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Preface

This standard was prepared by the Railway Infrastructure - Clearances Development Group, overseen by the RISSB Infrastructure Standing Committee.

Objective

The objective of this Standard is to manage the risks to safety arising from the interface between rail infrastructure and rolling stock during railway operations. It achieves this by setting out the minimum clearance standards for safe operation between:

(a) rolling stock (including loads) and trackside structures and equipment; and

(b) rolling stock (including loads) on adjacent tracks.

This Standard uses key inputs from AS 7507.

Statement of change

This document has been reviewed and updated to align with the industry good practice in 2025. Changes to the document include:

(a) updating the document formatting;

(b) updating Figure 1 and Figure 2;

(c) alignment with AS 7057; and

(d) refined wording and phrasing.

Compliance

There are four types of provisions contained within Australian Standards developed by RISSB:

(a) Requirements.

(b) Recommendations.

(c) Permissions.

(d) Constraints.

Requirements – it is mandatory to follow all requirements to claim full compliance with the Standard. Requirements are identified within the text by the term ‘shall’.

Recommendations – do not mention or exclude other possibilities but do offer the one that is preferred. Recommendations are identified within the text by the term ‘should’.

Recommendations recognize that there could be limitations to the universal application of the control, i.e. the identified control is not able to be applied, or other controls are more appropriate or better.

Permissions – conveys consent by providing an allowable option. Permissions are identified within the text by the term ‘may’.

Constraints – provided by an external source such as legislation. Constraints are identified within the text by the term ‘must’.

For compliance purposes, where a recommended control is not applied as written in the standard it could be incumbent on the adopter of the standard to demonstrate their actual method of controlling the risk as part of their WHS or Rail Safety National Law obligations. Similarly, it could also be incumbent on an adopter of the standard to demonstrate their method of controlling the risk to contracting entities or interfacing organisations where the risk may be shared.

RISSB Standards address known hazards within the railway industry. Hazards, and clauses within this Standard that address those hazards, are listed in Appendix A.

Appendices in RISSB Standards may be designated either “normative” or “informative”. A "normative" appendix is an integral part of a Standard and compliance with it is a requirement, whereas an "informative" appendix is only for information and guidance.

Commentary

Commentary *C Preface*

This Standard includes a commentary on some of the clauses. The commentary directly follows the relevant clause, is designated by ‘C’ preceding the clause number and is printed in italics in a box. The commentary is for information and guidance and does not form part of the Standard.

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Tables

Section 1 Scope and general

1.1 Scope

This document defines requirements for railway infrastructure transit space clearances throughout the asset lifecycle. It also specifies a system for calculating appropriate transit space clearances and provides recommended dimensions.

This document is not specifically intended to cover cane railways, light rail or heritage railways operating on a private or isolated railways, but items from this document may be applied to such systems as deemed appropriate by the relevant Rail Transport Operator (RTO).

1.2 Normative references

The following documents are referred to in the text in such a way that *some* or all of their content constitutes requirements of this document:

- AS 7634 Railway Infrastructure Survey
- AS 7507, *Rolling Stock Outlines*
- AS ISO 31000:2018, *Risk management – Guidelines*
- *Disability Standards for Accessible Public Transport 2002* (DSAPT)
- UIC 777-2:2ED 2002, *Structures built over railway lines – Construction requirements in the track zone*

NOTE:

Documents for informative purposes are listed in a Bibliography at the back of the Standard.

1.3 Defined terms and abbreviations

For the purposes of this document, the following terms and definitions apply:

1.3.1

combined kinematic envelope
greatest permissible kinematic envelope based on the summation of all rolling stock operating on a route

1.3.2
contingency margin
gap between the kinematic envelope and a contingency outline, or between kinematic envelopes on adjacent tracks

1.3.3
contingency outline
combined kinematic envelope plus the contingency margin

1.3.4
kinematic envelope
envelope generated by the kinematic outline, centre and end throw, and taking into account rolling stock and track tolerances

Note 1 to entry: The kinematic envelope changes in dimensions as it moves along the track due to track geometry and has an associated rollingstock kinematic outline and swept outline, as per AS 7507, which details the static outline, such as bogie lengths and body centres.

1.3.5
kinematic outline
two-dimensional shape that consists of the static outline, plus the maximum permitted allowance for vertical bounce upwards, plus lateral translation and body roll

1.3.6
rail survey control mark
permanent survey marks that are intended specifically for use in the railway environment and are installed in stable ground, solid rock, or in concrete in-situ, where the potential for disturbance is minimized

1.3.7
reference rolling stock outline
three-dimensional size of a reference vehicle

Note 1 to entry: This consists of three specific parts, i.e. the reference static outline, the reference kinematic outline and the reference swept outline.

1.3.8
reference vehicle
vehicle whose rolling stock outline has been accepted by the RIM as being clear to operate over a defined route

1.3.9
RIM
rail infrastructure manager as defined by Rail Safety National Law

1.3.10
RSO
rolling stock operator as defined in the Rail Safety National Law

1.3.11
RTO
rail transport operator as defined by Rail Safety National Law

1.3.12
static outline
outline drawing or specification of a notional vehicle cross-section, or item of vehicle equipment, which prescribes permissible rolling stock dimensions under specified conditions of load and suspension translations in vertical directions

1.3.13
structures
trackside infrastructure including retaining walls, rock faced cuttings, bridge members, tunnel walls, overhead wiring masts, signals and vegetation

1.3.14
structure outline
cross-sectional profile that designates the minimum allowable dimensions that separate trackside infrastructure from the centre lines and rail level of the track

1.3.15
track control mark (TCM)
mark specifically placed to provide a reference to the design alignment of the track to which it relates

General rail industry terms and definitions are maintained in the RISSB Glossary. Refer to: https://www.rissb.com.au/glossary/

Section 2 Calculating rail infrastructure clearances

2.1 General

A structure outline should accommodate all authorized rolling stock with sufficient contingency margin and other allowances nominated by the RIM. Allowances nominated by the RIM may include derailment protection or track stability.

RIMs complying with the clearances in accordance with Appendix B are deemed to satisfy the requirements of this document.

NOTE:

Appendix D provides guidance on how to calculate infrastructure clearance using the steps provided in this document.

Clearances are calculated by:

(a) establishing the rolling stock kinematic outline (Section 2.2);

(b) applying the track kinematic parameters to create a kinematic envelope (Section 2.3); and

(c) adding a contingency margin (Section 2.4).

If there is more than one reference vehicle operating on a route, the contingency margin is added to a combined kinematic envelope.

See Figure 1 and Figure 2 for the schematic representation of clearances.

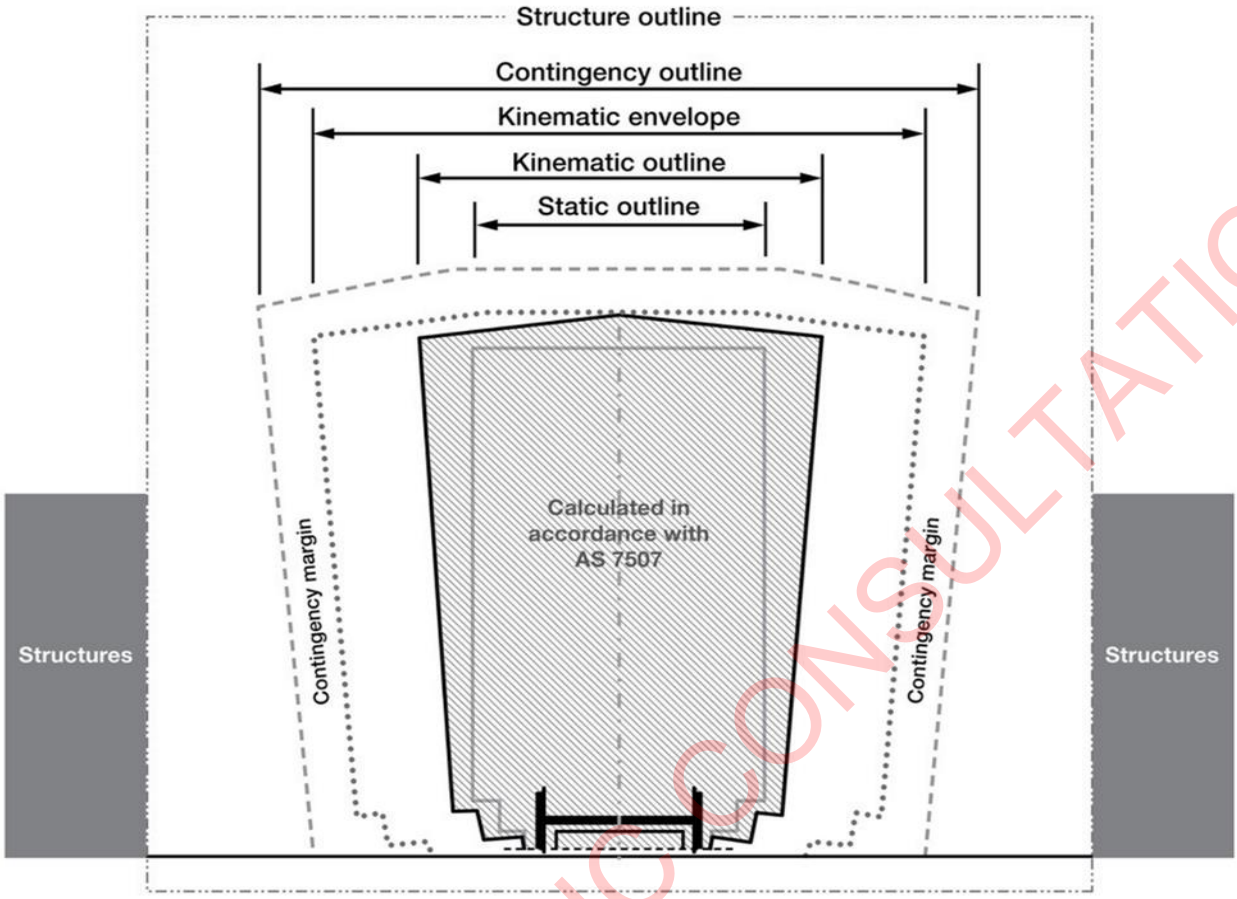


Figure 1 Schematic of clearance outlines between rolling stock and a structure

NOTE:

The schematic show in Figure 1 also shows the interrelationship between AS 7507 and this document.

2.2 Rolling stock kinematic outlines

Rolling stock kinematic outlines shall be determined using the methodology provided in AS 7507.

A register of rolling stock outlines authorized for each track section shall be established and maintained by the RIM.

NOTE 1:

AS 7507 provides calculations for determining the rolling stock kinematic outline based on the static outline.

NOTE 2:

The reference rolling stock outline could be restricted due to the historical structure outline.

NOTE 3:

AS 7507 includes reference vehicles that have been accepted by RIM.

2.3 Kinematic envelope

The kinematic envelope for a rolling stock vehicle shall be calculated, inclusive of:

(a) rolling stock kinematic outlines specified in Section 2.2 of this document, including build and maintenance tolerances;

(b) rolling stock centre throw and end effects on the curve at the specific location; and

(c) track kinematic tolerances (see Note 1):

(i) all lateral alignment track tolerances are applied relative to the vertical centreline;

(ii) lateral track tolerances caused by variation in the rail are applied relative to the plane of the cant;

(iii) all vertical track tolerances are applied perpendicular to the horizontal; and

(iv) all rotational track tolerances and the design cant are applied relative to horizontal.

The kinematic envelope shall be the cumulative effects of the above tolerances on the rolling stock kinematic outlines.

If more than one type of rolling stock operates over a route, a combined kinematic envelope shall be calculated.

NOTE 1:

Representative track tolerances are provided in Appendix C.

NOTE 2:

Reducing track tolerances can reduce the kinematic envelope.

NOTE 3:

A different kinematic envelope will apply for each type of rolling stock at each specific location.

2.4 Contingency outline

A contingency outline shall be calculated by adding a contingency margin to the combined kinematic envelope.

A radial 200 mm contingency margin should be maintained.

The contingency margin should be large enough to allow for variation in the rolling stock and structures.

The contingency margin of rolling stock on adjacent tracks may overlap, see Figure 2.

NOTE 1:

The 200 mm contingency margin above the kinematic envelope does not account for overhead line equipment.

NOTE 2:

An example procedure for calculating the contingency outline is provided in Appendix E.

2.5 Structure outline

The structure outline for a route shall be determined by the RIM.

The distance between the contingency outline and the structure outline should be appropriate to the railway operations. Noting that the risk of infringement decreases as the safety margin increases.

Appendix B provides a structure outline which is suitable for reference vehicles given in AS 7507, except Reference Vehicle 12.

Structure outlines also provide contingency for variation in rolling stock sizes (i.e. future proofing).

Track side structures should not encroach on the structure outline. The infringement of track side structures in accordance with Section 3 of this document.

2.6 Rail infrastructure clearances

The actual clearance required between rolling stock and structures shall be calculated, taking into account all of the factors identified in Section 2.3 and Section 2.4.

Where a combined kinematic envelope has not been calculated, separate analyses shall be carried out for each different type of rolling stock that operates over a section of track to determine the minimum clearances.

Although detailed requirements are not provided in this document, the following areas may be included in the analysis and calculations:

(a) restricted or confined spaces;

(b) authorized access to areas, including walking paths;

(c) detraining; and

(d) emergency access and egress.

Provision can be made for additional clearance over and above those stated within this document for service and maintenance requirements as determined by the RIM.

2.7 Track centres

The determination of track centres needs to consider the combined kinematic envelopes for both tracks, plus the provision for a single application of the contingency margin. It is important to note that the contingency margin for rolling stock on adjacent tracks are permitted to overlap, such that the contingency margin is only applied once.

See Section 2.4 for information regarding the contingency margin.

Recommended track centres are provided in Appendix B.

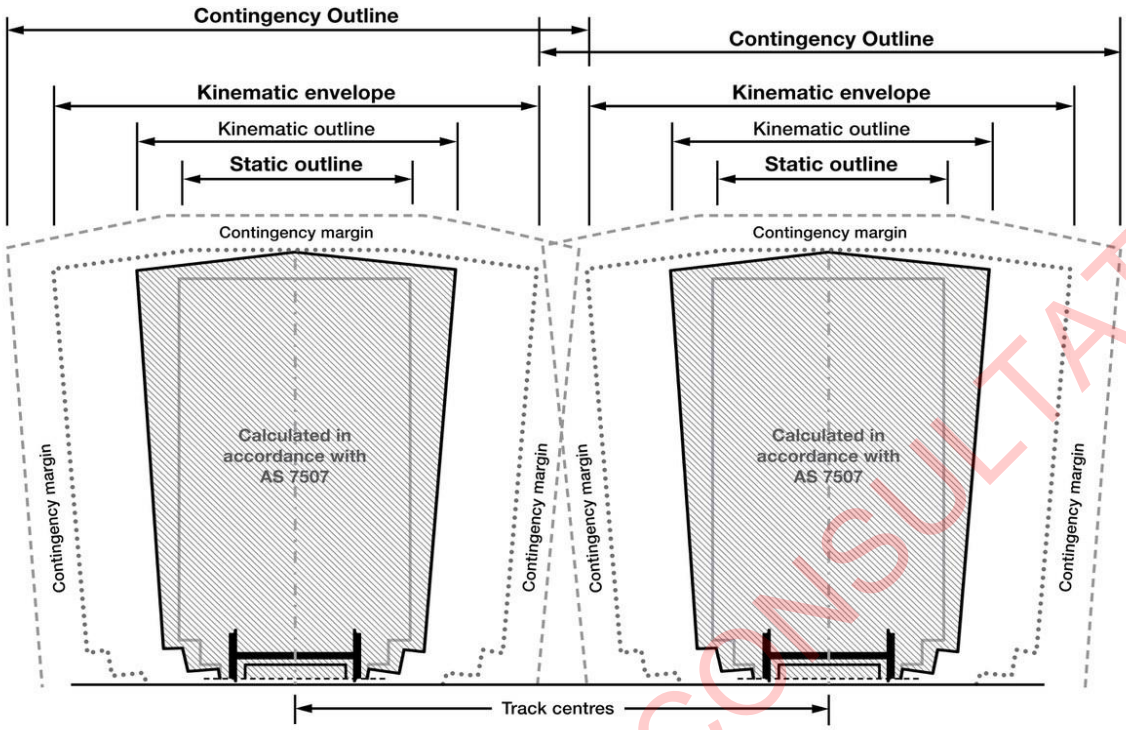


Figure 2 Schematic of clearance outlines between rolling stock on adjacent tracks

Section 3 Outline infringements

3.1 General

RIMs shall develop and implement a documented risk-based process for managing structure outline and contingency outline infringements.

Risk management systems and procedures should follow the principles described in AS ISO 31000 and be carried out by competent persons.

If a track side structure encroaches on the structure outline, it shall be assessed to determine if it infringes on the contingency outline.

Where contingency outline infringements have been approved by the RIM, the actual in-field nominated clearance requirements shall be measured, monitored and maintained.

Rail survey control marks should be provided at all platforms and at other structures where infringements inside of the contingency outline have been permitted. Alternatively, other surveying methods may be used (refer to AS 7634).

Additional risk controls should be implemented to reduce the likelihood of rolling stock colliding with infrastructure due to infringements, these can include but are not limited to:

(a) improved track structure rigidity;

(b) operational restrictions;

(c) more stringent track maintenance tolerances at constrained locations;

(d) conducting more frequent track maintenance inspections;

(e) more stringent rolling stock tolerances;

(f) conducting more frequent rolling stock inspections;

(g) risk treatment action plan to correct infringement; and

(h) sacrificial components (e.g., rubber gap fillers).

3.2 Platforms

The RIM shall set out the requirements for the design and maintenance of track offset and height through station platforms, including tolerances and intervention points.

The distance between platforms and rolling stock shall provide safe clearance for all authorized rolling stock and a safe step gap for passengers.

In the case of passenger rolling stock, the gap between the platform edge and rolling stock may be minimized by additional engineering devices for passenger access and egress, such as platform gap filler.

NOTE:

On curved track, the gap between the platform edge and the vehicle will vary depending on track curvature and subsequent centre throw and end throw of the rolling stock.

Allowances shall be made for applied cant, track level variations and vertical movements of rolling stock in determining the vertical distance between the top of the low rail and the platform edge.

The vertical distance between the top of the low rail and the platform edge should be determined for all rolling stock using the line and the track offset. The platform height should be:

(a) set at approximately the same level as the rolling stock floor; or

(b) set with a step up into the train, factoring;

  (i) rolling stock functionality, such as door operations;

  (ii) demographics and patronage;

  (iii) access/egress assistance; and

(c) compliant with the *Disability Standards for Accessible Public Transport 2002* (DSAPT)

3.3 Tunnels

Tunnels can encroach on the structure outline due to construction parameters or geographical limitations.

Tunnels shall provide adequate clearance to accommodate the combined kinematic envelope authorized for the track section.

Underground structure and tunnels shall have adequate space provision for the following but not be limited to:

(a) combined kinematic envelope;

(b) an agreed contingency margin beyond the combined kinematic envelope to tunnel structure;

(c) utilities and services;

(d) emergency egress; and

(e) maintenance requirements.

3.4 Low-lying infrastructure

Clearance requirements for low lying infrastructure within the immediate vicinity of the rail shall be determined by the RIM.

Low lying items of infrastructure or equipment close to the plane of the rails can include:

(a) train warning/control equipment;
(b) wayside condition monitoring equipment;
(c) level crossing surfaces and flangeway requirements;
(d) other lineside equipment such as signal trunking and dwarf signals; and
(e) through girders on bridges.

3.5 Train-to-infrastructure interfaces

Items of infrastructure that have a physical or operational interface with rolling stock shall be approved by the RIM before installation.

These items can include but not limited to:

(a) train stops in the trip position;
(b) rail lubricator actuators;
(c) overhead contact wires and associated equipment;
(d) automatic door openers in the active position;
(e) overhead wagon loading structures in the lowered position;
(f) buffer stops;
(g) approved legacy infringements;
(h) ancillary equipment on tunnel walls; and
(i) provision for pantograph kinematic envelope.

3.6 Infringement register

The RIM shall establish and maintain a register of approved infringements. The register should include:

(a) records of infringing rolling stock;
(b) details of the infringing asset;
(c) the location (i.e. kilometrage);
(d) approved infringement details, including reference points and measurements;
(e) approving person;
(f) additional risk controls; and
(g) reference to supporting documentation.

Section 4 Managing rail infrastructure clearances

4.1 General

All clearances shall meet the requirements established by the RIM.

All new infrastructure shall be constructed outside of the structure outline, unless otherwise approved by the RIM in accordance with section 3 of this document.

4.2 Design

As a minimum, the following items shall be factored when designing new infrastructure:

(a) Reference rolling stock outlines authorized to operate on a network.

(b) Construction and maintenance tolerances.

All track side structures shall be assessed to determine whether they infringe on the structure outline.

4.3 Monitoring and maintenance

RIM shall determine the method the method and frequency of inspections to monitor and maintain railway infrastructure clearances, including maintenance and intervention points.

The inspection frequency regime should be risk-based and factor in the track classification, location, rates of deterioration and other local factors.

Additional clearance inspections shall be undertaken where there is an indication that the stability of tracks, structures and other assets have been affected (such as by significant storm events).

Clearance inspections should assess the following:

(a) Lateral and vertical clearances at platforms.

(b) Lateral and vertical clearances to structures.

(c) Vertical clearances to overhead structures.

(d) Track centres between adjacent tracks.

(e) Track centres at turnout clearance points.

Action shall be taken to restore clearances when the contingency margin is infringed. Additional monitoring and increased inspection frequency should be maintained and/or operational restrictions applied until clearances can be restored.

Specific requirements apply to clearances at platforms and other locations where infringements are permitted (see Section 3).

4.4 Modification

Any new or modified structures adjacent to an existing railway shall be outside the structure outline.

Any modifications to structures within the structure outline should be risk assessed in accordance with ISO 31000, and additional risk control measures implemented where applicable.

4.5 Decommissioning

Any de-commissioned items of infrastructure should be removed or have necessary clearances maintained to ensure safe passage of trains.

Section 5 Overhead traction power

Clearances between rolling stock and trackside overhead line equipment shall be determined by the RIM, and factor in the type of traction power.

The minimum vertical distance from the top of rail to the underside of permanent structures shall include the electrical clearances requirements as determined by the RIM.

Expendable items shall not be permitted in the electrical clearance zone unless isolated to meet the requirements of the electrical supply authority.

Road level crossings provide an authorized at grade interface between road and rail traffic. Additional vertical clearance for overhead line equipment may be required at these locations to meet both the RIMs electrical clearance requirements and any Road Authority vertical clearance requirements.

Section 6 Out-of-gauge loading

Where any part of rolling stock exceeds the approved reference vehicle outline(s) for the rail corridor, it shall be treated as an out-of-gauge load.

Prior to the operational running of out-of-gauge loads, the critical dimensions of structures or adjacent tracks shall be inspected and measured, particularly on curves.

The RIM may require special condition when approving out-of-gauge loads including but not limited to:

(a) Limiting the rolling stock to a specific route, or section of track, to avoid collisions.

(b) Restricting the speed at which the rolling stock passes:

  (i) adjacent structures, and

  (ii) passenger platforms (if a load overhangs the platform);

(c) Confirming that the load is secured, and has not moved, immediately prior to passing a close structure.

(d) Restricting passenger access to platforms during the period in which an overhanging load would pass through a platform area.

(e) Piloting past close structures.

(f) Timetabling to control rail traffic movements.

(g) Determining the kinematic envelope of the out-of-gauge load.

Appendix A ARRM Hazard Register (Informative)

Hazard number	Hazard
5.31.1.39	Inadequate outline assessment
5.31.1.1	Rolling stock not being tested or verified for gauge compliance
5.19.1.16	Insufficient clearance at side bearers causing derailment at curve transitions
6.0	Infrastructure
6.6	Harm to track & civil infrastructure by rolling stock
6.8	Harm to Track & Civil infrastructure during construction
6.9	Harm to Track & Civil infrastructure during operation and maintenance
6.10	Path infringement
6.11	Collision
6.13	A level crossing collision
6.14	Derailment
6.15	Track failure
6.22	Persons being crushed
6.28	Track & civil infrastructure design failure
9.23.1.5	Inadequate clearance to rollingstock outline

Appendix B Deemed to Satisfy Clearances (Normative)

Clearances required to facilitate the interoperability of reference vehicles given in AS 7507 shall be calculated in accordance with Appendix Table B-1 (See Note 1).

Appendix Table B-1 Minimum Structure Outline

Track section	Minimum horizontal Distance from centreline of track to face of structures See Note 3.	Track centres	Minimum vertical distance from top of rail to the underside of permanent structures	
			Electrified tracks	Non-electrified tracks
Electrified passenger and/or freight operations up to speed of 160 km/h	3 m	4 m	5.65 m	-
Non-electrified passenger and/or freight operations	3 m	4 m	-	5.4 m
Interstate freight and/or double stacked container operations. See Note 2.	3 m	4.5 m	-	7.1 m

NOTE 1:

The lateral clearances and track centres in Table B-1 take into account kinematic, curve and throw effects for 26 m long vehicles, considering wheelbase and bogie centres, on curves of 150 m radius and normal track tolerances.

NOTE 2:

Measurements provided for interstate freight and/or double stacked container operations will permit RISSB Reference Vehicle 6 (Interstate Plate F).

NOTE 3:

UIC 777-2 provides additional information about the benefit of a minimum 3 m clearance from the centreline of the track to the face of a structure.

NOTE 4:

The clearances detailed in Appendix Table B-1 are generally applicable for greenfield sites or locations with minimum constraints. For congested brownfield sites with space limitations, calculations will be required based on the procedures outlined in this standard, to determine the minimum clearances for the safe operation of authorized rolling stock on the RIMs network.

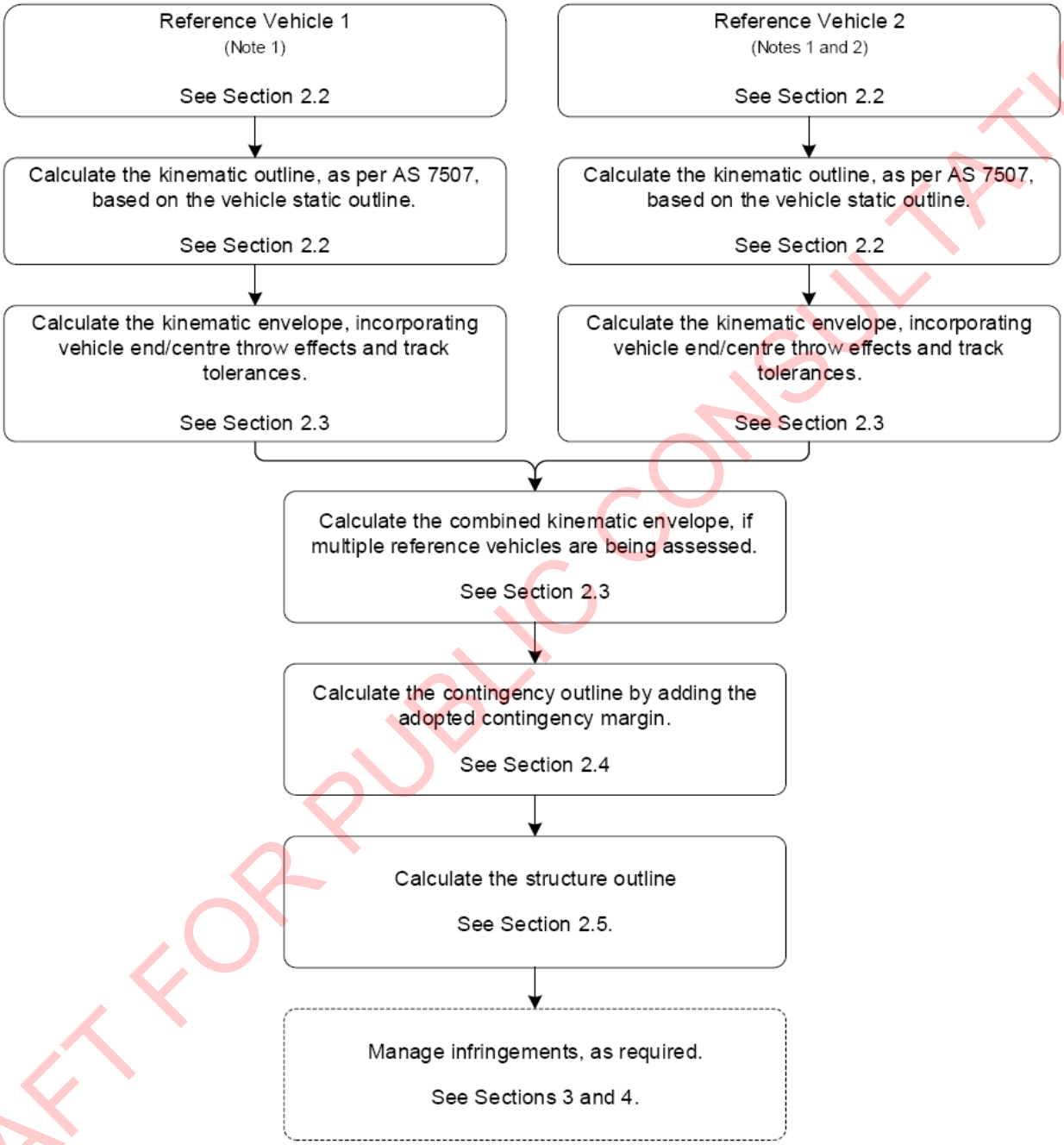
Appendix C Representative Track Tolerances for Standard Gauge Track (Informative)

The track tolerances to be used in the calculation of clearances provided in Table B.1 are representative only and may be varied depending on the RIM's maintenance regime.

Description			Direction	Tolerance
Timber, steel or alternative material sleepered ballasted track				
Alignment	Rail wear		Vertical and lateral	15 mm
	Variation from design	Tangents and curves >2,000 m radius	Lateral	±25 mm
		Curves <2,000 m radius		±35 mm
Level	Variation from design		Vertical	±75 mm
Cant	Variation from design		Rotational	±10 mm
Concrete sleepered track				
Alignment	Rail wear		Vertical and lateral	15 mm
	Variation from design	Tangents and curves >2,000 m radius	Lateral	±15 mm
		Curves <2,000 m radius		±25 mm
Level	Variation from design		Vertical	±75 mm
Cant	Variation from design		Rotational	±10 mm
Slab track and transom top bridges				
Alignment	Rail wear		Vertical and lateral	15 mm
	Variation from design	Tangents and curves >2,000 m radius	Lateral	±10 mm
		Curves <2,000 m radius		±20 mm
Level	Variation from design		Vertical	±10 mm
Cant	Variation from design		Rotational	±10 mm

Appendix D Guidance on This Document (Informative)

This appendix summarizes the steps given within this document and provides a quick reference to the relevant sections.



NOTE 1:

This can be a reference vehicle from AS 7507.

NOTE 2:

If more than one reference vehicle is being assessed, then the kinematic outline and kinematic envelope for each reference vehicle is to be assessed and included in the combined kinematic envelope.

Appendix E Example Procedure for Calculating the Contingency Outline (Informative)

E.1 General

This appendix provides a step-by-step example of the procedure for calculating the contingency outline. For completeness, it contains steps given in AS 7507 and this document.

E.2 D.2 Calculating the contingency outline

Determine the contingency outline for the particular track section using the following steps:

(a) Determine the static outline (on straight, uncanted track) for the rolling stock operating on the track section, including build tolerances.

(b) Determine the kinematic outline for the rolling stock operating on the track section, incorporating:

  (i) vertical bounce upwards;

  (ii) lateral translation;

  (iii) body roll;

  (iv) dynamic movements in response to track irregularity; and

  (v) rolling stock maintenance tolerances.

(c) Apply centre and end throw of the rolling stock on curved track. This needs to be applied at each location of interest for curved track as the kinematic envelope changes with track geometry.

(d) For each point on the kinematic outline, apply horizontal displacements to widen the outline on each side of its vertical centreline for:

  (i) wheel clearance (worn wheel to new rail);

  (ii) rail side wear;

  (iii) gauge widening of the track; and

  (iv) gauge tolerance of the track.

(e) From Step (c), apply angular displacements about the point of cant rotation for cant.

(f) From Step (d), apply angular displacements about the left handrail for cross level tolerance.

(g) From Step (d), apply angular displacements about the right handrail for cross level tolerance.

(h) From Steps (e) and (f), apply horizontal displacements for track alignment (line) tolerances, and vertical displacements for rail level (top) tolerances.

  (i) This defines the kinematic envelope for a particular rolling stock outline.

  (j) Repeat Steps (a) to (h) for any other rolling stock to operate on the same track section.

  (k) If multiple rolling stock operate on the track section, overlay all kinematic envelopes to define the combined kinematic envelope.

  (l) From Step (k), add the contingency margin radially to the combined kinematic envelope to define the contingency outline.

Bibliography (Informative)

The following referenced documents are used by this document for information only:

- AS 5100.2, *Bridge design – Part 2: Design loads*
- *Commonwealth Disability Discrimination Act 1992* (DDA)
- *RISSB Code of Practice for Loading of Rail Freight*