Horizons 7 Report

AS 7507 Rolling Stock Outlines – National Harmonisation in the Australian Rail Industry

Team Name: The outlines

Contents

1. Executive Summary

As Australia moves towards a more interoperable rail system, harmonisation of rollingstock outlines will help eliminate inefficiencies caused by duplication and unforeseen costs from infrastructure works. The calculation of rollingstock outlines is critical in ensuring safe clearances to platforms, overhead assets and tunnels, and avoiding collisions with other rolling stock.

The relevant standard, AS 7507, is already available as an approach for calculating outlines to support rolling stock approval, route access procedures, and assessment of infrastructure compatibility. But it has not been consistently adopted, and thus its contribution to harmonisation in its current form is uneven, due to fragmented local practices, legacy assets, and differing network conditions.

At worst, miscalculation of rolling stock outlines can have significant project impacts: a 2018 procurement for new Sydney trains that miscalculated a kinematic envelope only 20 centimetres wider than the existing fleet caused two years of works to modify ten tunnels on the network, as well as timetabling and speed impacts.

But even when working as intended, Australia's fragmented approach to outlines calculation is causing unnecessary inefficiencies. A vehicle accepted on one network cannot automatically be approved by another without reference to its bespoke requirements, as the current multiplicity of outlines tailored to each network results in a fragmented approach.

A revision to AS7507 would see a simplification to a smaller number of reference vehicle outlines, to create a default target envelope for new fleets. This would complement and capitalise on parallel work to develop a consistent rolling stock approval application process, paving the way for mutual recognition of rolling stock approval processes across networks.

Accompanying this, networks across the National Network for Interoperability ('NNI') could work together to classify corridors into 'core harmonised routes' and 'constrained legacy routes'. On the core harmonised routes, all the new standard-outline stock would be able to run unrestricted. Where tight tunnels, bridges, platforms or other infrastructure mean this is impossible, constrained legacy groups can put in place restrictions (such as speed limits). It will therefore be easier for operators to understand where proposed new rollingstock fleet is able to travel efficiently.

A staged national adoption approach is recommended, starting with common definitions, assessment principles, and approval pathways for new and modified rolling stock, then extending to existing fleets through transition arrangements. This would

create a consistent technical basis for national rail operations, while enabling a harmonised framework for clearance assessment, improving interoperability, streamlining approvals, while still allowing local risk controls where genuinely necessary.

2. Introduction

Australia's rail system has historically been shaped by state-based development, local operating rules, and infrastructure built to different standards over time. That history has left the rail industry with a fragmented environment in which operators, manufacturers, and infrastructure managers often face multiple approval processes and varying interpretations of technical requirements.

That issue is especially noticeable in rolling stock clearance. A vehicle suitable for one corridor may still need a separate engineering case or approval process elsewhere, even where the underlying design is largely the same. The result is duplicated work, longer approvals, and less flexibility when fleets need to move between networks.

Australian Standard [AS 7507:2017], Rolling Stock Outlines, sets out the requirements for determining whether rolling stock conforms to the referenced outline limits in the standard. Its purpose is to maintain safe clearance between rolling stock, fixed structures, and passing trains by defining how outline compliance is assessed. It applies to new, modified, and transferred rolling stock under all loading conditions, and it defines key concepts such as static, kinematic, swept, and vertical swept outlines.

AS 7507 is a suitable candidate for analysis because it sets out how rolling stock outline compliance is assessed and how reference rolling stock outlines are used to determine whether a vehicle can operate safely on a network. The standard is relevant not only to engineering teams, but also to procurement, certification, asset management, and network access decisions, and a harmonised approach would support more efficient approvals and reduce duplicated technical work across jurisdictions.

This report therefore examines the current state of adoption, the barriers to wider implementation, the benefits of national alignment, and whether AS 7507 should be prioritised for adoption across the Australian rail industry.

3. Current Industry State

Much of the focus on a shift to nationally-interoperable rail networks has focused on digital compatibility – ensuring that signalling and in-cab digital systems work consistently across Australia.

A truly seamless system would also be physically compatible. Today, different rail operators do not share a consistent approach to assessing what rolling stock outlines conform to network requirements. Rolling stock outlines are critical to ensuring there are safe clearances from other trains and fixed structures like platforms, tunnels, and overhead assets.

Where tunnels, bridges or cuttings cannot accommodate carbodies, interventions are needed. This can include speed and cant limits, track lowering under tunnels or using underbridges, targeted trimming or reprofiling of platforms, or optimisation (e.g. through track slewing or re-gauging) to steer the kinematic envelope away from obstructions. But these additional works would not be necessary in future if Australia successfully implemented a harmonised approach to new fleet.

AS7507 defines the static, kinematic, and swept outline limits of rolling stock. This means rolling stock will be acceptable to a given network if it fits within the outlines of approved reference vehicles as defined in the plates in the standard. The standard provides both static limits – that is, outlines of the train when it is still – and kinematic envelopes. The kinematic envelope refers to the space occupied by a rail vehicle in motion, such as the required allowances as the train travels at an angle around a curved track. For these reasons, the kinematic envelope is the largest volume that rolling stock can occupy as it travels along a railway track at speed. For each of the 37 networks, a different vehicle is used. As an alternative, the standard also provides that a reference vehicle can also be any other vehicle that has a history of operating with safe clearances over the required route.

Not only is there wide variation within the standard, but it is not consistently used around Australia. For example, ARTC has its own set of reference rolling stock outlines which are not captured in AS7507, and applies the standard in conjunction with their own bespoke Route Access Standard [1].

1. Case studies

Case study A

In 2018, Transport for New South Wales procured new intercity rolling stock at a cost of $2.3 billion. But the kinematic outline of the new trains was 20cm wider than existing trains, according to media reports, meaning they did not fit through ten tunnels on the

network dating from the early 20th century. This misjudgment reportedly had significant consequences [2]:[1]

- a two-year project of works required to modify the tunnels to allow trains to fit;
- speed and timetabling restrictions to accommodate the ways the new fleet could be used;
- modifications to existing safety standards; and
- station modifications and track realignment for 75 kilometres of track [3].

Case study B

In 2014, French railway SNCF reportedly ordered 2000 trains only to discover they were too wide to fit on all parts of its network. Reports indicate the root of the problem was identified because the procurement worked from specifications for stations constructed in the last 30 years, and stations dating from 50 years prior would not be compatible. Remediation required modifications to 1300 platforms – one in six platforms on the entire French rail network [4].

Case study C

Further media reports indicate that in 2020, Spanish procurement for (Euro) 260 million of trains was delayed by two years when the manufacturer ceased construction on discovering it had been provided inaccurate dimensions to build the new trains. The dimensions of the proposed trains would not have fit tunnels in the mountainous north of the country. In addition to years of delay, the scandal resulted in the resignation of Spain's Secretary of State for Transport as well as leader of its rail operator, reports say [5].

Why is now the right time to harmonise rolling stock outline measurements?

Enable more efficient approvals, complementing the new mandatory standard for rolling stock applications

A significant source of delays and inefficiencies in the rail sector is the fact that new rolling stock can take years to obtain approvals to run on different networks, in large part because multiple approvals are needed to allow trains to run across various networks. Work is underway to develop a mandatory new standard for rolling stock approval processes around Australia. This will make the information required for approvals applications consistent across networks for the first time, and helps speed up recognition of existing rolling stock approvals that have already been cleared to run on a different network.

A harmonised approach to rolling stock outlines complements this move. The new approach would shift away from the current multiplicity of outlines that are tailored to individual networks, towards a smaller number of reference vehicles that are

compatible across the National Network for Interoperability (NNI). Once the harmonised outline is agreed, it paves the way for automatic mutual recognition across networks - once a vehicle is proven to be compatible on one section of the NNI, it can be reused on other networks with the same constraints.

Under the revised approach, a vehicle designer can design a vehicle aligning with the harmonised outline and then check which parts of the NNI are classed as 'fully compatible'; 'compatible with conditions' or 'incompatible without infrastructure works'.

Support economies of scale in procurement
Because different networks require different specifications, it is impossible to reap the benefits economies of scale through standardised production. This limits Australian operators' ability to access a wider range of global suppliers, as well as serving as a barrier to entry for new Australian manufacturers [6]. A default target envelope for new, interoperable vehicles that are compatible across multiple networks on the NNI would support economies of scale in procurement and manufacturing, reducing overheads for manufacturers and allowing pooled tendering.

Support Australia's decarbonisation mission

As Australia transitions to cleaner forms of energy, the need for overhead infrastructure to support electric trains will intensify. A harmonised standard for rolling stock outlines will prove useful in the rollout of these overhead assets, particularly noting there are multiple ways to conduct overhead charging, and different networks will have different height and weight restrictions [7].

4. Barriers to Adoption

The incomplete adoption of AS 7507:2017 as a nationally harmonised baseline is driven by interrelated technical, governance, commercial, and training-related challenges that vary across the Australian rail network. Figure 1 shows an overview of the key challenges to the adoption of a nationally harmonised rollingstock outlines standard.

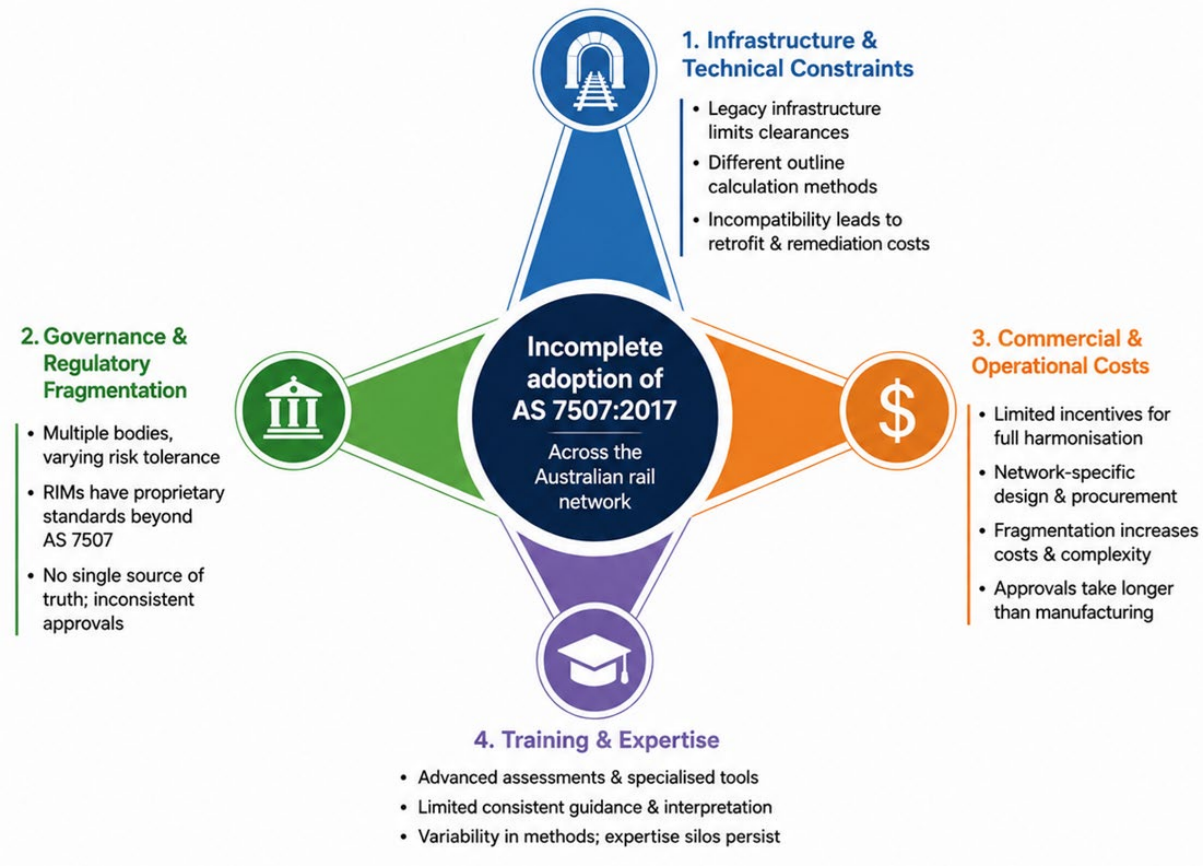

Figure 1: Key challenges to the adoption of a nationally harmonised AS 7507 standard.

Infrastructure and Technical Constraints: A primary technical barrier is path dependency, where legacy infrastructure decisions—such as tunnels and platforms built to early 20th-century specifications—continue to constrain the design requirements for modern rolling stock [9]. While AS7507 attempts to manage this by defining 37 distinct reference vehicles, it's a major barrier to harmonisation. Furthermore, different networks have historically employed varying methods for calculating static, kinematic, and swept outlines, achieving consistency across the determination methodology remains technically difficult [10]. As mentioned in the previous section, some major RIMs continue to maintain their own reference outlines and Route Access Standards hindering its universal adoption. Constraints associated with major fixed assets have been demonstrated in procurement challenges where new rollingstock was incompatible with existing infrastructure, resulting in significant retrofit and remediation costs [8].

Governance and Regulatory Fragmentation: The Australian rail landscape is governed by multiple bodies with varying risk acceptance levels, which impacts the consistency of national rail safety assessments [11]. This contributes to inconsistency in rolling stock approvals, since the adherence to this standard is regulated by individual RIMs. While the national regulator provides overarching guidance, infrastructure managers such as Australian Rail Track Corporation maintain proprietary route access standards and clearance definitions that extend beyond AS 7507. The absence of a unified "single source of truth" or "single national reference point" results in varying evidentiary

requirements and inconsistent interpretation of the standard, including certification, registration, and network access authorisation.

Commercial and Operational Costs: From a commercial perspective, there are limited policy or economic incentives to encourage full harmonisation, particularly given the financial risk associated with reassessing existing compliant fleets. Manufacturers and operators must continue to design and procure rolling stock to meet network-specific requirements, reducing opportunities for standardisation and economies of scale. This fragmentation constrains the national supply chain and increases procurement complexity, contributing to industry observations that approval processes can be more time-consuming than manufacturing itself [12]. This results in lost revenue for RTOs since the rolling stock can be used to generate value sooner if the approval process is streamlined.

Training and Expertise: Implementation is further constrained by capability and training requirements. The application of AS 7507 involves advanced engineering assessments, including lateral displacement, body roll, and kinematic envelope calculations, often requiring specialised modelling tools and measurement. While the standard defines high-level requirements, there is limited nationally consistent guidance on interpretation and application. This has led to variability in assessment methodologies across jurisdictions and the persistence of discipline-specific expertise silos [13].

5. Proposed Solution – Overview

5.1 Proposed Solution

The proposed solution is to adopt AS 7507:2017, Rolling Stock Outlines, as the nationally recognised baseline standard for assessing rolling stock clearance on the Australian heavy rail network.

This directly addresses the current fragmentation in clearance assessment practices, where differing methodologies, reference vehicles, and interpretation across networks result in duplicated engineering effort, inconsistent approval outcomes, and reduced interoperability.

Under this approach, AS 7507 becomes the default national reference for:

- Definition of rolling stock static, kinematic, swept, and vertical swept outlines
- Demonstration of clearance compliance at design, testing, and approval stages
- Acceptance of rolling stock for operation across multiple rail networks, supported by a consistent national clearance assessment methodology. This enables conditional mutual recognition of approvals across jurisdictions where assessment principles, reference vehicles, and route constraints are aligned

This would establish a consistent national method for clearance assessment and assurance, while still allowing infrastructure-specific constraints and route-based limitations to be applied where necessary.

5.2 Supporting Enablers for Effective Adoption

To transition from the current fragmented state to a consistent national framework, a combination of policy alignment, regulatory consistency, and practical industry implementation measures is required.

5.2.1 Consistent recognition in Approval Process

While Australia benefits from a nationally consistent regulator, variability exists in how clearance requirements are applied and recognised within network-specific approval processes.

To address this, Rail Infrastructure Managers (RIMs) should consistently recognise compliance with AS 7507 as a valid and sufficient basis clearance assessment within route access, engineering acceptance, and rolling stock approval processes.

This would reduce duplication in evidence requirements and improve consistency in approval outcomes across networks..

5.2.2 Progressive alignment of RIM frameworks

Rail Infrastructure Managers (RIM) should progressively express route clearance requirements in terms of applicable AS 7507 reference vehicles, rather than bespoke or undocumented local gauge definitions that currently drive rework and approval uncertainty.

At the same time, RIMs must retain the ability to impose stricter limits where infrastructure constraints require. This does not represent continuation of the current fragmented approach, but rather a structured and transparent application of local constraints within a nationally consistent framework,, where all variations are defined relative to a common baseline methodology.

These enablers address governance, assurance, and application consistency while supporting coordinated updates to the technical content of AS 7507 itself.

5.3 Harmonisation Model – Staged Adoption

The recommended approach is staged harmonisation of AS 7507, rather than immediate full adoption across all Australian heavy rail networks.

This approach reflects the practical realities of the national rail system and balances national consistency objectives with operational and infrastructure constraints.

A staged approach is necessary to accommodate:

- Existing legacy gauges and route specific clearance constraints, embedded in long-standing infrastructure and operating practices
- Operational diversity across metropolitan, regional, and heavy-haul networks, including differing vehicle types, speeds, loading profiles, and clearance histories
- The need to avoid disruption to existing, already approved fleets, where clearance compliance has been demonstrated and remains safe

Immediate adoption may result in unintended consequences, including forced reassessment of compliant fleets, disruption to ongoing operations, and increased approval burden without proportional safety benefit.

5.4 National Consistency with Retained Local Authority

A fundamental principle of the proposed solution is that national consistency is achieved without removing necessary local authority.

AS 7507 harmonises how rolling stock clearance is assessed and demonstrated, supported by a defined set of reference vehicles (RVs). It does not prescribe uniform physical clearance limits across networks.

Under this model:

- Assessment methodology, engineering assumptions, and assurance processes are consistent nationally
- Route access decisions, infrastructure constraints, and operational limitations remain the responsibility of each RIM

This distinction ensures harmonisation improves interoperability, efficiency, and engineering consistency without constraining infrastructure managers' ability to manage local safety risks.

5.5 Nationally Consistent Elements (Harmonised)

The following elements are harmonised nationally because they relate to engineering method, assurance, and interpretation consistency, rather than physical infrastructure capability.

5.5.1 Clearance Assessment Methodology

AS 7507 provides a common technical framework ensuring rolling stock is assessed against the same engineering principles regardless of network. This includes consistent definitions of:

- Static outline
- Kinematic outline
- Swept outline
- Vertical swept outline

And a standardised approach to:

- Cant deficiency and cant excess
- Vehicle body roll
- Lateral translation
- Bounce allowances due to suspension response and track irregularities

This consistency ensures assessments are comparable, repeatable, and technically defensible nationally.

5.5.2 Assurance and Testing Framework

National consistency applies to how clearance compliance is demonstrated and verified, including:

- Common expectations for design calculation evidence
- Standardised static outline measurement practices
- Consistent approaches to kinematic sway testing (static and/or dynamic)

As well as clear thresholds defining when:

- Physical testing is required
- Testing may be waived based on adequate clearance margin

This reduces uncertainty, approval delays, and late-stage design changes.

5.5.3 Safety and Risk Controls

AS 7507 enables consistent national treatment of clearance-related hazards, including:

- Structure strikes
- Passing-train side-swipe collisions
- Pantograph de-wirements
- Fouling due to suspension wear or degradation

It also standardises terminology and aligns clearance compliance with:

- Rolling stock RAMS processes
- Safety assurance cases submitted to regulators

5.5.4 Use of Reference Vehicles

A nationally consistent reference vehicle framework underpins AS 7507, including:

- National recognition of reference vehicles as the accepted mechanism for defining permissible rolling stock envelopes
- Progressive acceptance that a vehicle compliant with a nominated AS 7507 reference outline can be considered suitably gauged for routes where that reference vehicle is adopted, subject to alignment of network-specific constraints

This supports interoperability and reduces repeated gauging effort.

5.6 Local Authority Retained by Rail Infrastructure Managers

Consistent with AS 7507's intent, route-specific and infrastructure-specific control remains with Rail Infrastructure Managers. Harmonisation does not require acceptance of rolling stock that is unsuitable for a particular route.

RIMs retain control over:

- Selection and application of AS 7507 reference vehicles for specific routes
- Imposition of more restrictive limits where infrastructure constraints require
- Approval of out-of-gauge rolling stock and associated operational controls
- Electrical clearances, structure gauge constraints, and track condition tolerances

This ensures that while assessment methodology is harmonised nationally, risk acceptance and operational suitability remain locally determined.

6. Proposed Solution - Strategic Value

The harmonisation of AS 7507 as the nationally recognised framework for rolling stock outline and clearance assessment delivers substantial long-term strategic value for the Australian rail industry. This value extends beyond technical consistency, addressing enduring national challenges related to safety, interoperability, productivity, procurement efficiency, workforce capability, innovation, and sustainability.

The proposed solution establishes a common technical and assurance foundation while preserving the ability for Rail Infrastructure Managers (RIMs) to manage local infrastructure constraints and operational risks. In doing so, it enables consistency without over-standardisation and reform without disruption.

6.1 Long-Term Value of Harmonisation

Australia's rail system has historically developed as a set of largely independent networks, resulting in fragmented clearance practices, duplicated effort, and inconsistent approval expectations. Over time, these inefficiencies compound, increasing costs and eroding confidence for operators, manufacturers, and investors.

Harmonisation of AS 7507 delivers long-term value by:

- Providing a stable national reference point for rolling stock outline assessment. Which will be beneficial for improved national consistency in documentation and application, Enhanced efficiency in project delivery and approvals, Reduced risk of misinterpretation or non-compliance & Strengthened assurance and auditability.
- Reducing reliance on jurisdiction-specific interpretations and undocumented legacy practices.
- Enabling incremental improvement aligned with asset renewal cycles rather than forcing disruptive, one-off changes.
- By embedding harmonisation at the standards level, the proposed solution supports enduring systemic improvement rather than short-term project-based efficiencies.

6.2 Safety Benefits and National Risk Reduction

Clearance-related incidents such as structure strikes, sideswipe collisions, and electrical interface failures remain a credible hazard across Australian rail networks, particularly where legacy infrastructure intersects with modern rolling stock.

The proposed solution strengthens safety by:

- Ensuring clearance risks are evaluated using a consistent, technically robust methodology linked to defined reference vehicles and envelopes.

- Supporting integration of clearance assessment into RAMS processes and safety assurance cases, improving traceability from design assumptions to operational controls.
- Reducing variability in safety margins arising from differing interpretations between networks.
- Following a harmonised safety management procedure throughout Australia

  This approach enhances national safety outcomes while retaining RIM accountability for route suitability and residual risk acceptance.

6.3 Interoperability and Network Access

Interoperability remains a key strategic weakness in the Australian rail system, even where physical gauge compatibility exists. Inconsistent clearance assessment approaches create barriers to cross-network operation, limiting fleet flexibility and increasing operational costs.

Harmonised adoption of AS 7507:

- Establishes a common language and framework for rolling stock outlines across jurisdictions.
- Facilitates more predictable and efficient multi-network access negotiations.
- Supports national freight and passenger objectives by reducing regulatory friction rather than imposing physical uniformity.

  This directly addresses long-standing interoperability challenges without undermining local network sovereignty.

6.4 Productivity and Asset Utilisation Benefits

The approval effort associated with rolling stock clearance assessments is a significant contributor to project delays and cost overruns in Australia. Repeated re-assessment of similar vehicles across different networks consumes scarce engineering capacity and introduces avoidable risk.

The proposed solution improves productivity by:

- Minimising duplicated analysis through a single nationally aligned assessment approach.
- Improving certainty in approval pathways for RSOs, project sponsors, and manufacturers.
- Reducing late-stage design changes driven by inconsistent clearance expectations.

  These gains support better utilisation of existing infrastructure and engineering resources across the industry.

6.5 Procurement and Market Efficiency

Fragmented clearance requirements have historically constrained rolling stock procurement by forcing bespoke designs for each network, limiting supplier competition and reducing economies of scale.

Harmonising AS 7507 supports:

- More standardised and modular (interchangeable) rolling stock designs suitable for multiple networks.
- Improved access for global manufacturers by creating the requirements more harmonised and aligned with global market requirement.
- Enhanced participation by domestic rail manufacturing and supply chains through clearer national requirements.
- Further improvement in coordination, cooperation and transparency across rolling stock projects by adopting the National Rolling Stock Procurement Pipeline created by The Office of National Rail Industry Coordination (ONRIC).

These outcomes lower whole-of-life costs and reduce procurement risk for both public and private operators.

6.6 Strategic Risks and Trade-offs

The proposed solution consciously balances benefits against potential risks and trade-offs. These include:

- The risk of perceived loss of local control, mitigated by maintaining route-specific acceptance authority with RIMs.
- The coexistence of legacy rolling stock and infrastructure, which is managed through staged adoption and transitional arrangements.
- Any risk of treating AS 7507 as a prescriptive standard is managed through its clear positioning as a methodology and framework, rather than a universal clearance mandate.

This balance ensures harmonisation delivers value without imposing disproportionate cost, operational disruption, or unintended safety consequences.

6.8 Broader Strategic Value

Taken together, the proposed solution delivers strategic value at a national level by:

- Enhancing safety assurance and risk transparency
- Enabling practical interoperability
- Improving productivity and approval efficiency

- Supporting innovation and modern rolling stock deployment
- Strengthening workforce capability and skills portability
- Contributing to sustainability and decarbonisation objectives (such as national rollout of standardised overhead electrification and charging infrastructure).

7. Proposed Solution - Implementation Feasibility

7.1 A Staged Approach

Implementation feasibility relies on encouraging the development of a revised AS 7507, progressed as a staged national harmonisation program rather than an immediate industry-wide requirement. The current Australian rail environment remains fragmented across multiple networks, with different rolling stock outline practices, approval pathways, and infrastructure constraints applying between jurisdictions. A staged approach is therefore a practical pathway, as it allows the industry to establish a common technical basis for future interoperability while recognising the operational and legacy constraints that continue to exist across the industry.

The objective of a staged model is not to mandate uniform application of the current standard in its existing form, nor to require immediate reassessment of all existing fleets. Rather, the objective is to support development of a revised national reference approach that can improve consistency in interpretation, measurement, assessment and approval, beginning where interoperability value is highest and expanding over time. A revised standard should also be supported by a smaller number of default target envelopes, rather than retaining a broad set of reference vehicles. This would better reflect a harmonised approach in which the outline becomes the default design and approval envelope, with structured management of exceptions where infrastructure cannot reasonably be changed in the short term.

7.1.1 First stage

Each Rail Infrastructure Manager (RIM) should review its current standard and internal clearance assessment practices to identify the specific barriers to broader alignment. Each RIM's review findings are to be consolidated and progressed through a national technical working group or forum.

While it is clear that AS 7507 is not consistently applied across all networks, the reasons for this are unlikely to be uniform. In some cases, the barriers may relate to legacy infrastructure and route-specific constraints. In others, they may be due to local engineering practices, differing interpretations of the standard, approval culture, limited technical capability, or the absence of supporting guidance documents.

As a practical starting point, alongside the RIM review, this first stage should place particular emphasis on the National Network for Interoperability (NNI). The NNI is an appropriate initial focus because it represents the part of the national rail task where interoperability is already a recognised strategic objective and where the benefits of a more consistent approach can be realised most quickly. In this context, focusing on the NNI does not mean that all routes within it are physically identical or immediately compatible. Rather, it means using the NNI as the first implementation environment in which a revised standard, common interpretation, and supporting guidance can be

discussed with key stakeholders and applied consistently across multiple connected corridors and organisations.

Starting with the NNI would allow the industry to establish an agreed national position on core matters such as terminology, measurement principles, assessment evidence, approval expectations, and reference vehicles. It would also provide an opportunity to consider the number of reference vehicles and test whether the revised standard can function as a common reference point in practice, rather than remaining a document interpreted differently by each network. In addition, it would create a clear audience for the escalation of deviations and modifications. In parallel, the NNI could be used to classify corridors into harmonised and constrained routes, giving the industry a clearer view of where the revised outline can be applied directly and where local constraints will continue to require tailored controls.

7.1.2 Second Stage

A common national approach should be developed for interpretation, assessment principles, measurement methods, and approval processes. This is a critical step, as the value of AS 7507 will not come from the document alone, but from a shared understanding of how it is to be applied. At present, one of the key barriers to harmonisation is not simply the content of the standard, but the inconsistency in how different parties read it, use it, and incorporate it into approval decisions.

This second stage should therefore focus on building the supporting architecture around the standard. That would include agreed definitions, practical guidance on application, clearer expectations for evidence and testing, and a more consistent relationship between the standard and route-specific approval processes. In effect, this stage would create the common language and supporting tools needed for RIMs, RSOs, manufacturers and regulators to work from the same technical basis.

This stage should also consider a smaller number of default target envelopes and clearer reference outlines. Rather than expecting every route to fit one uniform profile, the revised framework could identify which outline applies to which corridor group and which routes are treated as constrained legacy routes. Where routes are constrained, the framework should be able to point to defined conditions such as speed limits, or other modified operating parameters.

7.1.3 Third stage

Transition arrangements should then be developed for new procurements, modified vehicles, and existing fleets where practical. This stage is important because national harmonisation will not be achieved through a single change event. Some fleets may already align closely with AS 7507, while others may require further assessment, route restrictions, local conditions, or long-term modification. In many cases, legacy

infrastructure and established fleet interfaces will continue to justify local exceptions for a considerable period.

For that reason, transition should be progressive and risk-based. Priority should be given to new rolling stock procurement, major fleet modification, and those corridors or vehicles where the interoperability benefit is highest. Existing fleets that are already safely operating should not be unnecessarily disrupted where there is no clear safety or value case for reassessment. Over time, this would allow the revised standard to become the primary national reference point for rolling stock outline assessment, while still recognising that some local variation will remain necessary due to infrastructure history and route-specific constraints.

7.2 Supporting Measures

Supporting measures will be essential if the standard is to be workable in practice. A common standard without common guidance will not achieve harmonisation on its own. Industry participants will require clear supporting documents that explain how the revised standard is to be interpreted, what evidence is expected, when testing or modelling is required, and how local constraints are to be managed without undermining national consistency.

Training and capability development will also be important. The application of rollingstock outline standards requires specialised engineering judgement, particularly where kinematic movement, suspension behaviour, infrastructure interface, and route-based restrictions must all be considered together. Targeted training for engineers, assessors, and approval personnel would help reduce inconsistent interpretation and improve confidence in application. This should be supported by agreed measurement methods, suitable tools, and practical examples that demonstrate how the revised standard is intended to operate in real project and approval environments.

A national technical working group or forum should also be established to support implementation. This group could provide a mechanism to resolve interpretation issues, coordinate updates, consider exceptions, and maintain consistency across networks over time. This would be particularly important during the early phases of implementation, when the revised standard is being embedded into industry practice and when questions are most likely to arise around application in different operational contexts. The review findings from each RIM should feed into this forum so that the national approach is informed by actual network constraints rather than developed in isolation.

7.3 Implementation Challenges

Implementation will need to account for the reality that the Australian rail system is not starting from a clean slate. Legacy infrastructure, corridor-specific constraints,

historical approvals, and long-established local practices all create path dependency. Some routes and rail corridors will not be able to align immediately with a national reference approach without disproportionate cost or operational impact. This is particularly relevant where platforms, tunnels, structures, and overhead interfaces have been designed or maintained to suit local fleets and historic operating conditions.

Another major challenge is balancing national consistency with retained local authority. For harmonisation to be practical, the revised standard must provide a stronger and clearer national reference point, particularly across the NNI, but it must not remove the ability of RIMs to manage route-specific constraints and residual risk. That balance is central to feasibility. If the approach is too rigid, it will not be accepted by industry. If it is too flexible, it will fail to improve consistency. The implementation model must therefore standardise the core interpretation, methodology, and supporting guidance, while still allowing justified local variation where infrastructure or operational conditions require it.

The overall implementation pathway is therefore pragmatic rather than absolute:

- Begin with the NNI,
- establish common interpretation and supporting guidance,
- define a smaller number of default target envelopes, and
- classify routes as harmonised or constrained.

Then progressively extend adoption as fleets, approvals, and infrastructure are transitioned over time. This approach provides a realistic path to national harmonisation while recognising the complexity of the Australian rail environment.

8. Proposed Solution - Stakeholder Commitment & Adoption

8.1 Stakeholder consultation

The Successful implementation of a national reference approach for rolling stock outlines across Australia requires significant commitment from key stakeholders. It is essential to gain the support from Rail Infrastructure Managers (RIMs) and understand which Rolling stock Outlines they currently accept within their Network, as well as from Rolling Stock Operators (RSOs), with an agreement that they will adopt the revised AS 7507 as their single national reference point. Additional stakeholders that should be consulted during the review and development process are Rolling Stock manufacturers, maintainers, regulatory authorities and other Subject Matter Experts (SMEs) to fully understand the best approach to implement this Standard and see the biggest benefits.

As discussed earlier, a staged approach is recommended rather than a full and instant adoption of AS 7507 in its current form. Further consultation with key stakeholder is required to ensure this standard is adopted. Early industry involvement during standards development and revision ensures all real-world impacts are considered [14] , resulting in lower risks, cost reductions and confident planning [15]. It also increases stakeholder ownership and buy-in, reduces resistance, improves understanding, and leads to faster, more consistent adoption during implementation. [4] Initial discussions with SMEs from IPEX, Queensland Rail, ARISO, Keolis Rollingstock Australia, Public Transport South Australia and Bombardier about AS 7507 have highlighted areas which, if revised, could increase stakeholder adoption in addition to further benefits. These points are outlined in Section 9.

8.2 Benefits of Adoption to Stakeholders

The current state of adoption of AS 7507, being a partial adoption across multiple state networks, means that the rolling stock manufacturers have no clear understanding of where their rolling stock is likely to be approved for use. It requires them to consult with each RIM and ROS individually to confirm their rolling stock outline standards if they intend to produce a product which can travel across multiple states. Ensuring a single national reference point, being AS7507, would significantly improve timelines for rolling stock approval. It would provide confidence that their product may be adopted across more than one state, increasing Australia's competitiveness in purchasing rolling stock and their parts. Additionally, having a single standard would streamline design costs and engineering checks, reducing manufacturing costs. This cost reduction would be passed on to RSOs. RIMs would also see a cost benefit with the new rolling stock being assessed against their accepted rolling stock outlines prior to production. It would significantly minimise engineering costs and approval timelines to run new rolling stock within their network. After all, "it can take less time to build a train than it does to get it approved to run across the country" [16]

Adopting a national standard for rolling stock outlines would increase the ability for Rollingstock to travel more easily across state borders, with additional review considerations potentially increasing that likelihood further. Enabling rolling stock to move across state borders would result in a more competitive national freight network, moving freight from roads to rail. The flow on effects of this would mean more capital investment in rail, an increase in profit for RIMs from the increased customer base, reduced congestion on roads and a step towards net zero emissions [16].

8.3 Barriers to adoption

With all benefits considered, there are clear barriers preventing stakeholders from adopting a national rolling stock outline standard. Legacy infrastructure, including route specific envelopes, make blanket implementation of rolling stock outlines impossible. Exceptions to the standard will always exist due to these historical constraints. Also, there is a cultural reliance on flexibility within this domain, with concerns that harmonisation will constrain rolling stock operations to the lowest common denominator.

9. Recommendations

It is recommended that a revised version of AS 7507 be prioritised for national adoption as part of Australia's broader rail reform program and be rolled out using a staged, collaborative approach.

- Stage 1: Rail Infrastructures Managers to review the AS 7507 and identify barriers to adoption from their perspective. Form a technical working group or forum to address these barriers.
- Stage 2: Agree on a National approach and conduct an in-depth revision of AS 7507, including a strong focus on harmonising Reference Vehicles on the National Network for Interoperability (NNI). Additional elements that should be addressed and a harmonised during the revision include:
  - Assessment principles
  - Terminology and definitions
  - Measurement methods
  - Approval processes
- Stage 3: Apply the standard to all new procurement and develop transition arrangements for existing fleet where possible, prioritising inclusion based on risk and value benefit. Legacy Rolling stock will likely be grandfathered and may never comply. This may be managed by the respective RSO.

As part of this process, a rigorous review of the standard is recommended to consolidate and simplify the reference vehicle (RV) outlines included. This review should be done in direct consultation with the stakeholders, including Rail Infrastructure Managers, Rolling Stock Operators, regulators and other subject matter experts. Focus should be directed towards the National Network for Interoperability (NNI), seeking agreement from RIMs and RSOs that they maintain AS7507 as the single source of truth. Legacy and route specific outlines may still be managed by the RIMS and RSOs to address the issue of network specific constraints and allow flexibility. The following recommendations have been compiled following initial consultation with subject matter experts across the rail industry and should be considered during the review process:

- Revision of included rolling stock outlines and removal or consolidation of obsolete outlines
- Assessment of included RVs to determine whether some outlines are enveloped by others or are comparable. This may then be noted to further decrease the required design costs and approval timelines of new or updated rolling stock. It would also provide more clarity where specific rolling stock can run
- Development of a reference vehicle outline for broad acceptance across the NNI, identifying network constraints and specifying restrictions where necessary. For example, if a section of the network has a tight curve through a tunnel, lower speeds may be required for approval to run through this section. Sections of the

network can be classified as ‘core harmonised routes’ and ‘constrained legacy routes’.

- Development of a Network map which specifies which RVs are approved across the NNI, including any commentary around conditional approvals and what restrictions may apply to that RV.
- Development of complementary documents to provide guidance on how to apply the standard, such as instructions and measurement guides
- Development of a working group to manage technical disputes, coordinate exceptions and maintain accountability for the progressive improvement and harmonisation of AS 7507 and other related documents and Standards across the Nation.
- Develop a National rolling stock register which contains every rolling stock index. This has been successfully implemented in the UK and allows visibility into where each rolling stock is approved and compliant, as well as any conditions of approval.

If these steps are taken, AS 7507 can become a stronger harmonised standard and deliver lasting value to the Australian rail industry. Some of the main benefits include significantly improved interoperability, reduced rolling stock approval timeframes and costs, and increased competitiveness for rolling stock procurement across Australia. It should therefore be prioritised within the national harmonisation agenda.

10. Conclusion

In conclusion, the national harmonisation of AS 7507 presents a practical and high value opportunity to address one of the most persistent sources of inefficiency in Australia's rail system fragmented rolling stock clearance assessment. By establishing a consistent technical and assurance framework, while retaining necessary local control over infrastructure constraints, the industry can reduce duplication, improve safety outcomes, and unlock greater interoperability across networks.

A staged and collaborative implementation approach ensures that legacy constraints, operational diversity, and existing fleets are managed pragmatically, without disruptive change. Importantly, the application of AS 7507 should be forward-looking, with compliance expectations applied to new designs, procurements, and major modifications rather than retrospectively imposed on existing assets or previously approved clearances. Retrospective application would introduce significant cost, operational disruption, and unnecessary reassessment burden without commensurate safety benefit, potentially undermining industry support for harmonisation.

With strong stakeholder commitment and supporting measures in place such as national working group, training and guides, etc,. Prioritising AS 7507 within the national reform agenda will deliver lasting benefits in productivity, procurement efficiency, and network integration, positioning Australia's rail industry for a more connected, competitive, and sustainable future.

11. References

1. ARTC reference.
2. NSW Intercity fleet: New trains too wide for tunnels | news.com.au — Australia's leading news site for latest headlines
3. Sydney plagued by public transport failures despite billions spent on infrastructure - ABC News
4. French railway operator SNCF orders hundreds of new trains that are too big | France | The Guardian
5. Spain officials quit over trains that were too wide for tunnels
6. GHD report FINAL 231024 Harmonisation of Standards Research Project Report_241023_Full.pdf
7. Interview with Candis Rhodes
8. NSW Intercity fleet: New trains too wide for tunnels | news.com.au — Australia's leading news site for latest headlines
9. Transport for NSW (2020), New Intercity Fleet Project Review (documented clearance compatibility issues)
10. Office of the National Rail Safety Regulator, National Rail Safety Guideline – Rolling Stock
11. Rail Industry Safety and Standards Board publications on interoperability
12. Productivity Commission (2021), Transport Regulation Report
13. Australasian Railway Association, Rail Industry Report & Workforce/Capability Studies
14. Consultation Guidance Note, Office of Impact Analysis, Australian Government, https://oia.pmc.gov.au/sites/default/files/2023-05/best-practice-consultation.pdf
15. Rail Standards Consultations, RSSB, https://www.rssb.co.uk/standards/defining-the-future-of-standards/rail-standards-consultations
16. Streamlining rolling stock approval processes, National Transport Commission, https://www.ntc.gov.au/project/streamlining-rolling-stock-approval-processes
17. Exploring Stakeholder Engagement Process as the Success Factor for Infrastructure Projects, Prebanic, K. R, Vukomanovic, M,The Impact of Construction Projects and Project Management on Society, 2023, https://www.mdpi.com/2075-5309/13/7/1785