

Australian Standard[®]

Railway safety management

Part 5: Operational systems



This Australian Standard® was prepared by Committee ME-079, Railway Safety. It was approved on behalf of the Council of Standards Australia on 17 October 2006. This Standard was published on 10 November 2006.

The following are represented on Committee ME-079:

- Association of Railway Preservation Groups
 - Australasian Railway Association
 - Australian Chamber of Commerce and Industry
 - Australian Transport Safety Bureau
 - Commonwealth Department of Transport and Regional Services
 - Council of Tramway Museums of Australia
 - Department of Infrastructure, Vic.
 - Department of Infrastructure, Energy and Resources, Tas.
 - Department of Infrastructure, Planning and Environment, NT
 - Department of Transport Energy and Infrastructure, SA
 - Engineers Australia
 - Independent Safety and Reliability Regulator, NSW
 - National Transport Commission
 - Queensland Transport
 - Rail, Tram & Bus Union
 - WA Department of Planning and Infrastructure
-

This Standard was issued in draft form for comment as DR 05557.

Standards Australia wishes to acknowledge the participation of the expert individuals that contributed to the development of this Standard through their representation on the Committee and through public comment period.

Keeping Standards up-to-date

Australian Standards® are living documents that reflect progress in science, technology and systems. To maintain their currency, all Standards are periodically reviewed, and new editions are published. Between editions, amendments may be issued.

Standards may also be withdrawn. It is important that readers assure themselves they are using a current Standard, which should include any amendments that may have been published since the Standard was published.

Detailed information about Australian Standards, drafts, amendments and new projects can be found by visiting **www.standards.org.au**

Standards Australia welcomes suggestions for improvements, and encourages readers to notify us immediately of any apparent inaccuracies or ambiguities. Contact us via email at **mail@standards.org.au**, or write to Standards Australia, GPO Box 476, Sydney, NSW 2001.

Australian Standard[®]

Railway safety management

Part 5: Operational systems

Originated as AS 4292.5—1997.
Second edition 2006.

COPYRIGHT

© Standards Australia

All rights are reserved. No part of this work may be reproduced or copied in any form or by any means, electronic or mechanical, including photocopying, without the written permission of the publisher.

Published by Standards Australia GPO Box 476, Sydney, NSW 2001, Australia
ISBN 0 7337 7850 X

PREFACE

This Standard was prepared by the Standards Australia Committee ME-079, Railway Safety in conjunction with AS 4292.1 to provide a means of demonstrating compliance with that Standard in the relevant technical area. It supersedes AS 4292.5, *Railway safety management*, Part 5: *Operational systems*.

This Standard is part of a series of Standards on railway safety as follows:

AS

4292	Railway safety management
4292.1	Part 1: General and interstate requirements
4292.2	Part 2: Track, civil and electrical infrastructure
4292.3	Part 3: Rolling stock
4292.4	Part 4: Signalling and telecommunications systems and equipment
4292.5	Part 5: Operational systems (this standard)
4292.7	Part 7: Railway safety investigations

The principal changes from the previous edition are as follows:

- (a) Reference to maintenance issues has been added to Section 3.
- (b) Clauses on verification and validation have been added to Sections 3 and 4.

The terms ‘normative’ and ‘informative’ have been used in this Standard to define the application of the appendix to which they apply. A ‘normative’ appendix is an integral part of a Standard, whereas an ‘informative’ appendix is only for information and guidance.

CONTENTS

	<i>Page</i>
FOREWORD.....	5
 SECTION 1 SCOPE AND GENERAL	
1.1 SCOPE	6
1.2 APPLICATION	6
1.3 REFERENCED DOCUMENTS	6
1.4 DEFINITIONS	7
1.5 FUNCTIONAL AREAS	8
1.6 ASSET LIFE CYCLE.....	9
1.7 ADOPTION OF EXISTING PRACTICES	9
1.8 HAZARD IDENTIFICATION AND RISK ANALYSIS	9
1.9 COMMUNICATION.....	11
1.10 HANDLING OF EXCEPTIONS	11
 SECTION 2 INTERFACE COORDINATION.....	
	12
 SECTION 3 DESIGN	
3.1 GENERAL	13
3.2 SAFEWORKING SYSTEM SELECTION	13
3.3 OPERATIONAL INTEGRITY.....	14
3.4 CONSTRUCTION SITES	16
3.5 SAFETY OF PERSONS.....	16
3.6 VERIFICATION AND VALIDATION.....	17
 SECTION 4 CONSTRUCTION AND IMPLEMENTATION	
4.1 GENERAL REQUIREMENTS	18
4.2 FACTORS TO BE CONSIDERED	18
4.3 VERIFICATION AND VALIDATION.....	18
 SECTION 5 COMMISSIONING	
5.1 GENERAL	19
5.2 COMMISSIONING PLAN.....	19
 SECTION 6 OPERATIONS	
6.1 GENERAL	20
6.2 TRAIN MANAGEMENT.....	20
6.3 TRAFFIC MANAGEMENT.....	20
 SECTION 7 MONITORING AND MAINTENANCE	
7.1 GENERAL	21
7.2 INSPECTION AND MAINTENANCE.....	21
7.3 MONITORING OPERATIONAL PERFORMANCE.....	21
 SECTION 8 MODIFICATION	
	22
 SECTION 9 DECOMMISSIONING AND DISPOSAL	
	23

APPENDICES

A	ASSET LIFE CYCLE PHASES—DESCRIPTION AND PROCESS REQUIREMENTS.....	24
B	INTERFACES BETWEEN ENGINEERING AND OPERATIONAL FUNCTIONS.....	28
C	SAFEWORKING OCCUPANCY CONTROL	32
D	OTHER OPERATIONAL SYSTEMS	36
E	EXAMPLES OF OCCUPANCY CONTROL SYSTEMS.....	37
F	EXAMPLES OF OCCUPANCY AUTHORITIES.....	39
G	APPLICATION OF JOINT OCCUPANCY RULES	43

FOREWORD

A means of complying with this Standard may be by an organization entering into a commitment to conform to a code of practice which has been deemed by the relevant authority to comply in respect of the organization's type of operation. The National Code of Practice for Australian Rail Operations includes a range of codes applicable to specific railway activities such as tramways, tourist/heritage, short haul and advanced technology railways, as well as main line and heavy haul operations.

STANDARDS AUSTRALIA

Australian Standard

Railway safety management

Part 5: Operational Systems

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE

This Standard specifies requirements and provides guidelines for preparing or adopting engineering and operating systems safety standards and procedures to comply with the relevant requirements of AS 4292.1, in respect of design, installation, operation and maintenance of operational systems.

The Standard provides broad, high level principles intended to foster uniformity in railway operational systems ranging from the sophisticated controls required for high volume, high speed heavy rail systems to low volume heavy rail systems and to the special needs of light rail. The breadth of these principles invites them to be interpreted to cover all of the control environments currently existing or likely to develop in the foreseeable future in Australia whilst at the same time ensuring that the essential elements of safe and uniform practice are incorporated within those environments.

1.2 APPLICATION

This Standard sets technical requirements to be considered for inclusion in engineering systems safety Standards forming part of a railway safety management system prepared in accordance with AS 4292.1. It also addresses requirements for an interface coordination plan which specifies the information which must pass across the interfaces between the various functional areas of railway organizations to enable these standards and procedures to be implemented, and to ensure compatibility between those functional areas.

It is recognized however, that additional or alternative matters and requirements may need to be considered for each railway application. The applicability of each element of these guidelines should be determined by the level of risk it imposes on each operation (see Clause 1.8). In applying this Standard the following matters should be taken into account:

- (a) The role of the railway.
- (b) The function in the organization of the person, corporation, contractor or supplier who is applying the Standard.
- (c) The commercial agreements between owners, operators and functional areas.
- (d) The promotion of commercial and technological innovation.
- (e) Existing safety procedures and practices.
- (f) The need to determine which life cycle phases (see Clause 1.6) are applicable to an organization.

NOTE: Attention is drawn to the Foreword which describes a means of complying with this Standard.

1.3 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

AS

- 4292 Railway safety management
- 4292.1 Part 1: General requirements
- 4292.2 Part 2: Track, civil and electrical infrastructure
- 4292.3 Part 3: Rolling stock
- 4292.4 Part 4: Signalling and telecommunications systems and equipment

AS/NZS

- 4360 Risk management

1.4 DEFINITIONS

The definitions in this Clause may include terms which are either not used in some railway organizations or are defined differently. In the interests of national uniformity the following terms are promoted for ultimate universal use. Terms and definitions in most common use have been adopted where practicable.

For the purposes of this Standard, the definitions in AS 4292.1 and those below apply.

1.4.1 Cross

The passing of two trains travelling in opposite directions at crossing loops on a single track.

1.4.2 Interlocked

Interconnected components of signalling and signal systems, with or without points or crossings, designed so that no conflicting movements can be signalled.

1.4.3 Occupancy authority

Any formal permit of a kind described in this Standard issued to a train crew or work site safety supervisor allowing occupancy or obstruction of one or more track sections.

1.4.4 Pass

The overtaking of one train by another travelling in the same direction at crossing loops on a single track.

1.4.5 Permissible rolling stock outline

The outline which defines the limiting cross-sectional geometry for rolling stock and its load including kinematic effects.

1.4.6 Points and crossings

In-track structures which provide for one track to join or cross another.

1.4.7 Safeworking system

An integrated system of operating procedures and technology for the safe operation of trains and the protection of people and property on or in the vicinity of the railway.

1.4.8 Shall

Indicates that a statement is a requirement of this Standard.

1.4.9 Should

Indicates a recommendation.

1.4.10 Track section

The section of railway track between two locations specified for operating purposes. In different track networks this track element may be referred to as either a section or a block.

1.4.11 Train controller

The employee responsible for the management and control of traffic movements and occupancy authorities.

1.4.12 Train crew

Worker or workers in charge of the operation of trains.

1.4.13 Work site safety supervisor

The worker responsible for safety and protection of personnel at a track work site and ensuring that the site is safe for the operation of trains.

NOTE: May be referred to as 'protection officer' in some organization.

1.4.14 Validation

Confirmation that the particular requirements for a specific intended use are fulfilled.

1.4.15 Verification

Testing and evaluation of an item of equipment or a system to assure compliance with its specification or other requirements.

1.5 FUNCTIONAL AREAS

Application of this Standard requires that the functional areas set out in Table 1.1 and their corresponding responsibilities be recognized in the preparation of a railway safety management system.

The roles of each functional area are as follows:

- (a) Establishment and maintenance of standards and procedures in the primary areas of responsibility and in accordance with the referenced Standards as set out in Table 1.1.
- (b) Interface coordination as set out in Section 2.

TABLE 1.1
FUNCTIONAL AREAS IN RAILWAY ORGANIZATIONS

Functional areas	Primary area of responsibility	Reference Standard
Infrastructure	All aspects relating to the provision of track, civil and electrical infrastructure	AS 4292.2
Rolling stock	All aspects relating to the provision of items of rolling stock	AS 4292.3
Signalling and telecommunications	All aspects relating to the provision of signalling, telecommunications and train monitoring equipment	AS 4292.4
Traffic management	All aspects relating to the provision and implementation of traffic (train) control and uniform safeworking rules, regulations and procedures and relevant aspects of train integrity	AS 4292.5*
Train management	All aspects relating to the provision and implementation of train movement, planning, marshalling, consist requirements, dispatch, crewing and inspection, and relevant aspects of train integrity	AS 4292.5*

* This Standard.

1.6 ASSET LIFE CYCLE

The Sections of this Standard have been arranged to follow the successive phases in the life cycle of operating system assets. The phases in the life cycle are as follows:

- (a) Design (see Section 3).
- (b) Construction and implementation (see Section 4).
- (c) Commissioning (see Section 5).
- (d) Operations (see Section 6).
- (e) Monitoring and maintenance (see Section 7).
- (f) Modification (see Section 8).
- (g) Decommissioning and disposal (see Section 9).

The way in which these life cycle phases relate to the railway safety management system described in AS 4292.1 and expanded in this and the other parts of AS 4292, is illustrated in Figure 1.1.

NOTE: Descriptions of the phases and their process requirements are tabulated in Appendix A.

It is recognized that an organization's safety management system will deal with only those life cycle phases which are relevant to its operation. The assessment as to which of these is relevant in a particular case should be made in accordance with Clause 1.2.

1.7 ADOPTION OF EXISTING PRACTICES

It is acknowledged that in existing railway operations there are practices considered by organization as safe. Continued use of these practices or their use by a new railway that can be shown to be sufficiently similar to an existing railway, shall be supported by a comprehensive assessment to ensure that all risks including latent risks are identified and any appropriate additional controls implemented. This option may have particular relevance to the operation and maintenance of tourist, heritage and special purpose systems.

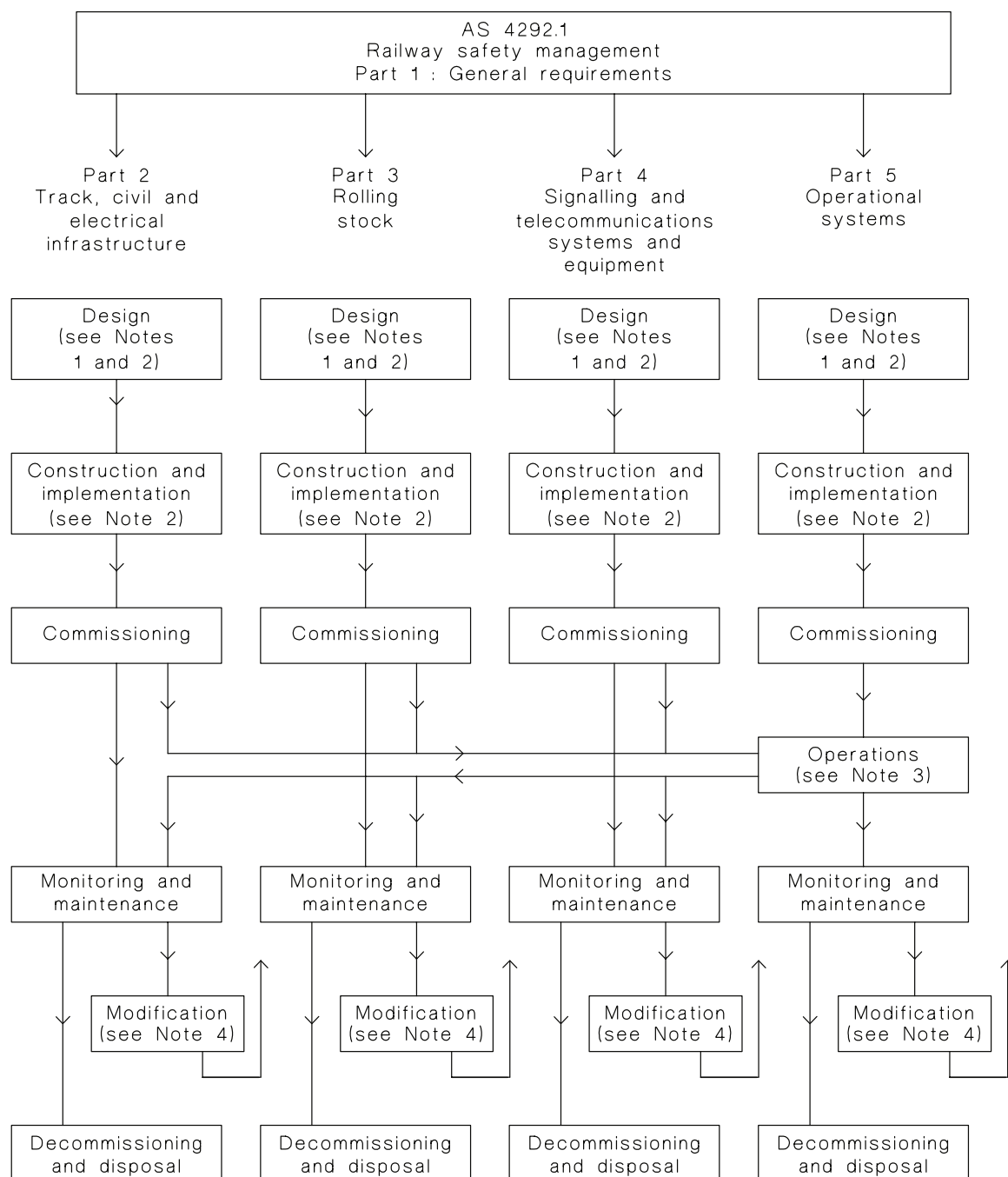
1.8 HAZARD IDENTIFICATION AND RISK ANALYSIS

Determination of the matters to be included in standards and procedures for each phase of the life cycle should include identification of hazards which might affect the following:

- (a) Safety integrity of the safeworking system in use at any location.
- (b) Integrity of trains.
- (c) Route integrity at the junction of two safeworking systems, or at a change of system.
- (d) Compatibility between the safeworking system and the signalling and telecommunications system and hardware.
- (e) Safe operation of trains including yard type operations.
- (f) Safety of persons on or adjacent to the railway.

The level of risk analysis needed for particular factors will not necessarily be the same in all cases. Detailed analysis may not be required where an organization adopts established practices that have been shown to deliver a satisfactory safety performance under equivalent conditions. Analysis will, however, be required where changes to the practices are proposed. The minimum requirement in such cases shall be a risk analysis on the elements of the changes.

NOTE: Further guidance on risk analysis may be found in AS/NZS 4360.



NOTES:

- 1 Designs are to be compatible.
- 2 Verification and validation of this process is required.
- 3 Operational interfaces are to be co-ordinated.
- 4 Modification will involve the design, construction, implementation and commissioning lifecycle stages.

FIGURE 1.1 THE ASSET LIFE CYCLE

1.9 COMMUNICATION

Safe operation of a railway requires communication within an organization and between organizations on a variety of matters. Standards and procedures prepared in accordance with this Standard shall include requirements to ensure that all required communication is carried out in an effective and reliable way.

1.10 HANDLING OF EXCEPTIONS

Procedures should be established and maintained for assessing the safety of operations which are considered to be feasible in a particular case but which would normally be precluded by strict observance of the specified design or operating parameters, e.g. structure gauge infringement, communications system failure.

SECTION 2 INTERFACE COORDINATION

Where there exists a planned railway activity interface which involves other parties, or functional areas, if documented processes are not already in place, an interface coordination plan shall be established. This plan shall clearly delineate the responsibilities of each party or functional area involved. The plan should include the following:

- (a) Determination of the functional areas in each organization which will be involved and the interfaces across which coordination needs to be established.
- (b) The subject matter to be considered and resolved across each interface, in terms of the matters specified for consideration in this Section.
- (c) Determination as to which party agrees to accept responsibility for each item of subject matter identified in Item (b).
- (d) Procedures for the exchange of safety information.
- (e) Procedures for assessing and monitoring the compatibility of engineering and operational parameters.
- (f) Procedures for the review of the interface coordination plan.

Recommended subject matter which should be considered and resolved in the establishment of an interface coordination plan between each of the functional areas set out in Clause 1.6 is given in Appendix B. The need for each of the items listed in the Appendix to be included in an organization's safety management system should be determined in accordance with Clauses 1.2, 1.7 and 1.8.

SECTION 3 DESIGN

3.1 GENERAL

This Section specifies how standards and procedures are developed for the selection and design or modification of a safeworking system in respect of the following:

- (a) Safeworking system selection and justification.
- (b) Operational integrity of track and trains in respect of—
 - (i) route integrity;
 - (ii) train integrity; and
 - (iii) contingency planning.
- (c) Safety of persons and property.

The need for each of the items listed under each heading in this Section, to be included in an organization's safety management system, should be determined in accordance with Clauses 1.2, 1.7 and 1.8.

3.2 SAFEWORKING SYSTEM SELECTION

3.2.1 Safety level justification

The appropriateness of a particular safeworking system should be justified with regard to the level of safety of the operation. This assessment should be made in accordance with the hazard identification and risk analysis recommendations given in Clause 1.8.

NOTE: Although this assessment may not be included in the organization's operating procedures manuals, it should be recorded in supporting documentation. An organization may develop standardized guidelines for the selection of safeworking systems related to various combinations of operating conditions.

3.2.2 Selection procedure

The selection procedure shall take account of the need for a railway safeworking system to—

- (a) maintain a safe distance between trains on the same track;
- (b) safeguard the movement of trains at points and crossings;
- (c) maintain the route set during the passage of a train;
- (d) regulate the passage of trains according to the service density and speed required;
- (e) ensure trains are provided with a valid route for the required destination; and
- (f) maintain the safety of personnel and equipment on or near the track.

3.2.3 Factors to be considered

The safeworking system may rely on a combination of various safety-related factors, both physical and procedural, for safety. The factors to be considered in selecting an appropriate system should include the following:

- (a) Train traffic frequency, in particular, the number of interacting train movements.
- (b) The speed, mass, acceleration and brake performance of trains.
- (c) The physical layout of the track.

- (d) The need to determine whether track sections are clear or occupied (including the operation of track circuits and other similar apparatus).
- (e) The need to determine the status of signals and associated appliances, e.g. points and operating mechanisms.
- (f) Human factors involved in carrying out the procedures.
- (g) The need to ensure that roads or track sections that are closed cannot be entered inadvertently.
- (h) The need to ensure that electrically isolated or non-energized sections cannot be inadvertently energized.
- (i) Maintenance issues.

3.3 OPERATIONAL INTEGRITY

3.3.1 Route integrity

Standards and procedures shall be established and maintained for the provision and maintenance of route integrity for any train which has been given clearance to proceed along that route. These standards and procedures should take into account the need—

- (a) to ensure that the train has either exclusive occupancy of each track section over which it is authorized to move, or that an appropriate occupancy authority will be provided to permit joint occupancy of a track section under controlled safeworking conditions (see Appendix C), or alternatively that it can operate under a different operating system (see Appendix D) at acceptable risk levels;
- (b) to ensure the protection of workers and work sites;
- (c) to ensure that points are not moved either under a train or when it is approaching;
- (d) for interlocking;
- (e) to provide alternative means of ensuring route integrity if there is a failure of the occupancy control system normally in place;
- (f) where practicable, to minimize the risk of track obstructions;
- (g) to regulate the speed of trains in respect of interface items, including—
 - (i) any speed restrictions related to the effect of particular items of rolling stock on the track or infrastructure;
 - (ii) permanent speed limits to apply to specific tracks and track layouts such as curves, junctions and level crossings on a particular route;
 - (iii) arrangements for applying temporary or emergency speed limits on track sections;
 - (iv) means of ensuring timely and effective communication of speed limits to all track users; and
- (h) secure rolling stock when stopped or parked.

Where a railway is to operate under a safeworking system providing exclusive occupancy or joint occupancy or both, general requirements are given in Appendix C. Requirements for alternative operating systems are given in Appendix D.

3.3.2 Train integrity

Standards and procedures shall be established and maintained for the provision and maintenance of train integrity before and during any journey. These standards and procedures should take into account where appropriate, the following factors:

- (a) Train management requirements:
 - (i) Train length.
 - (ii) Loading gauge limitations.
 - (iii) Motive power.
 - (iv) Train marshalling sequences.
 - (v) Tonnage limitations.
 - (vi) Train braking characteristics.
 - (vii) On-board communications and safeworking equipment.
 - (viii) Train brake testing.
 - (ix) Handbrakes.
- (b) The need for provision of rolling stock which is fit for the journey to be undertaken by the train.
- (c) Coupling integrity, including integrity of pneumatic and electrical couplings.
- (d) The need to load and secure freight within the limits for the journey to be undertaken.
- (e) The need to regulate the speed of trains with respect to interface items, including the following:
 - (i) The maximum speed at which particular items of rolling stock can be run on any track.
 - (ii) Temporary or emergency speed limits which apply to particular items of rolling stock from time to time.
 - (iii) Means of ensuring timely and effective communication of speed restrictions imposed on rolling stock to the appropriate operating staff and where relevant to the train controller.
- (f) The need to provide on-train documentation detailing the train's length, tonnage and composition including dangerous goods and out-of-gauge loading.
- (g) The need to provide any other on-train equipment required for safe operation.
- (h) Verification that the train is complete.
- (i) Requirements for re-establishing train integrity after the train composition is changed.
- (j) Requirements for dealing with defective vehicles in accordance with AS 4292.3.

3.3.3 Contingency planning

Standards and procedures shall be established and maintained for minimizing the impact and re-establishing route and train integrity in the event that integrity is lost. These standards and procedures should take into account where appropriate, the following factors:

- (a) The need to establish the cause of loss of integrity.
- (b) The need to arrest any dangerous situation resulting from the loss of integrity, including track and train protection.
- (c) The need to ensure integrity is recovered by issue of appropriate occupancy authorities.
- (d) The use of alternative standards and procedures to provide and maintain track or train integrity.

- (e) The need to ensure route and train integrity is not lost during the transition from one system to another or to a recovery phase.

The contingency plan for recovering loss of integrity should also take into account the route integrity requirements listed in Clause 3.3.1 and the train integrity requirements listed in Clause 3.3.2.

3.4 CONSTRUCTION SITES

A construction site is described as a site at which new railway infrastructure is being constructed and is yet to be commissioned, or a section of existing railway which has been temporarily decommissioned for construction, emergency or other purposes. It is separated operationally from the normal traffic management system. Standards and procedures shall be established and maintained for the safe traffic management, including where appropriate, a safeworking system at a construction site. These should take into account the following:

- (a) The need for a single person to control track occupation and train movement to and from, and within the site.
- (b) Procedures for defining the boundaries of the site.
- (c) Procedures for commissioning or reinstating the site into the railway operating system.
- (d) Procedures for excising and decommissioning the site from the existing railway system where relevant, and invoking construction site management.

3.5 SAFETY OF PERSONS

3.5.1 General requirements

Standards and procedures shall be established and maintained for safeworking requirements associated with the safety of passengers, the public and workers in the following respects:

- (a) Train arrival and departure at stations, including—
 - (i) train crew procedures; and
 - (ii) station procedures.
- (b) Train breakdown in track section.
- (c) Train evacuation.
- (d) Derailment, collision, level crossing accident or other emergency procedures, including actions by—
 - (i) train crew;
 - (ii) station staff;
 - (iii) train control; and
 - (iv) management (e.g. emergency response, media).
- (e) On-train passenger safety related to railway operations, including—
 - (i) train handling;
 - (ii) braking characteristics; and
 - (iii) compatibility of consist.
- (f) Communications to and from passengers.

NOTE: Any of the above matters adequately covered elsewhere in operating standards and procedures need not be repeated here.