

Options to harmonise rolling stock testing and test locations

ARA submission on the NTC discussion paper

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Executive summary

The Australasian Railway Association (ARA) welcomes the opportunity to provide feedback on the National Transport Commissions (NTC) discussion paper on options to harmonise rolling stock testing and test locations. This submission is informed by a broad cross section of the ARA membership.

The ARA and our members support the National Pathway objective of reducing duplication, cost and delay in rolling stock approvals while maintaining robust safety assurance and protecting the integrity of each network. Our members agree that interface compliance testing is essential. Rolling stock suppliers, operators and infrastructure managers highlighted that they can be required to navigate multiple sets of requirements, methodologies, evidence expectations and testing locations even where the safety objective is essentially the same. This creates additional engineering effort, late-stage design and test changes, avoidable retesting, longer project timeframes, additional costs and uncertainty for rolling stock intended to operate across more than one network.

Members broadly support harmonisation, mutual recognition and better evidence portability. There are, however, differences in views on the preferred mechanisms and sequencing. Some members see a strong case for a national testing body or facility; others consider a coordinated network of recognised test locations, supported by common methodologies and evidence requirements, would deliver more immediate and practical benefits. Some members favour allocating more tests to certification, while others support a clearer distinction between certification, registration and network approval. The ARA has sought to reflect these views by recommending a staged, risk-based reform program rather than a single perspective model.

The ARA recommends that the NTC progress a national framework built around a simple principle - test once, validate gaps only. Under this approach, common vehicle design and performance evidence should be reusable across networks where equivalent safety outcomes can be demonstrated. Network specific testing should be reserved for genuine interface risks, with any RIM variations documented, justified and made transparent to applicants at the start of the process.

Summary of recommendations

No	Recommendation	Purpose
1	Adopt a national "test once, validate gaps only" principle	Use existing Australian approvals, international evidence, accredited subsystem/component testing and validated simulation wherever equivalent safety outcomes can be demonstrated. Additional testing should target genuine Australian or network specific gaps
2	Develop a national test requirements matrix as an early deliverable.	The matrix should identify common requirements, documented RIM variations, evidence expectations, applicable standards, required approval stages and whether results can be mutually recognised

3	Immediately standardise documentation and evidence packages	Create common technical file structures, compliance matrices, vehicle information pack requirements, test report templates, standards derogation templates and configuration records.
4	Prioritise low complexity and high duplication tests.	Start with static and inspection-based tests, structural and calculation-based assessments, and documentation requirements. In parallel, develop harmonised methodologies for high impact dynamic tests such as brake performance, ride performance, and traction/hauling assessment.
5	Preserve risk-based network approval for genuine interface risks	RIM specific requirements should be transparent, justified by risk and limited to matters such as signaling, communications, traction power, route specific clearance, environmental conditions and operational rules.
6	Create a testing location and simulation register	A register should describe approved sites, recognised test types, limits, accreditation status, instrumentation, assessor competence and whether evidence is accepted nationally or requires network specific assessment.
7	Develop national protocols for validation simulation	Protocols should address model validation, data quality, physical validation tests where needed, reporting, tool accreditation and mutual recognition of simulation evidence.
8	Assess national testing capability before committing to a single facility	Member feedback supports stronger national capability, but views differ on whether this should be a single physical facility, a coordinated network of accredited locations, or a hybrid model. A feasibility study should consider costs, access, gauges, electrification, axle loads, regional logistics and existing capability.

The ARA position

Support for harmonisation and mutual recognition

The ARA supports harmonisation as part of a broader interoperability and productivity reform agenda under the National Pathway. Harmonisation should not be understood as lowering assurance or removing the ability of RIMs to manage legitimate network risks. It should be aimed at reducing unnecessary duplication, improving the portability of equivalent evidence and giving industry clear, early visibility of what is required.

A risk-based approach should allow previous Australian approvals, international certifications, subsystem level tests, accredited laboratory results, operational history and validated simulations to be considered where they demonstrate equivalent outcomes. For mature designs and minor modifications, the burden should be on identifying the delta from existing approval evidence rather than repeating a full testing program.

Managing different member views

Member feedback showed strong alignment on the need for greater consistency, transparency and mutual recognition, but not always on the precise reform model. The ARA therefore recommends that the NTC avoid locking in a single solution too early. A staged program can capture early benefits while allowing more complex issues, such as dynamic testing locations, simulation validation and any national testing facility to be resolved through detailed design and feasibility work.

Where member views differ, the ARA suggests the following balanced positions:

- Certification should carry as much nationally reuseable evidence as possible, but network approval should remain available for genuine network specific interfaces such as signaling, communications, and traction power. Local clearances, operating rules and environmental conditions.
- A national testing facility may be valuable, particularly for specialist dynamic testing, emerging technologies and development of Australian rolling stock capability, but the first step should be defining the national testing capability required and recognising existing facilities, sites and simulation environments where they meet agreed requirements.
- Independent competent persons and independent safety assessors may support consistent evidence acceptance in some cases but should not be mandated universally as doing so would add cost without improving safety outcomes or timing.
- Simulation should be accepted where properly validated, but physical testing should remain available or required where needed to validate models, address safety critical functions or confirm genuine network interface risks.

Responses to the consultation questions

Question 1

To what extent do current rolling stock testing requirements and practices contribute to inefficiency and delay in certification and registration? How should efforts to address testing requirements be prioritised relative to other rolling stock approval elements of the National Pathway?

Current testing requirements and practices contribute materially to inefficiency and delay, particularly for rolling stock seeking access to multiple networks. Members identified inconsistent RIM requirements, differing interpretation of similar standards, separate evidence packages, limited mutual recognition and variation in nominated testing locations as recurring sources of cost and uncertainty. Several members noted that requirements may not be fully visible until late in the design or test planning process. This can force redesign of test regimes, rework of documentation and in some cases alternations to rolling stock. Dynamic testing can also require train paths, access approvals and waivers, and may need to be scheduled around operational constraints, adding months to project timeframes.

Testing reforms should be a high priority in the National Pathway because it is a practical area where early benefits can be realised. The priority should be improving the portability of compliance evidence, not reducing the level of assurance. The ARA recommends early action on a national test requirements matrix, standard evidence templates and mutual recognition rules, alongside work on safety assurance guidance and the single registration form.

Question 2

Are there particular types of tests or approvals where harmonisation would be most effective?

Harmonisation would be most effective where tests demonstrate vehicle performance or design compliance that is substantially independent of individual network characteristics, or where networks require similar evidence but apply different methods, thresholds or reporting expectations. Priority candidates include static geometric and mass tests, clearance and swing assessments, inspection-based compliance checks, structural and calculation-based assessments, static brake tests, brake evidence requirements, horn performance, vehicle weighing and loading verification, and standard documentation supporting AS7501 compliance.

High impact dynamic tests should also be targeted, even where full harmonisation is more complex. Members identified dynamic brake performance, ride performance, traction/haulage testing, adhesion performance, noise and vibration, signalling and coordination between rolling stock and power supply. For these tests, harmonisation may need to focus first on common methodologies, evidence standards and reporting before identical acceptance limits are feasible.

Question 3

In rolling stock approvals, there are three stages: certification, registration and network approval. For Table 1 on pages 21-22, could the various tests be identified as belonging to certification, registration or network approval?

The ARA supports the NTC identifying each test category by approval stage, as this would improve transparency and reduce the risk that network approval reassesses matters already addressed through certification. However, the allocation should not become a rigid barrier that prevents evidence reuse. The same evidence may support more than one stage.

The ARA recommends the following working allocation:

Stage	Primary purpose	Indicative test categories/evidence
Certification	Demonstrates that the vehicle, subsystem or component has been designed, manufactured and verified against applicable standards.	Static geometric and mass tests; static outline; weigh and twist; clearance and swing assessments where generic; static brake function; inspection-based compliance checks; structural assessments; calculation-based assessments; acoustic and visibility tests where standardised; component /subsystem certifications; validated simulations and engineering analysis.
Registration	Confirms the rolling stock configuration, technical file and compliance evidence are complete and accepted for national registration or reuseable approval purposes.	Technical records; configuration management; evidence package; vehicle information pack; type test evidence; dynamic ride quality/stability and dynamic brake performance where they demonstrate integrated vehicle performance and are not driven by unique network conditions.
Network approval	Confirms compatibility with a specific network and operating context.	Signalling and electrical interaction; electromagnetic compatibility with network systems; train control; communications; traction power coordination; pantograph interaction; route specific clearance or dynamic behaviour; environmental conditions where locally regulated; operational rules; train configuration; route and haulage assessments where network specific.

This approach recognises the concern raised by some members that most testing is fundamentally product or system verification. It also recognises the legitimate role of RIMs in assessing interfaces that cannot be fully demonstrated without reference to their network.

Question 4

Are there additional learnings, or approaches from international jurisdictions that should be investigated to inform potential reforms to rolling stock testing requirements or locations in Australia?

The ARA supports examining international approaches but cautions against direct transplantation of highly centralised or prescriptive regimes. Australia has multiple track gauges, mixed ownership models, isolated networks and distinct operating environments. International examples should inform the design of an Australian model, not replace risk-based safety assurance.

The ARA recommends that the NTC investigates: mutual recognition of test evidence; type approval for common rolling stock platforms; independent assessment models; technical files that remain with the vehicle over its lifecycle; risk based vehicle classifications such as approaches used in North America freight practice; digital clearance and simulation methods; and the role of recognised test centres and accredited facilities.

International experience also highlights two areas for caution. Firstly, centralised and legislative standards systems can slow technology introduction if they become overly prescriptive. Secondly, large physical test centres require substantial capital and ongoing operational funding, so Australia should be clear about the problem any facility is intended to solve before committing to a particular infrastructure model.

Question 5

To what extent is there a need for a national testing facility in Australia, and how could it deliver value to the industry?

Member feedback supports stronger national testing capability, but views differ on whether this should take the form of a single national testing facility, a national testing body, a coordinated network of approved sites, or a hybrid model. The ARA recommends a feasibility study that starts with the capability need rather than the facility solution. A single national facility could deliver value for specialist dynamic testing, new technologies, development testing, whole vehicle or component testing and testing that would otherwise disrupt operational networks. It could also support Australian rolling stock manufacturing and reduce the need to secure operational train paths for complex trials.

However, a single facility would need to address difficult access and scope issues; narrow, standard and broad-gauge capability; heavy axle loads, electrification systems such as 1500V DC and 25 kV AC; high speed and low speed environments; multiple signalling systems; geography access for regional and isolated operators; and the cost of transporting rolling stock to the facility.

For these reasons the ARA recommends that the NTC first establish a national testing capability model that recognises existing Australian (and where appropriate international) facilities, manufacturer test sites and validates simulation environments. A single physical facility could then be considered as a longer-term option where there is a clear gap, a robust business case and national agreement on recognition of its outputs.

Question 6

Are the options for harmonisation mentioned in section 4.3 better considered as standalone options, as a combination of options, or altogether? Which options should be implemented as a priority?

The options should be progressed as an integrated but staged reform program. The options reinforce each other – a requirements matrix reveals variation, harmonised criteria and methodologies make evidence comparable, standard documentation enables efficient assessment, recognised locations support evidence reuse, and consolidated standards with documented variations provide long-term stability.

The ARA recommends the following sequence.

1. create a national test requirements matrix and publish RIM requirements and variations;
2. standardise evidence packages and test report templates;
3. harmonise acceptance criteria and methods for low complexity tests and high duplication documentation;
4. develop protocols for validated simulation and mutual recognition;
5. establish a testing location and simulation register;
6. assess longer term national testing capability needs.

This staged approach allows quick wins to proceed without waiting for more difficult questions, such as dynamic testing location and investments in a national facility to be fully resolved.

Question 7

Are there specific acceptance criteria or documentation requirements that could be quickly harmonised to deliver immediate benefits?

The ARA recommends early action on the following quick wins:

- A standard technical file structure and common vehicle information pack accepted by participating RIMs.
- A common compliance matrix that maps AS7501, ARISO standards, RIM requirements and any justified variations.
- Standard test report templates for static tests, brake evidence, ride performance reporting, horn testing and inspection-based checks.
- A national checklist for inspection-based compliance items, such as markings, AEI tags, reflective delineators and electrical safety markings.
- Standard configuration management records and change/delta assessment templates for modifications and similar vehicles.
- A common standards derogation or variation template that records the local risk basis and proposed control.
- Publication of RIM test requirements, acceptance criteria, forms and guidance in a common digital location.

- A rolling stock evidence register recording tests already completed, including location, standard, date and scope, to reduce repeat testing where vehicles move between networks or change ownership.

Question 8

Would allowing greater flexibility in where dynamic and static tests are conducted (for example, recognising results from a wider range of approved sites or simulators) help reduce costs and improve timing?

Greater flexibility would reduce costs and improve timing where static tests are conducted using approved methodologies, competent assessors and comparable conditions. Static testing is generally more portable, provided the acceptable criteria and reporting are agreed. Dynamic testing is more sensitive to track condition, geometry, speed, wheel-rail profiles and local operating context, but that is an argument for accrediting conditions and documenting limits, not for automatically requiring repeated network specific tests.

The ARA recommends a register of recognised locations and simulation environments. The register should identify each location or facility, the types of tests it can support, applicable gauges and limits, relevant track geometry, operating speeds, instrumentation, accreditation status, assessor competence and which RIMs recognise the outputs.

Recognition should extend to manufacturer facilities and overseas test centres where equivalent safety outcomes can be demonstrated, and Australian specific gaps are addressed. Where a RIM requires additional testing, the requirements should be linked to a clear network specific risk.

Question 9

Is simulation testing a viable alternative to physical trials and, if so, what protocols would need to be adopted to validate simulation models? Are there specific tests that simulation testing could be used to demonstrate compliance?

Simulation is a viable alternative or supplement for some physical trials and is already embedded in parts of Australian rolling stock practice. It can reduce network access constraints, test unsafe or rare operating conditions, reduce cost and improve the scope of assessment once a model is established. It should not be treated as a blanket replacement for physical testing, particularly where real-world validation is required for safety critical functions or new technologies.

Simulation should be supported by national validation protocols covering model assumptions, input data, validation against physical tests or operational data, sensitivity analysis, version control, software/tool acceptance, competence review, reporting and circumstances where physical validation remains required. The work occurring through ARISO and AS7509, including modelling acceptance procedures such as wagon and locomotive model acceptance, should be leveraged.

Simulation is particularly suitable for vehicle dynamics and ride quality, kinematic envelop and clearance assessment, wheel-rail interaction and track force calculations, brake performance scenarios, traction and haulage modelling, structural and crashworthiness analysis using finite element methods, and software or control system testing through

hardware in the loop environments. Physical testing should be focussed on validating models and addressing network specific risks that cannot be credibly resolved through simulation alone.

Question 10

Should harmonisation of testing requirements and locations be progressed as a separate, dedicated project, or could it be effectively managed by the Technical Working Group for a single registration application pilot during a future stage of the National Pathway?

The ARA recommends that harmonisation of testing requirements and locations be progressed as a dedicated National Pathway project, aligned with but not dependent on the single registration application pilot. The single registration pilot can test concepts, templates and mutual recognition arrangements, but harmonisation requires broader engagement across RIMs, RSOs, manufacturers, maintainers, technical experts, standards bodies and the regulator.

A dedicated project should have clear deliverables: a national test requirements matrix, a prioritised harmonisation work plan, common documentation templates, proposed mutual recognition rules, simulation validation protocols, a testing location register and advice on national testing capability. The Technical Working Group should help steer implementation and ensure alignment with the single registration process.

A first-stage pilot on the National Network for Interoperability may be a sensible way to test feasibility across a relatively consistent standard-gauge environment before extending to more diverse gauges and network types.

Question 11

Would a testing location register be useful?

A testing location register would be a practical, relatively low-cost early reform that would improve transparency, project planning and evidence reuse. It would be useful for RSOs, OEMs, integrators, RIMs and assessors.

The register should include recognised test sites, manufacturer facilities, overseas facilities where accepted, simulation environments and any relevant national testing capability. It should specify recognised test types, technical limitations, gauge and axle load capability, available line speeds, electrification and signalling characteristics, instrumentation, assessor and witness requirements, accreditation status, evidence requirements and the RIMs or networks that recognise outputs.

The register should be maintained as a living digital resource and linked to the test requirements matrix. It should not simply list locations; it should make clear what evidence from each location can be reused and what network-specific gap assessment may still be required.

Conclusion

The ARA supports the NTC progressing harmonised rolling stock testing and test locations as a priority under the National Pathway. The reform should focus on safety, efficiency and interoperability: maintaining robust assurance while removing unnecessary duplication and uncertainty.

The strongest near-term opportunities are a national test requirements matrix, standard documentation and reporting templates, harmonisation of low-complexity and high-duplication tests, common protocols for simulation, and a testing location register. More complex reforms - including a single national facility or national testing body - should be examined through a staged feasibility process that considers cost, access, capability and industry acceptance.

A national framework based on 'test once, validate gaps only' would support a more competitive, innovative and interoperable rail industry while preserving each RIMs ability to manage genuine network-specific risks.

If you wish to discuss any aspect of our submission please contact Roz Chivers, General Manager Rail Operations at [REDACTED] or on [REDACTED].