

Australian Standard[®]

Railway safety management

Part 2: Track, civil and electrical infrastructure



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- 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
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 - National Transport Commission
 - Queensland Transport
 - Rail, Tram & Bus Union
 - WA Department of Planning and Infrastructure
-

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Australian Standard[®]

Railway safety management

Part 2: Track, civil and electrical infrastructure

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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 4292.2—1997, *Railway safety management, Part 2: Track, civil and electrical infrastructure*.

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

AS

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

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 term ‘informative’ has been used in this Standard to define the application of the appendix to which it applies. An ‘informative’ appendix is for information and guidance.

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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 2: Track, civil and electrical infrastructure

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 track, civil and electrical infrastructure.

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	
1085	Railway track material (series)
4292	Railway safety management
4292.1	Part 1: General requirements
4292.3	Part 3: Rolling stock
4292.4	Part 4: Signalling and telecommunications systems and equipment
4292.5	Part 5: Operational systems

AS/NZS
4360 Risk management

1.4 DEFINITIONS

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

1.4.1 Check rails

Rails positioned in track at particular locations to guide wheels through points and crossings, on curves and through flangeway gaps in streets.

1.4.2 Cross level

The difference in the rail level of the two rails in a track.

1.4.3 Gauge

The distance between the running faces of the two rails, measured a nominal distance below the tops of the railheads.

1.4.4 Guard rails

Rails positioned in track at particular locations to restrict the lateral movement of derailed wheels.

1.4.5 Neutral temperature

The rail temperature at which the track has no longitudinal thermal stresses.

1.4.6 Points and crossings

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

1.4.7 Permissible rolling stock outline

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

1.4.8 Permissible structure outline

The outline relative to the track cross-section which defines the limiting cross-sectional geometry which no part of any structure or trackside fixture may infringe (see Appendix A).

1.4.9 Shall

Indicates that a statement is a requirement of this Standard.

1.4.10 Should

Indicates a recommendation.

1.4.11 Superelevation

The difference in level between the two rails of a track on a curve.

1.4.12 Track buckle

A substantial misalignment contributed to by longitudinal thermal stresses overcoming the lateral resistance of the track.

1.4.13 Track geometry

The vertical and horizontal alignment, cross level and superelevation of the track.

1.4.14 Twist

The change in the cross level between two track locations separated by a nominated distance interval.

1.4.15 Validation

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

1.4.16 Verification

Testing and evaluation of any 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 reference 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 track, civil and electrical infrastructure 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) Monitoring and maintenance (see Section 6).
- (e) Modification (see Section 7).
- (f) Decommissioning and disposal (see Section 8).

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 other parts of AS 4292, is illustrated in Figure 1.1.

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

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) Integrity of the track and civil infrastructure.
- (b) Integrity of the railway electrical infrastructure.
- (c) Compatibility with other engineering and operating systems and equipment.
- (d) Safety of persons or property 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.

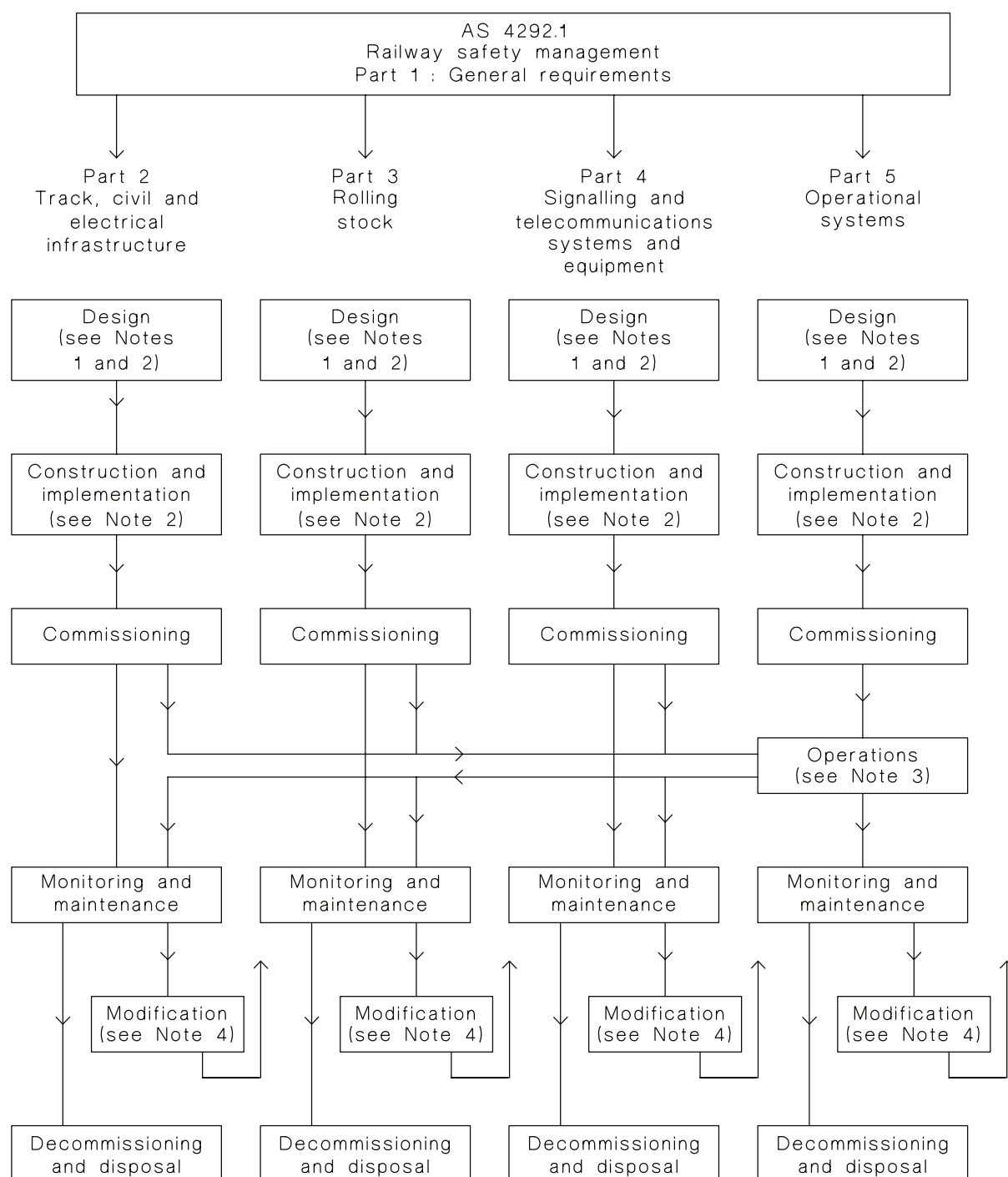
NOTE: Further guidance on risk analysis may be found in AS/NZS 4360.

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 shall be established and maintained where appropriate, 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.



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

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 C. 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 of track, civil and electrical infrastructure items.

The need for each of the items listed in this Section, including appendices referenced herein, 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 OPERATING PARAMETERS

Standards and procedures shall provide for the specification of operating parameters to be met by trains for each section of track over which they operate. Determination of operating parameters shall include requirements of the interface coordination plan in Section 2.

3.3 INFRASTRUCTURE ITEMS

Standards and procedures shall be established and maintained for the selection and design of infrastructure items, including where relevant, those listed as follows:

- (a) Sight distance provision.
- (b) Operational signage.
- (c) Structure and electrical infrastructure clearances.
- (d) Track geometry.
- (e) Structures.
- (f) Flooding and storm damage management.
- (g) Earthworks.
- (h) Rail support systems.
- (i) Rail.
- (j) Guardrails.
- (k) Points and crossings.
- (l) Track lateral stability.
- (m) Access control and protection.
- (n) Fire prevention and control.
- (o) Operation and control of the electrical system.
- (p) Electric traction system capacity and integrity.
- (q) Separation distances from electrical equipment.
- (r) Working on live equipment.
- (s) Electrical switching and isolating procedures.
- (t) Earthing potential and bonding.
- (u) Spatial location of conductors.
- (v) Electrical fault protection.
- (w) Electrolysis mitigation.

- (x) Electric traction system interference management.

NOTES:

- 1 These standards and procedures should be based on consideration of the recommendations and factors to be considered for each of the above items set out in Appendix D and should include maintenance issues.
- 2 Items listed for detailed consideration in Appendix D are, in many instances, of particular relevance to steel wheel on steel rail systems using open ballasted track. Users of this Standard preparing standards and procedures for other systems will need to add or delete items to or from the list to accord with their type of operation.

3.4 VERIFICATION AND VALIDATION

Standards and procedures shall be established for the verification and validation of all stages of design of track, civil and electrical infrastructure. These Standards and procedures shall include at least the following:

- (a) Verification of the design specification and test plan in terms of accuracy and conformance to client requests, safety requirements, standards and regulatory requirements.
- (b) Verification of the detailed design in terms of accuracy and conformance to safety requirements, standards and regulatory requirements.
- (c) Validation that the detailed design conforms to the required safety standards and client requirements.

These verification and validation processes shall be performed at an appropriate level of independence from the design process to be verified and validated. The degree and the nature of this independence shall be determined by taking into account at least the following factors:

- (i) The risk of errors being perpetuated during the verification and validation process due to there being too close an association between the persons performing the verification and validation and those involved in the design process.
- (ii) The risk imposed on the existing system both by the introduction of the system to be verified and validated and by faults or inconsistencies in that system.

SECTION 4 CONSTRUCTION AND IMPLEMENTATION

4.1 GENERAL

This Section specifies how standards and procedures are developed for the construction and implementation of track, civil and electrical infrastructure items.

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

4.2 INFRASTRUCTURE REQUIREMENTS

Standards and procedures shall be established and maintained for the construction and implementation of the track, civil and electrical infrastructure.

Standards and procedures should include the following items:

- (a) The maintenance of safe railway operations during any system changes.
- (b) Process control in accordance with AS 4292.1.
- (c) Work site operation and management (see Appendix E).
- (d) Access control and protection (see Appendix D, Paragraph D14).
- (e) Compliance with design documentation, and use of construction and installation practices and procedures consistent with the intent of the design (for the relevant items included in Clause 3.3 and Appendix D).
- (f) Procedures to ensure use of approved and current plans and specifications.

NOTE: Requirements for standards and procedures for the operation and management of trains in a construction site are specified in AS 4292.5.

4.3 VERIFICATION AND VALIDATION

Standards and procedures shall be established for the verification and validation of all stages of construction and commissioning of track, civil and electrical infrastructure projects. These Standards and procedures shall include at least the following:

- (a) Verification that the construction conforms to the detailed design and to client requests, safety requirements, standards and regulatory requirements.
- (b) Validation that the track, civil and electrical infrastructure construction conforms to the required specifications, safety standards and client requirements.

These verification and validation processes shall be performed at an appropriate level of independence from the construction and implementation process to be verified and validated. The degree and the nature of this independence shall be determined by taking into account at least the following factors:

- (i) The risk of errors being perpetuated during the verification and validation process due to there being too close an association between the persons performing the verification and validation and those involved in the construction and implementation process.
- (ii) The risk imposed on the existing system both by the introduction of the system to be verified and validated and by faults or inconsistencies in that system.