly alert	Feel active, energetic, wide awake and attentive to surroundings, good coordination.	1 ☐
Alert	Functioning well but not quite at peak (see above).	2 ☐
Mildly fatigued	Awake but not energetic or fully alert. Responding to things as required but requiring an effort. Prefer to relax rather than to be active.	3 ☐
Fatigued	Eyes tired, difficulty in focusing, irritable, struggle to understand complex instructions, clumsy, unmotivated, have speech errors or impediments.	4 ☐
Very Fatigued	Long eye-blinks, head nodding forward, fighting sleep, difficult to hold a conversation, forget what one is trying to say, want to be left alone and lie down, strong desire to sleep.	5 ☐

Assessment	**Action**
All "low":	Continue to monitor your personal levels of fatigue.
One or more "moderate":	You are showing some early signs of fatigue – you should consider using relevant fatigue-relieving strategies and continue to monitor your fatigue levels. If you start feeling sleepy, yawning or find it hard to concentrate you should immediately stop work and talk to your manager or supervisor.
One or more "high"	You are showing potentially strong signs of fatigue – you should talk to your manager or supervisor about your fatigue status before commencing work.

Name: _____ Department: _____

Date: _____

Annex F
Informative

F.1 Fatigue Risk Assessment Process

Step 1: Hazard identification	**Step 2: Risk assessment**				**Step 3: Risk control**
Identify potential hazards and risks at the workplace. Examples of some factors that contribute to fatigue are listed below. Consider these factors in the context of the specific railway activity.	To assist risk assessment, a general level of risk for each hazard is indicated along arrow guides. In assessing risks consider the existence of and interaction between multiple hazard factors that could influence the level of risk. Also take into account specific workplace or industry circumstances that may influence it.				Where a hazard is assessed as a medium or higher risk, consider implementing control measures such as those outlined below:
Factors that contribute to fatigue	**General risk indicator for factors that contribute to fatigue**				**Control measures**
Work scheduling and planning	Lower Risk → Higher risk				**The most appropriate control measures should be implemented for the identified risk factor. Control measures may include:**
☐Average weekly hours worked:	35-40 hours per working week)	40-48 hours per working week	48-56 hours per working week	56 hours or more per working week	☐Scheduling safety-critical work outside low body-clock periods (i.e. between 02:00 and 06:00).
☐Daily work hours:	Less than 9 hours	9 hours	9-12 hours	12 or more hours	☐Structuring shifts and work plans so that demands are highest towards the middle of the shift and decrease towards the end.

☐Daily work-related travel, including commuting time:	Less than 1 hour	1-2 hours	2-4 hours	4 or more hours	☐Using forward rotation roster systems (day-evening-night).
☐Scheduling of work:	Regular, predictable hours		Irregular and unpredictable hours, short notice of schedule, extended overtime, on-call across shift cycle		☐Designing working hours and rosters to provide for adequate sleep opportunity (considering time for eating, washing, personal commitments, etc.).
					☐Monitoring actual time worked against the allocated roster and identify if excessive hours are being worked.
Shift work and shift patterns	Lower Risk			Higher risk	**Additional control measures should be implemented for special work arrangements and include:**
☐Length of shift:	Less than 9 hours	9 - 10 hours	10 - 12hours	More than 12 hours	☐Consider sleep opportunity and recovery in instances where workers are required to work on-call after a normal shift or on days off.
☐Time of shift:	Day shift	Afternoon shift	Evening shift	Night shift	☐Avoiding quick shift changeovers such as finishing at 23:00 and starting again at 07:00.
☐Speed and direction of shift:	Forward rotation (e.g. morning -> afternoon -> night)		Backward rotation (e.g. night -> evening -> morning)	Slower rotation (e.g. weekly or 2-4 weeks rotation)	☐Allocating shift and night workers consecutive days off to allow for at least two full nights' rest including some weekends.

☐Split shifts and variable shifts:		10-hour or greater split-shift period / 13-hour or greater split-shift period	☐Using forward rotation roster systems (e.g. day->evening->night->day).
Environmental conditions	Lower Risk → Higher risk		**The most appropriate control measures should be implemented for the identified risk factor. Control measures may include:**
☐Exposure to high, low or extreme temperatures:	Moderate temperatures, short periods of exposure	Higher or lower than normal temperatures, longer periods of exposure	☐Avoiding working during periods of extreme temperature. ☐Installing heating devices in cold work environments. ☐Installing cooling devices in hot work environments and ensure shelters for shade are available if cooling is impractical.
☐Exposure to hazardous substances:	Hazardous substances with low risk, calculated using relevant exposure standard or exposure for short durations	For hazardous substances with high risk, calculated using relevant exposure standard or exposure for longer durations	
☐Exposure to noise:	Low noise levels measured using relevant standard (see SANS 3000-4)	High noise levels measured using relevant standard (see SANS 3000-4)	☐Installing fit-for-purpose machinery (low-noise). ☐Installing adjustable, low-vibration seats in appropriate machinery and vehicles and providing low-vibration hand-held equipment. ☐Taking reasonable steps to ensure the workplace and surroundings are well lit, safe
☐Exposure to extreme temperatures:	Short periods of exposure measured using relevant standard (see SANS 3000-4)	Longer periods of exposure measured using relevant standard (see SANS 3000-4)	
☐Exposure to vibration:	Short periods of exposure measured using relevant standard (see SANS	Longer periods of exposure measured using relevant standard (see SANS	

	3000-4)	3000-4)	and secure.
Individual and lifestyle	Lower Risk	Higher risk	**The most appropriate control measures should be implemented for the identified risk factor. Control measures may include:**
☐Sleep (quality):	Night sleep, low light, low noise	Day sleep, high light, high noise	☐Consulting with workers and designing shift rosters that enable workers to meet work and personal commitments. ☐Developing a fitness for work policy and implementing health and fitness programs. ☐Developing and implementing EAP and lifestyle management programs.
☐Sleep (amount):	8 or more hours sleep time in 24 hours	6 or fewer hours sleep in 24 hours	
☐Health and wellbeing:	No illness or injuries	Recent illness or injuries	
☐Social life:		Influence of alcohol, drugs or reduced amount of sleep	
☐Family responsibilities:	Adequate time to fulfil family responsibilities	Inadequate time to fulfil family responsibilities	
☐Other work commitments (for example having a second job):	No other work commitments	Additional work commitments (moonlighting or second job)	

Night work	Lower Risk → Higher risk			**The most appropriate control measures should be implemented for the identified risk factor. Control measures may include:**
☐Shift end time (for those working 8 hrs or more between 22:00 and 06:00:			After 22:00 and before 06:00	☐ Planning into work schedules enough workers and other resources to do the job without placing excessive demands on workers. ☐Avoiding overtime allocations following a period of afternoon or night shifts. ☐Keeping sequential night shifts to a minimum.
☐Long shift lengths:	8-hour or less shift length	8 to 10-hour shift length	Greater than 10-hour shift length	
☐Consecutive night shifts:			More than 5 x 8-hour or 4 x 10-hour or 3 x 12-hour consecutive night shifts	

Breaks	Lower Risk → Higher risk				**The most appropriate control measures should be implemented for the identified risk factor. Control measures may include:**
☐Period of non-working following a sequence of night shifts:	48 hours or more		Less than 48 hours	Less than 24 hours	☐Ensuring that workers have and take adequate and regular breaks so that they can rest, eat and rehydrate. ☐Designing working hours and rosters to allow for good quality sleep and enough
☐Frequency of breaks during work:	Adequate and regular breaks	Some breaks	Infrequent or few breaks	No breaks	

			recovery time between work days or shifts for travelling, eating, washing and sleeping.
☐Recovery time or sleep opportunity between work periods:	Adequate time for sleep, travel, meals, etc.	Inadequate time for sleep, travel, meals etc.	☐Including rest periods in the work schedule and allowing time for controlled sleeping and napping if necessary.
Job demands	Lower Risk → Higher risk		**The most appropriate control measures should be implemented for the identified risk factor. Control measures may include:**
☐Repetition (physical or mental):	Varying task demands	Repetitive or high concentration work, with high demands over an extended period of time	☐Installing fit-for-purpose plant, machinery and equipment for use at the workplace.
☐Physical:	Minimally physically-demanding work	Physically-demanding work that results in muscle fatigue	☐Redesigning jobs to limit periods of excessive mental or physical demands.
☐Mental:	Minimally mentally-demanding work	Mentally-demanding work that results in mental fatigue	☐Introducing job rotation to limit build-up of mental and physical fatigue.

End of Document