Standard

Interface Standards

MD-10-194

QUEENSLAND RAIL OFFICIAL

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Version: 6.2
Updated: 19/09/2024

Policy: Safety

QueenslandRail

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1 Purpose

This standard sets the minimum safety interface standards for:

- rolling stock operating on Queensland Rail rail infrastructure, and
- the connection between Queensland Rail rail infrastructure and other rail infrastructure

The modules listed below are contained in this standard:

- Module 1 Infrastructure
- Module 2 Rolling Stock
- Module 3 Safeworking

This standard prescribes the minimum requirements for designing and maintaining rolling stock to manage the safety interface risks between rolling stock operations and the network.

This standard assists Queensland Rail to meet its obligations under the Rail Safety National Law (Queensland).

1.1 Scope

This standard applies to all rolling stock operations on Queensland Rail Infrastructure.

This Standard applies to:

- every Queensland Rail employee (whether permanent, temporary or casual)
- every Queensland Rail contractor or consultant
- everyone who does work for Queensland Rail, while they are doing work for Queensland Rail
- third party operators
- transfer facility managers, and
- Any of the people referred to in Section 3.1 who need to make use of this Standard for work purposes.
- If this applies, Queensland Rail expects you to understand and comply with this Standard and related documents from Queensland Rail's Policy Framework that are relevant to your work, including Queensland Rail's Code of Conduct.

1.1.1 What is out of scope

This standard does not apply to areas where Queensland Rail is not the Rail Infrastructure Manager.

2 Requirements of this Standard

2.1 Interface Principles

Queensland Rail will maintain its rail infrastructure and connecting rail infrastructure in accordance with the requirements of the Queensland Rail Safety Management System.

Rolling stock operators will maintain and operate their rolling stock and rolling stock configurations in accordance with these interface standards.

Rolling stock operators and Queensland Rail will manage the operation of trains on the Queensland Rail rail infrastructure in accordance with these interface standards.

2.2 General

The rolling stock operator must implement a maintenance regime that keeps its rolling stock within the requirements of the interface standards and to enable safe operation on the Queensland Rail rail infrastructure.

The rolling stock operator must have an implemented procedure to identify and manage in service rolling stock safety related defects, that will not import any additional risk to the operational safety or Queensland Rail rail infrastructure.

Rolling stock for operation on 1435mm gauge track must comply with ARTC document WOS01 “Minimum Operating Standards for Rolling Stock” and the following sections of the Queensland Rail interface standard:

- Module 1, Section 1.3 - Mobile Voice Radio Communications Systems
- Module 1, Section 1.6 - Signalling of Trains
- Module 2, Section 2.6 - Pantograph Requirements
- Module 2, Section 2.9 - Rolling Stock Fire Performance
- Module 2, Section 2.12 - Hygiene Requirements
- Module 2, Section 2.14 - Emergency Requirements
- Module 2, Section 2.16 - Brake System Requirements
- Module 2, Section 2.16.9 - On-Track Machines Additional Requirements and 2.17 - On
- Track Machine Special Requirements
- Module 2, Section 2.17 - Rolling Stock Electromagnetic Compatibility (EMC)
- Module 2, Section 2.21 - Train Safety Systems.

2.3 Document Formatting

"HED" cells are grey coloured and contain the section heading, and sub-section heading, descriptions; this cell is formatted in this colour as a sample of the colour used.

"PRI" cells contain the intent and principles of the document and are coloured yellow; this cell is formatted in this colour as a sample of the colour used.

"QRR" cells contain the mandatory requirements and are coloured blue; this cell is formatted in this colour as a sample of the colour used.

"GUI' cells contain guidance and are white-coloured. Guidance is intended to provide practical advice and are not mandatory requirements.

"SUP" cells are white-coloured and contain supplementary information.

3 Responsibilities

The following establishes the unique accountabilities and responsibilities of the key internal stakeholders specific to this Standard.

3.1 Who does what?

Who	What
Board	Responsible for the approval of related Policy in accordance with legal and regulatory obligations, and to enable Queensland Rail's pursuit of opportunities aligned with its vision and values in an ethical and responsible manner. Responsible for authorising the commitments in this Standard. Leads Queensland Rail's implementation of and compliance with the related Policy, by: • communicating Queensland Rail's vision, and the importance of the Standard, to all Queensland Rail personnel • responding to recommendations made when the Standard is reviewed, to ensure the Standard remains up to date and relevant to Queensland Rail
Executive Leadership Team (ELT)	Must assist the CEO with the implementation of this Standard and by extension the related Policy, by leading the implementation of this Standard in their respective functions, everywhere, every day. Are also accountable for ensuring this Standard has been implemented and complied with.
Manager Rail Safety Systems	As the Functional Owner approves this Standard and must: • establish and maintain processes to provide assurance to the CEO that this Standard is being followed by Queensland Rail • review this Standard regularly, and provide recommendations to the CEO
Principle Safeworking Adviser	Is the Content Developer, on behalf of the Functional Owner.
General Manager Regional Operations	Is responsible for managing the operator interface in regard to registration of rollingstock and issue of Train Route Acceptances and must develop and implement related documents and processes to ensure this Standard is reflected in Queensland Rail's day to day operations for rollingstock operator interface.
Principal Engineer Rolling Stock, Operator Interface Section	This role is unique to this Standard and will provide subject matter expertise and must: • support and communicate the Standard to their employees, contractors and consultants to ensure they understand the Standard • demonstrate compliance with the Standard
All employees, contractors, consultants and others listed in Section 3.1	Everyone who needs to make use of this Standard for work purposes must understand and comply with this Standard.

4 Terms and definitions

The following key terms and definitions are unique to this Standard. Please refer to the Business Glossary for other terms not included in this section.

Term	Definition	Source[1]
On-Track Vehicle (OTV)	Rolling stock used for infrastructure maintenance e.g. section cars, on-track machinery.	Queensland Rail Business Glossary
RACI Matrix	A table outlining activities and roles of different stakeholders in relation to those activities identifying who is: • Responsible – who does the work • Accountable – who is required to ensure the work is done adequately • Consulted – who is asked for their input, and • Informed – who must be told about the work.	
RISSB	Abbreviation for 'Railway Industry Safety and Standards Board'. A wholly owned entity of the Australasian Railway Association (ARA), responsible for development and management of the Australian Code of Practice (ACOP).	
Road-Rail Vehicle (RRV)	A vehicle that can travel on a road and can also travel on rail by use of a rail wheel guidance system. It can readily be transferred from one mode to the other without additional facilities.	
Rolling Stock	Any vehicle that operates on, or intends to operate on, or uses a railway track, including any loading on such a vehicle, but excluding a vehicle designed for both on- and off-track use when not operating on the track. Rolling stock is a collective term for a large range of rail vehicles of various types, including locomotives, freight wagons, passenger cars, track machines and road-rail vehicles.	
Uncontrolled Document	A printed or electronic copy of a document which is not maintained or updated.	
Rolling Stock Operator	The accredited organisation with duties associated with the safe operation of their rollingstock on QR's Network.	
OILD	Over and Imbalanced Load Detector	
WILD	Wheel Impact Load Detector	

[1] Where left blank, Source is not applicable.

5 Document History

Document Information

Current Version	6.2
First Released	01 July 2010
Last Updated	19 September 2024
Review Frequency	Every 3 years
Review Before	19 September 2027
Document Authoriser	Chief Executive Officer (CEO)
Functional Owner	Chief Engineer
Content Developer*	Discipline Head Rollingstock
Review Stakeholders	Rolling Stock Discipline, Safety Discipline Heads, Operational Managers, Network Access
Audience	All employees, contractors and consultants

*Contact for further information

Document Amendment History

Version	Date	Section(s) Amended	Summary of Amendment
6.2	19/09/2024	Module 2, Appendix 2	Stopping distance errors corrected for braking curves F, I, N, S, T and W in Tables 2 and 3.
6.1	07/12/2022	3.1	Titles and activities amended to current structure, No change to requirements.
6.0	25/09/2021	Whole Document	Transfer from Excel Document to PDF Reorganise and reformat Standard Overview
		Module 1	Removed 1.5, 1.7.1 and 1.7.2, added information to 1.3.
		Module 2	Added sections to 2.2, 2.3, 2.6, 2.9, 2.11, 2.13, 2.18 Removed sections from 2.9, 2.13
5.0	11/01/2019	Whole Document	Transfer of contents to updated SEMS template.

6 Appendices

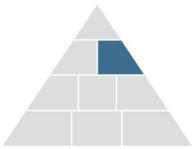
Appendix 1 – Related documents

Legal, regulatory and other obligation sources

Jurisdiction	Title
Commonwealth	N/A
State	Rail Safety National Law (Queensland)
Other (Voluntarily adopted by Queensland Rail)	N/A

Queensland Rail documents

Document type	Document title
Policy	MD-10-69 Safety Policy
Principle	N/A
Strategy / Plan	N/A
Specification / Framework	N/A
Procedure	N/A



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Standard

Interface Standards
Module 1: Infrastructure

MD-10-194

QUEENSLAND RAIL OFFICIAL

QueenslandRail

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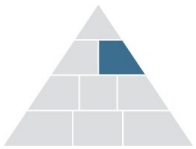
Clause	Requirements	Type
1	**REQUIREMENTS**	**HED**
1.1	**Track and Structures**	**HED**
1.1.1	**Track Gauges**	**HED**
1	The nominal track gauge is:	QRR
1(a)	• 1067mm for narrow gauge	QRR
1(b)	• 1435mm for standard gauge	QRR
2	The track gauge range for maintenance of the narrow gauge is:	QRR
2(a)	• minimum 1050mm	QRR
2(b)	• maximum 1095mm	QRR
3	The track gauge range for maintenance of the standard gauge is:	QRR
3(a)	• minimum 1418mm	QRR
3(b)	• maximum 1458mm	QRR
1.1.2	**Design Track Curvature**	**HED**
1	Existing mainline minimum horizontal radius is 90m.	QRR
2	Existing siding and depots minimum horizontal radius is 80m	QRR
3	Typical minimum radius of vertical curves in running lines at summits and sags is 1650m.	QRR
4	Typical minimum radius of vertical curves in sidings and yards at summits is 525m.	QRR
5	Typical minimum radius of vertical curves in sidings and yards at sags is 300m.	QRR
6	Severity of reverse curves for:	QRR
6(a)	• running lines minimum radii is 100m	QRR
6(b)	• running lines intervening straight is 10m	QRR
6(c)	• cross-over roads minimum radii is 140m	QRR
6(d)	• cross-over roads intervening straight is 10m	QRR
7	• Transition curve lengths range from 0 to 160m.	QRR
1.1.3	**Track Geometry Parameter Limits**	**HED**
1	Track geometry will be maintained within the limits in Figure 1 (Appendix 1.1)	QRR
2	Top is the variation in vertical alignment of a rail, measured from the midpoint of a chord. The chord length is 6.5m for 1067mm gauge track and 6m and 10m for Standard Gauge (SG) track.	QRR

Clause	Requirements	Type
3	Versine is the variation in horizontal alignment in each rail, measured from the midpoint of a chord. The chord length is 10m for 1067mm gauge track and 6m or 10m for SG track.	QRR
4	The track category for the route is available from Queensland Rail Operator Interface Section.	SUP
1.1.4	**Clearances**	**HED**
1	Queensland Rail infrastructure is constructed and maintained to achieve safe clearances between:	QRR
1(a)	• trackside structures and rolling stock conforming to the reference vehicle	QRR
1(b)	• rolling stock on adjacent tracks where the rolling stock on both tracks conforms to the reference vehicle	QRR
2	The rolling stock outlines for Queensland Rail lines are shown in Appendix 1.2 and include both the dimensions and dynamic characteristics for standard reference vehicles.	QRR
3	Queensland Rail Operator Interface Section can advise which rolling stock outline applies to a specific route. This may be one of the standard outlines in Appendix 1.2 or an additional outline.	SUP
4	Some routes can also accept rolling stock with other dimensional or dynamic characteristics. Queensland Rail Operator Interface Section may approve other vehicles subject to operating restrictions.	QRR
1.1.5	**Axle Loads**	**HED**
1	Queensland Rail infrastructure is constructed and maintained to carry axle loads of the train at the load / speed combination for the route specified in MD-10-533 "Operational Route Manual" providing the axle spacing requirements in module 2 of this standard are also met.	QRR
2	Some routes can also accept other axle load / speed combinations. Queensland Rail Operator Interface Section may approve other vehicles subject to operating restrictions.	QRR
1.1.6	**Rail Profiles**	**HED**
1	Rail can be the as rolled profile, the traffic worn shape or may be ground.	SUP
2	Rail grinding may also be used to remove corrugations or other rail defects without gross changes to the insitu rail shape.	SUP
3	General rail profile details can be obtained from Queensland Rail Operator Interface Section.	SUP
1.1.7	**Rail Lubricators**	**HED**
1	Rail lubricators are placed on all balloon loops for effective lubrication.	SUP
2	Rail lubricators may be placed at other locations on the Queensland Rail network where excessive wear occurs or is likely to occur.	SUP

Clause	Requirements	Type
1.2	**Electrical Traction Systems**	**HED**
1.2.1	**General**	**HED**
1	Within the Queensland Rail network there are two electrically different systems used for providing 25kV to the pantograph:	SUP
1(a)	• Booster Transformer System	SUP
1(b)	• Auto Transformer System	SUP
2	The neutral section Automatic Power Control (APC) track magnets are located between 5m to 48m from the neutral section.	QRR
3	The APC magnets are spaced from the neutral section based on a 0.5s MCB opening time.	QRR
4	The overhead traction system is electrically connected to earth or the 25kV supply.	QRR
5	The traction earthing and bonding system provides a continuous return path for traction return currents and does not rely on signal track bonds for continuity.	QRR
7	Automatic Power Control (APC) magnets are placed in pairs, with one pair at the beginning and one pair at the end of neutral sections, coal loadouts and gaps in overhead traction wiring.	GUI
8	APC track magnets are located at the ends of sleepers.	GUI
9	The top of the track magnets are 25mm to 30mm below rail level.	GUI
1.2.2	**Contact/Catenary System**	**HED**
1	Open route minimum contact wire height at supports is 4.5m	QRR
2	Maximum contact wire height is 5.8m	QRR
3	The total side displacement of the contact wire (including stagger, temperature effect and wind load) under operating wind conditions is up to 510 mm.	QRR
4	The designed horizontal stagger of the contact wire is as follows:	QRR
4(a)	• 230mm on straights	QRR
4(b)	• 350mm to 380mm on curves	QRR
4(c)	• 400mm maximum acceptable stagger	QRR
5	The contact wire tension will range between 11.0kN and 12.26kN.	QRR
6	The nominal maximum train speed for which the above overhead wiring system is designed is 160km/h.	QRR
7	The nominal maximum grading for contact wire is 1 in 480 but it may be up to 1 in 200.	QRR
1.2.3	**Power System Parameters**	**HED**
1	The overhead line equipment operates at 25kV, 50 Hertz, alternating supply.	SUP
2	Expected 50Hz supply voltage levels and their occurrence levels are as follows:	QRR



Clause	Requirements	Type
2(a)	• 30kV max regularly for short duration	QRR
2(b)	• 27.5kV Nominal continuous maximum	QRR
2(c)	• 19kV Nominal continuous minimum	QRR
2(d)	• 17.5kV minimum for short duration (prolonged under unusual circumstances)	QRR
3	Consideration must be given to harmonic over voltages and onerous transient voltage disturbances, which can cause voltage disturbances exceeding 66kVpeak.	QRR
4	During normal operation the frequency of the supply may vary from 49.5Hz to 50.5Hz, abnormal operation can produce short periods in which the frequency varies from 47Hz to 52Hz.	QRR
5	The short circuit capacity of the overhead supply system is 12kA and the pantograph must be suitably rated and tested to this level as a minimum.	QRR
1.3	**Requirements for Mobile Voice Radio Communications Systems**	**HED**
1.3.1	**Mobile Voice Radio Communications Systems**	**HED**
	Queensland Rail has four (4) mobile voice radio communications systems designed to control trains and other rail traffic. Full details can be found in MD-10-86. These are:	SUP
1	• The Enhanced Radio System (ERS) is the primary mobile voice radio communications system in South East Queensland (SEQ). The ERS is a Digital Mobile Radio (DMR) system providing communications between drivers, guards and network control. The ERS also provides mobile voice radio capability for other functions such as Maintenance, Shunting, and Station Communications. The ERS is based on DMR Tier 3 technology. Terminals compatible with DMR Tier3 technology are also able to operate in analogue mode, providing interoperability to existing analogue mobile voice radio communications systems.	SUP
2	• Train Control Radio (TCR) is an open-channel two-way analog UHF radio Private Mobile Radio (PMR) system for voice communications between Rail Traffic Drivers, Rail Traffic Guards and Network Control Officers. This system is the primary mobile voice radio communications system outside of SEQ.	SUP
3	• Maintenance Supervisory Radio (MSR) is an open-channel two-way analog UHF PMR radio system available on or adjacent to the rail corridor outside of SEQ. The MSR may also be used for communications between Infrastructure personnel and Network Control Officers or making PABX calls. The MSR can also provide two-way voice communications between Rail Traffic Drivers and Network Control Officers in the following situations: a) In areas where the TCR system is not installed b) When the TCR system is temporarily unavailable, e.g. a system failure.	SUP
4	• The Shunt Radio is an open-channel two-way UHF radio system for voice communications between Rail Traffic Drivers, operational staff, and Network Control Officers, within shunting limits.	SUP

Clause	Requirements	Type
1.4	**Track Monitoring**	**HED**
1.4.1	**Hazard Location**	**HED**
1	The rolling stock operator must advise the train controller of any track quality concerns, indicating the hazard and location which is likely to reduce the capability of the track to safely perform.	QRR
1.5	**Signalling of Rail Traffic**	**HED**
1.5.1	**Rail Traffic Location and Detection**	**HED**
1	Permanent and electro-magnets, where required, are located on the approach side of the signal.	GUI
2	In the Brisbane Suburban Electrified Area, Automatic Warning System (AWS) magnets are installed generally 80m on the approach side of the signal.	GUI
3	Where track magnets are provided for Station Protection (SP), they are generally positioned 2000m from the approach side of the signal.	GUI
4	AWS and SP magnets are located along the centre line of the track.	GUI
5	The top of the track magnets are 25mm to 30mm below rail level.	GUI
1.6	**Cane Railway Crossings**	**HED**
1.6.1	**Signalling**	**HED**
1	For all new cane railway crossings at grade, the movement of rail traffic on Queensland Rail tracks must be controlled by colour light signals.	QRR
2	The colour light signals must be approach locked, such that a path for the cane train cannot be set whilst rail traffic is within braking distance of the signals protecting the crossing.	QRR
3	Approach beacons and approach signals on Queensland Rail tracks must be positioned in accordance with Queensland Rail signalling standards.	QRR
4	The red aspect lamps of the colour light signals at the cane railway crossing applying to rail traffic on Queensland Rail tracks must be proved lit before the moveable crossing is permitted to operate.	QRR
5	Moveable crossings must have the following provided:	QRR
5(a)	• an emergency stop button	QRR
5(b)	• an operation warning siren	QRR
5(c)	• a motor isolation lockable switch, configured so as to place all signals at stop when in the ‘off’ (isolate) position.	QRR
6	For all cane railway crossings, track magnets must be placed on the Queensland Rail track at the approaches to the crossings, as approved by Queensland Rail.	QRR
7	An overlap must be provided between all signals protecting the crossing and where rail traffic would actually collide with a cane train on the crossing.	QRR
8	All catchpoints discs must be electrically lit or reflectorised.	QRR

Clause	Requirements	Type
9	For existing semaphore signalled crossings, backing boards must be provided to signals where visibility is restricted.	QRR
10	Existing cane railway crossings will be progressively upgraded to meet the requirements of this standard.	GUI
11	The need to upgrade existing crossings will be prioritised on a risk basis, in consultation with the cane railway operator.	GUI
1.6.2	**Visibility**	**HED**
1	For non-interlocked cane railway crossings, sight distances not less than braking distance, must be provided for cane train crew from the catch points to approaching rail traffic on the Queensland Rail track.	QRR

Appendices

Appendix 1

Figure 1 - Track Geometry Parameter Limits

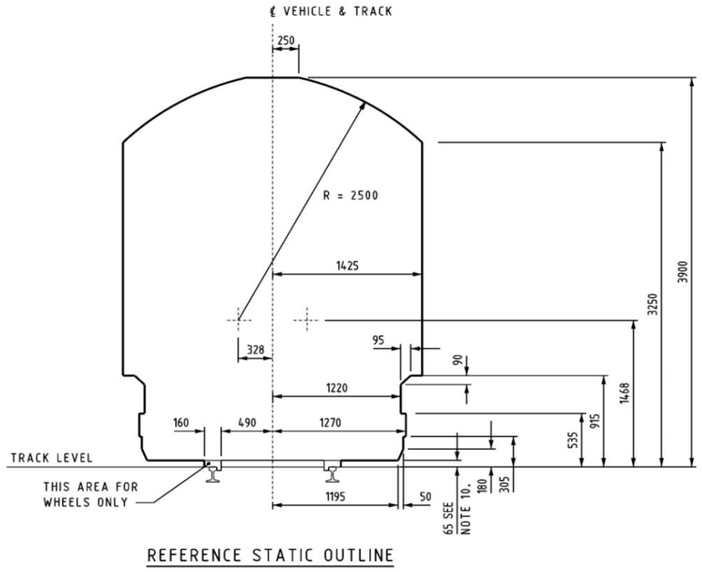
Track Category	Parameter Limits				
	Top (mm)	Twist (mm) Chord 3m 1067mm gauge 2.7m SG	Twist (mm) Chord 10m 1067mm gauge 13.2m SG	Versine (mm)	Cant (mm) variation from design
5	±25	±16	±30	±22	±30
6	±28	±19	±30	±27	±32
7	±31	±22	±30	±31	±34
8	±34	±25	±30	±36	±36
9	±37	±27	±30	±40	±38
10	±40	±30	±30	±45	±40
SG1 & 1C	±19 ±28	±17	±35	±17 ±20	±40

Figure 2 - Cane Train Crossing Types

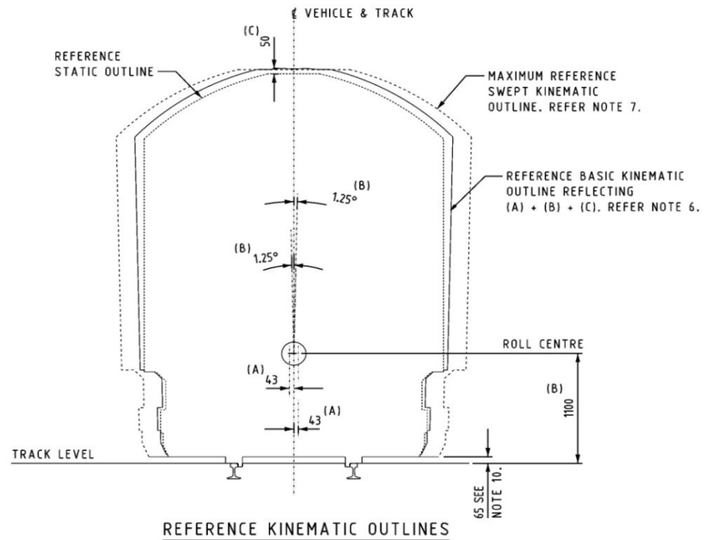
Applicable Speed Range (km/h)	Crossing Type
Main Line Crossings	
100-160	Grade Separation
80-100	Moveable or manganese diamond crossing
≤80	Fabricated 60kg diamond
Branch Line Crossings	
≤50	Fabricated 41kg diamond

Appendix 2

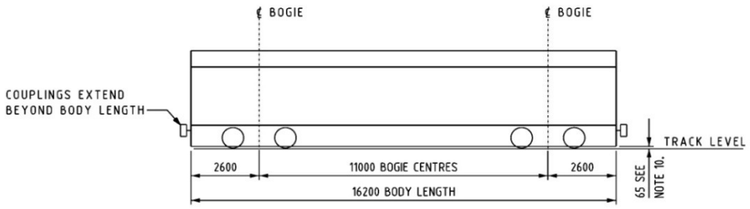
Reference Rolling Stock Outline RS1



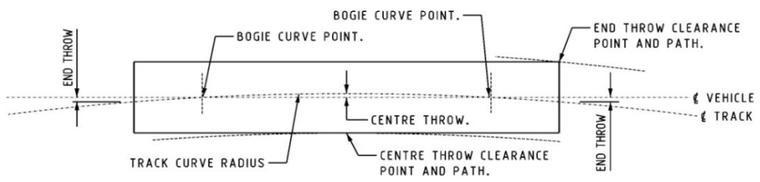
REFERENCE STATIC OUTLINE



REFERENCE KINEMATIC OUTLINES



REFERENCE VEHICLE SIDE ELEVATION - OUTLINE



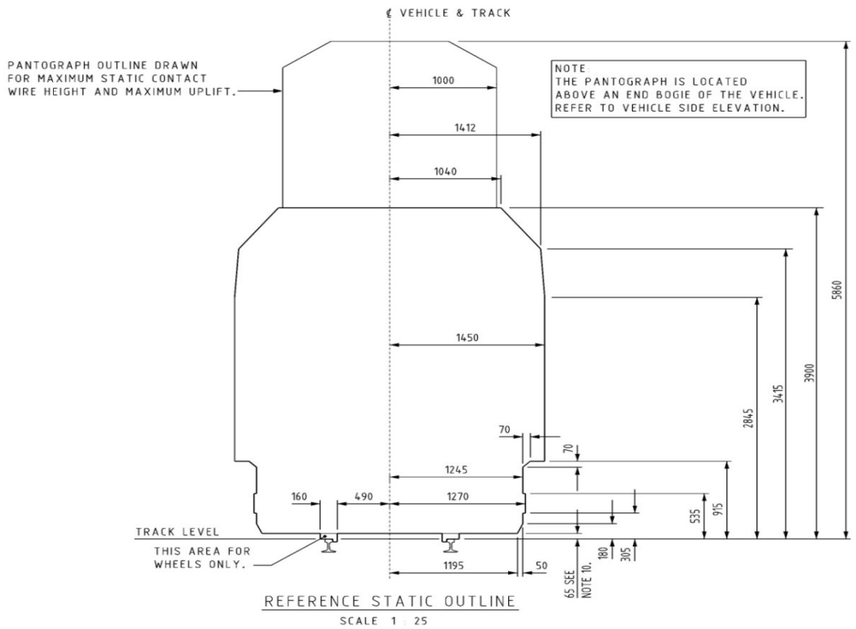
REFERENCE VEHICLE PLAN - END AND CENTRE THROW EFFECTS

NOTES:

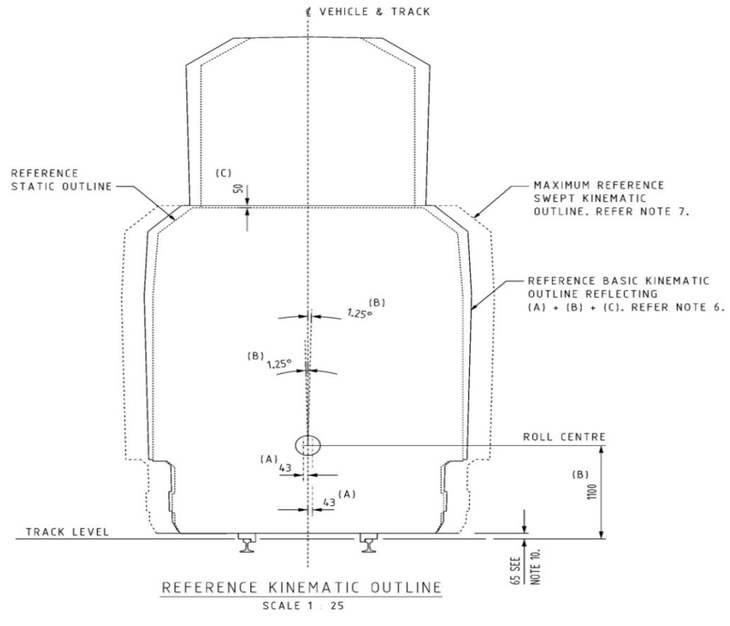
1. THE REFERENCE BASIC KINEMATIC OUTLINE AND REFERENCE SWEPT KINEMATIC OUTLINE ARE CALCULATED FROM THE REFERENCE STATIC OUTLINE USING THE DYNAMIC MOVEMENTS SPECIFIED IN NOTE 6 AND APPLYING THE METHODS DEFINED IN AS 7507 (PARTS 1 TO 4).
2. ALL DIMENSIONS ARE IN MILLIMETRES, UNLESS SHOWN OTHERWISE.
3. A ROLLING STOCK OUTLINE CONSISTS OF THREE (3) PARTS
   - THE STATIC OUTLINE;
   - THE BASIC KINEMATIC OUTLINE; AND
   - SWEPT KINEMATIC OUTLINE.
4. A REFERENCE OUTLINE IS DEFINED AS AN OUTLINE ACCEPTED BY QUEENSLAND RAIL AS APPLICABLE TO A SPECIFIED ROUTE.
5. THIS DRAWING DEFINES A REFERENCE STATIC OUTLINE AND THE FACTORS TO BE ADDED TO PRODUCE THE ASSOCIATED REFERENCE BASIC KINEMATIC OUTLINE & THE MAXIMUM REFERENCE SWEPT KINEMATIC OUTLINE.
6. THE REFERENCE BASIC KINEMATIC OUTLINE IS DETERMINED BY APPLYING THE FOLLOWING DYNAMIC MOVEMENTS TO THE REFERENCE STATIC OUTLINE
   (A) LATERAL TRANSLATION ±43mm
   (B) BODY ROLL ±1.25° ABOUT A ROLL CENTRE 1100mm ABOVE TRACK LEVEL ON THE VEHICLE CENTRELINE
   (C) BOUNCE UPWARDS 50mm.
7. THE MAXIMUM REFERENCE SWEPT KINEMATIC OUTLINE IS DETERMINED BY APPLYING THE CENTRE AND END THROW EFFECTS OF A 100m RADIUS HORIZONTAL TRACK CURVE TO THE REFERENCE BASIC KINEMATIC OUTLINE.
8. ROLLING STOCK MUST COMPLY WITH ALL PARTS OF THE REFERENCE ROLLING STOCK OUTLINES
   - WHEN EMPTY AND NEW CONDITION
   - WHEN FULLY LOADED AND WORN CONDITION
   - INCLUDING ALLOWANCE FOR CONSTRUCTION TOLERANCES.
9. OTHER ROLLING STOCK PROPORTIONS (e.g. LENGTH, WIDTH, BOGIE SPACING) MAY BE AUTHORISED BY QUEENSLAND RAIL PROVIDED THAT THE ROLLING STOCK DOES NOT EXTEND BEYOND THE REFERENCE OUTLINES.
10. 65mm VERTICAL SWEPT PATH HEIGHT FROM TRACK LEVEL TO UNDERSIDE OF THE STATIC AND KINEMATIC OUTLINES TO BE MAINTAINED FOR THE FULL LENGTH OF THE VEHICLE FOR ALL DYNAMIC MOVEMENTS AND ON VERTICAL TRACK CURVES.
11. VERTICAL SWEPT PATH IS TO BE DETERMINED BASED ON A 525m RADIUS TRACK SUMMIT CURVE AND A 300m RADIUS TRACK SAG CURVE.
12. COUPLINGS, HOSES ETC MAY EXTEND BEYOND THE BODY LENGTH PROVIDED THEY DO NOT EXCEED THE REFERENCE OUTLINES SWEPT PATHS.

RS1 QR-C-S3035

Reference Rolling Stock Outline RS2



REFERENCE STATIC OUTLINE
SCALE 1 : 25



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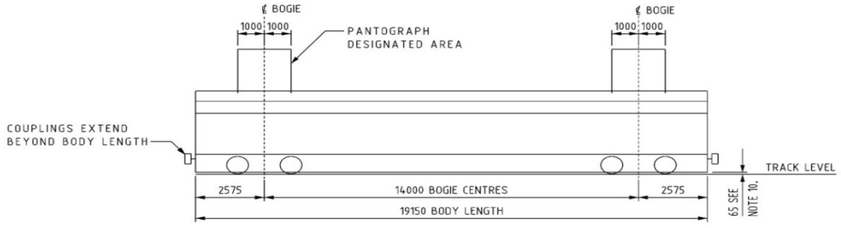
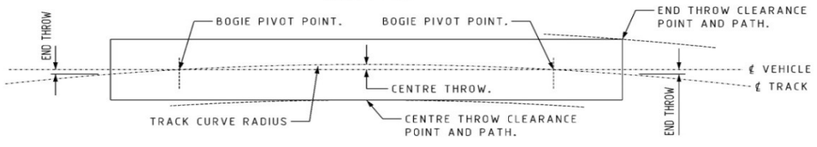


REFERENCE VEHICLE SIDE ELEVATION – OUTLINE
SCALE 1 : 100



REFERENCE VEHICLE PLAN – END AND CENTRE THROW EFFECTS
SCALE 1 : 100

NOTES:

1. THE REFERENCE BASIC KINEMATIC OUTLINE AND REFERENCE SWEPT KINEMATIC OUTLINE ARE CALCULATED FROM THE REFERENCE STATIC OUTLINE USING THE DYNAMIC MOVEMENTS SPECIFIED IN NOTE 6 AND APPLYING THE METHODS DEFINED IN AS 7507 (PARTS 1 TO 4).
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   (C) BOUNCE UPWARDS 50mm.
7. THE MAXIMUM REFERENCE SWEPT KINEMATIC OUTLINE IS DETERMINED BY APPLYING THE CENTRE AND END THROW EFFECTS OF A 100m RADIUS HORIZONTAL TRACK CURVE TO THE REFERENCE BASIC KINEMATIC OUTLINE.
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   - INCLUDING ALLOWANCE FOR CONSTRUCTION TOLERANCES.
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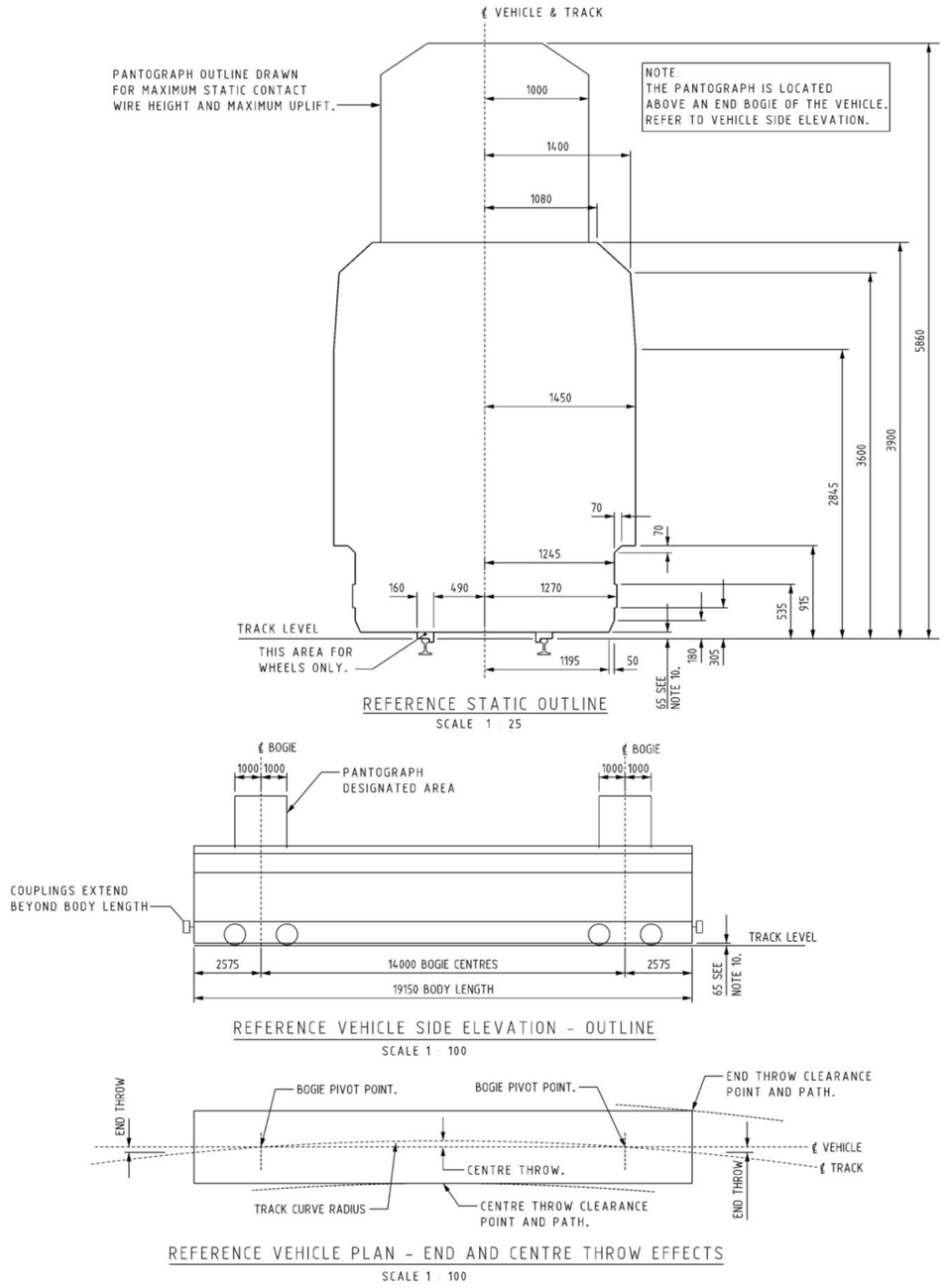
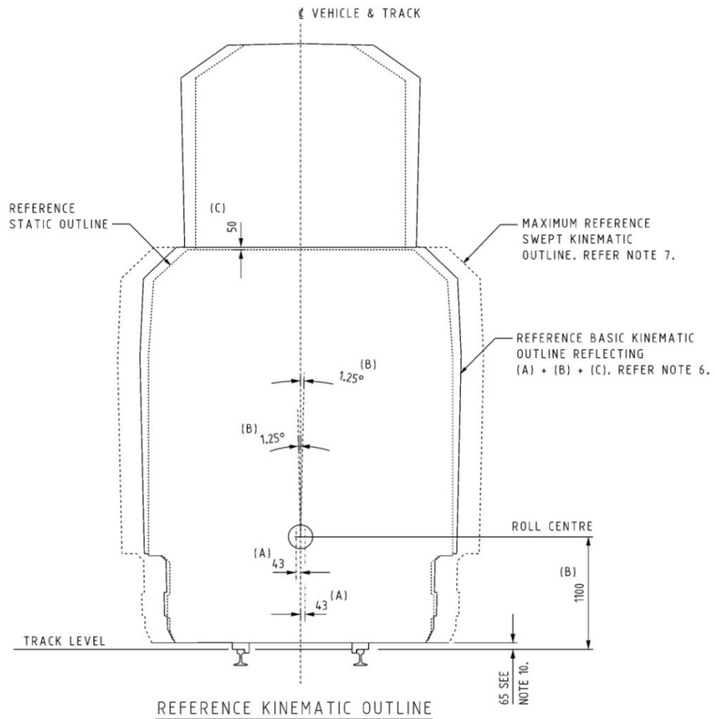
12. COUPLINGS, HOSES ETC MAY EXTEND BEYOND THE BODY LENGTH PROVIDED THEY DO NOT EXCEED THE REFERENCE OUTLINES SWEPT PATHS.

RS2 QR-C-S3036

Reference Rolling Stock Outline RS3



REFERENCE STATIC OUTLINE
SCALE 1 : 25



REFERENCE KINEMATIC OUTLINE
SCALE 1 : 25

REFERENCE VEHICLE SIDE ELEVATION – OUTLINE
SCALE 1 : 100

REFERENCE VEHICLE PLAN – END AND CENTRE THROW EFFECTS
SCALE 1 : 100

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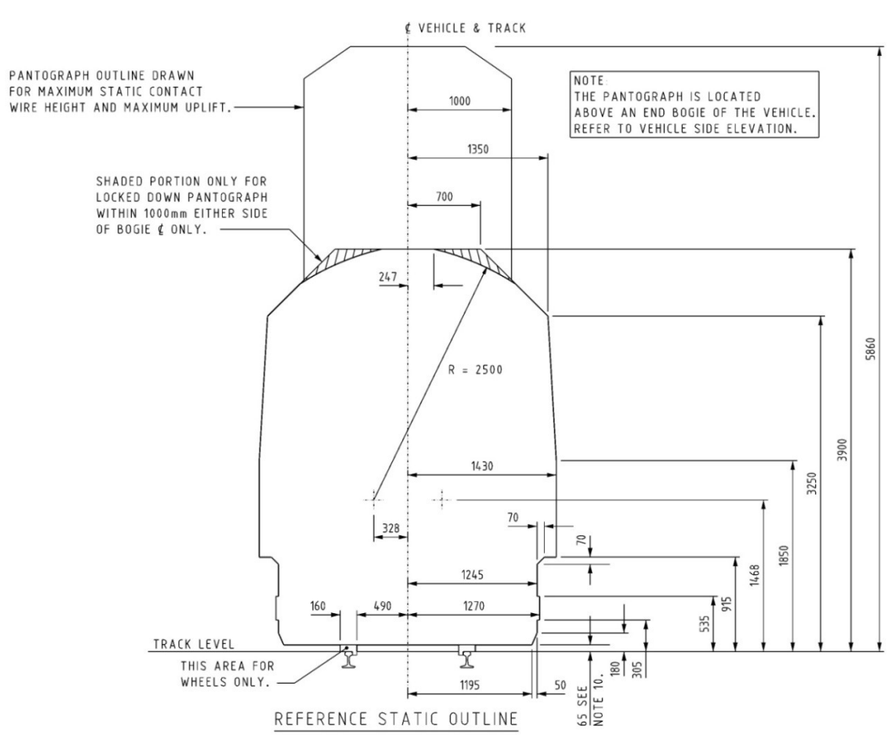
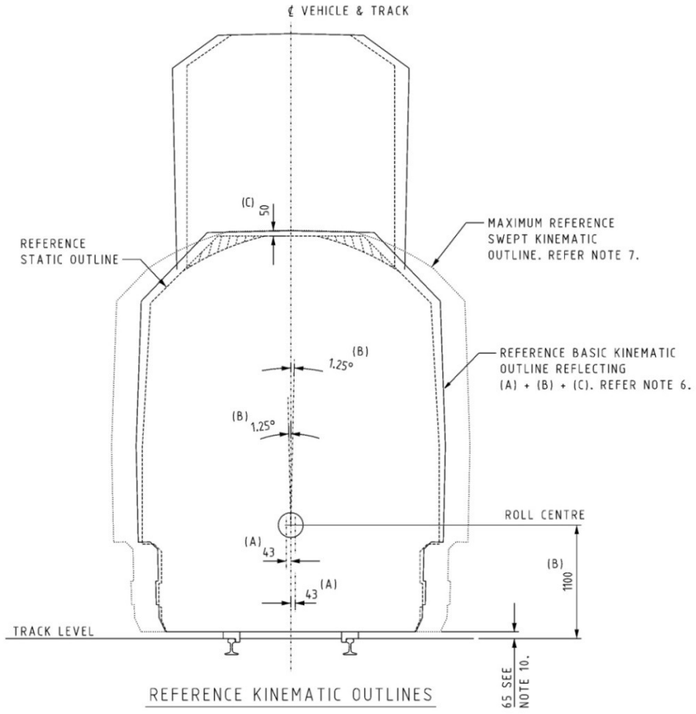
RS3 QR-C-S3037

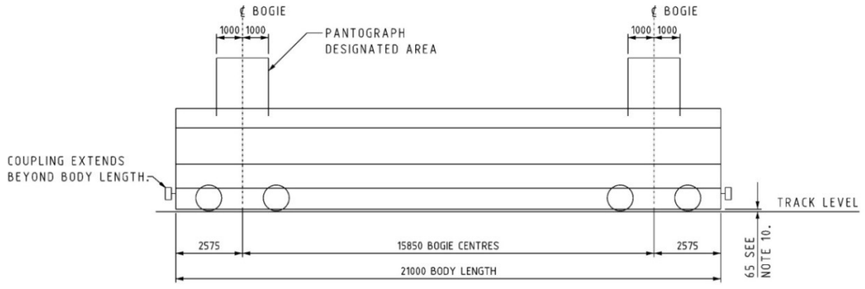
Reference Rolling Stock Outline RS4



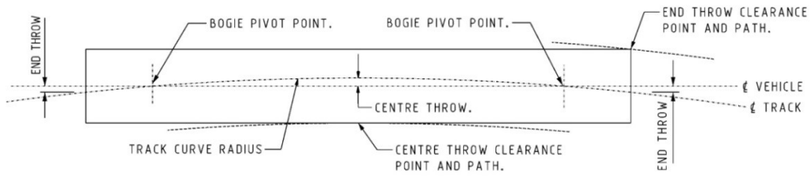
REFERENCE STATIC OUTLINE



REFERENCE KINEMATIC OUTLINES



REFERENCE VEHICLE SIDE ELEVATION - OUTLINE



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Standard

Interface Standards
Module 2: Rolling Stock

MD-10-194

QUEENSLAND RAIL OFFICIAL

QueenslandRail

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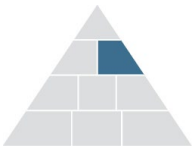
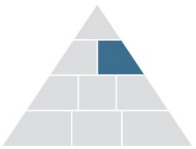
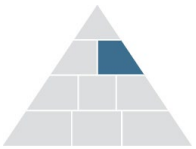


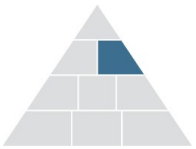


Clause	Requirements	Type
2	**REQUIREMENTS**	**HED**
2.1	**General**	**HED**
1	Unless stated otherwise in this standard, the requirements apply to:	QRR
• 1(a)	• all rolling stock	• QRR
• 1(b)	• on-track machines	• QRR
• 1(c)	• rail road vehicles (RRVs)	• QRR
2	For the purposes of this standard, RRVs are also considered as on-track machines and any requirements for on-track machines also apply to RRVs unless stated otherwise.	QRR
2.2	**Clearances & Axle Loads**	**HED**
2.2.1	**Clearances**	**HED**
1	The swept kinematic outline of the vehicle must remain within the swept kinematic outline of the relevant reference vehicle for the route.	QRR
2	Details of the reference vehicle can be found from Module 1 Section 1.1.4 Clearances	GUI
3	Tests or calculations must be carried out to determine the kinematic outline of the vehicle (i.e. car-body roll angle and lateral shift) when the vehicle experiences a steady state cant imbalance of 105mm.	QRR
4	No part of the rolling stock must infringe the allowable kinematic outline (refer 2.2.1.1 above) under these test conditions.	QRR
5	If the kinematic outline is calculated and is less than 25mm inside the allowable kinematic outline, then a practical test must be conducted. This may be a static test.	QRR
6	A part of rolling stock which is outside the swept kinematic outline of the reference vehicle, but has low consequences if it struck another object, may be treated as an expendable item.	GUI
7	Any proposed expendable items must be agreed with Queensland Rail Operator Interface Section.	QRR
8	When operating under live overhead line equipment, it must be physically impossible for any part of an on-track machine to exceed 3.9m above top of rail under any circumstances including wear, failure of the equipment or abnormal track conditions.	QRR
2.2.2	**Axle Loads/Spacings**	**HED**
1	The axle load limits specified in this section (2.2) are the absolute limits inclusive of manufacturing and loading variation.	QRR
2	The operator should assess the manufacturing and loading variation and target a lower limit to maintain compliance with this section.	GUI
3	Overload and Imbalanced Load Detectors (OILDs) are strategically located on Queensland Rail's Network to identify overloaded, or unevenly loaded, freight wagons.	SUP
4	Axle loads must not exceed the maximum axle load and speed permitted for the route as specified in MD-10-533 "Operational Route Manual".	QRR
5	Axle spacings at the rated load for the line must either:	QRR



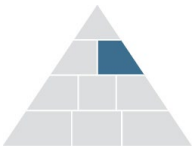
Clause	Requirements	Type
5(a)	• comply with Figure 23 or Figure 24 (Appendix 2.1), or	QRR
5(b)	• comply with an alternative approved by Queensland Rail Operator Interface Section	QRR
2.3	**Visibility and Audibility**	**HED**
2.3.1	**Lighting - General**	**HED**
1	Lighting must not be fitted which is likely to be mistaken for coloured light signals if these lights will be functioning in or near coloured light territory.	QRR
2	Items to consider include colour, position on the vehicle, pattern, brightness, and how operations will be carried out.	GUI
3	Lighting specified as required under this section (2.3) can be assumed to meet section 2.3.1.1 above.	GUI
2.3.2	**Headlight**	**HED**
1	Rolling stock which can be the leading end of rail traffic in normal operation (excludes setting back and propelling) must have a white headlight fitted at any leading end.	QRR
2	The headlight may be a single lamp, two or more lamps in a single assembly, or two or more lamps in separate assemblies.	QRR
3	Headlight arrangements, for rolling stock in excess of 20 tonnes, must provide a high intensity beam of at least 200,000 candela luminous intensity.	QRR
4	"Headlight arrangements" is the total of all operating headlamps.	QRR
5	The peak intensity requirement must also be met if devices to protect / diffuse the headlamps are fitted while in service.	QRR
6	Headlights must be at least 2.3m above rail.	QRR
7	The centreline of each headlamp beam must be aimed at a point 240m in front of the vehicle at top of track.	QRR
8	Headlights with a high beam intensity of 200,000 candela or above, must also be able to be dimmed to give a maximum luminous intensity of 80,000 candela.	QRR
2.3.3	**Visibility Lights**	**HED**
1	Rolling stock must have a minimum of two white visibility lights fitted at any end which can be the leading end of a train in normal operation (excluding setting back and propelling).	QRR
2	Each visibility light must produce a peak intensity of at least 20,000 candela.	QRR
3	Visibility lights must be:	QRR
3(a)	• at least 600mm above the top of the rail	QRR
3(b)	• laterally separated by at least 900mm if they are mounted 1500mm or more below the headlights	QRR
3(c)	• laterally separated by at least 1500mm if they are mounted less than 1500mm below the headlights	QRR
4	Visibility lights must be aimed at a point that is at least 25m in front of the vehicle at top of track.	QRR

Clause	Requirements	Type
5	Visibility lights must then be aimed / turned cross-eyed to between a minimum of 7.5 degrees and a maximum of 15 degrees to the longitudinal centreline of the vehicle.	QRR
2.3.4	**Tail Lights, Marker Lights, and Headlight Operation**	**HED**
1	Locomotives, self-propelled passenger vehicles (including trailer units of a permanently coupled self-propelled consist), and other self-propelled rolling stock must have red tail and white marker lights fitted as high and wide as practical at both sides of each end which can be the end of a train.	QRR
2	Rail traffic direction-of-travel and completeness must be shown by:	QRR
2(a)	headlights or white marker lights at the leading end of rail traffic, and	QRR
2(b)	• At least one functioning red tail light; placed at the rear of the last vehicle in the consist; or • One approved end-of-train marker, placed at the rear of the last vehicle in the consist. • no red tails lights or End-of-Train Markers shall be placed in any other location within the consist	QRR
3	Marker lights and tail lights must be:	QRR
3(a)	• (where fitted) lit during travel, and	QRR
3(b)	• if defective, repaired or replaced as soon as possible.	QRR
4	End of train markers	QRR
4(a)	• may travel without being lit during hours of good visibility	QRR
4(b)	• must be lit during hours of poor visibility • may be portable and a flashing type, with a flashing rate of between 40 flashes per minute and 180 flashes per minute.	QRR
2.3.5	**Livery and Signage**	**HED**
1	Rolling stock must have livery applied that enhances the visibility of the vehicle.	QRR
2	Any end of rolling stock which can be the leading end of rail traffic in normal operation must have a forward facing area of high visibility colour not less than 1m² in area with a minimum continuous height or width of 0.6m.	QRR
3	The high visibility colour may be yellow or orange or white.	QRR
4	The forward facing area of high visibility colour may be divided by the features of the front of the rolling stock if necessary.	QRR
5	Each section of a divided high visibility colour surface must have an uninterrupted area of 0.4m² with a minimum continuous height or width of 0.6m.	QRR
6	If the front of the rolling stock slopes from vertical or is rounded, the area of the high visibility colour surface and its vertical and/or horizontal dimensions must be increased in order to produce the equivalent required areas and dimensions when projected onto a vertical plane.	QRR
7	As the application of large areas of high visibility colour may generally not be in keeping with the nature of heritage rolling stock, the rolling stock operator may propose alternative control mechanisms that will:	QRR
7(a)	• enhance the visibility, or	QRR
7(b)	• demonstrate, through the risk management process, that the visibility hazard is acceptably controlled	QRR



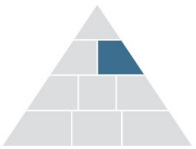
Clause	Requirements	Type
8	Reflective delineator decal(s) must be fitted to each side of all rolling stock.	QRR
9	Each reflective delineator must have a minimum height of 75mm and a minimum width of 350mm.	QRR
10	Reflective delineators should be mounted between 800mm and 2000mm above rail.	QRR
11	At least 2 delineators per side must be fitted, with one mounted near each end of the vehicle.	QRR
12	Additional delineators should be fitted every 2.5 to 5m between the end mounted delineators.	QRR
13	Class 1A reflective material compliant with AS/NZS 1906.1 must be used.	QRR
14	The colour of the delineators must be white or yellow.	QRR
2.3.6	**Horns**	**HED**
1	Rolling stock which can be the leading end of rail traffic in normal operation must have a warning horn fitted which is capable of providing a minimum sound pressure level of 96dBA measured (with the vehicle stationary) 30m in front of the vehicle, 1.5m above track centreline on level, straight track in open surroundings.	QRR
2.3.7	**On-Track Machines Additional Requirements**	**HED**
1	Exterior lighting must be unobstructed from view.	QRR
2	Where travel lights of the towing vehicle are obscured by the trailer or load then these must be duplicated on the rear of the trailer.	QRR
3	To protect personnel who may work on the ground in the vicinity, all on-track machines must be fitted with a warning beeper that sounds when a change of direction is made in work mode.	QRR
4	Amber flashing beacon(s) should be fitted to the vehicle.	QRR
5	The beacons, if fitted, must flash at between 40 flashes per minute and 180 flashes per minute.	QRR
6	On-track machines that travel at speeds not exceeding 60km/h and are less than 20 tonne gross mass must comply with the above requirements except as follows:	QRR
6(a)	• May have a single headlight of at least 100,000 candela, providing the visibility light(s) is also at least 100,000 candela	QRR
6(b)	• Headlights with a high beam intensity of 100,000 candela or above, must also be able to be dimmed to give a maximum luminous intensity of 75,000 candela	
6(c)	• In the case of a single headlight and single visibility light, must have the lights mounted as close as practical to the vertical centreline of the machine with the headlight as high as possible and at least 1500mm above the visibility light	QRR
6(d)	• Lighting is not required for on-track machine trailer vehicles, that are less than 20 tonnes gross mass and can be towed at speeds not exceeding 60km/h, unless they are required for work purposes	QRR
6(e)	• Must have a horn that provides at least 82dBA at 30m	QRR
2.3.8	**RRV Additional Requirements**	**HED**
1	Marker lights and visibility lights must, as far as reasonably practicable, meet the standard lighting requirements in section 2.3 and comply with the Australian Design Rules for road vehicles.	QRR

Clause	Requirements	Type
2	RRVs may be predominantly white.	GUI
2.4	**Cab Layout**	**HED**
2.4.1	**Driving Positions**	**HED**
1	Driving positions in all driving cabs must be provided such that the driving crew are able to safely control the rail traffic.	QRR
2	Where a second worker is also required to be in the cab, a position with associated controls and vision necessary to meet their requirements when seated must also be provided.	QRR
2.4.2	**Sighting Requirements**	**HED**
1	The cab layout must maximise the unobstructed lines of sight for the driving crew.	QRR
2	The forward facing view from the driver's position must allow the sighting of a 4m high signal located:	QRR
2(a)	• 3m laterally to either side of a straight track centreline, and	QRR
2(b)	• 5m ahead of the vehicle	QRR
3	The forward facing view from the driver's position must also allow the sighting of the head of a person standing 5m ahead of the vehicle on track centreline.	QRR
4	The driver must be able to determine that the track in front of the vehicle is clear before moving the vehicle.	QRR
2.4.3	**On-Track Machine Additional Requirements**	**HED**
1	The operator must have a clear and unhindered view of the work area and the functions under his control.	QRR
2.4.4	**Heritage Rolling Stock Additional Requirements**	**HED**
1	If heritage rolling stock does not comply, the rolling stock operator must take all reasonable steps to demonstrate compliance with the intent of this standard including using alternative controls or must make modifications to comply.	QRR
2.5	**Structural Requirements**	**HED**
2.5.1	**Structural Rating**	**HED**
1	The structure and attachments on all rolling stock must:	QRR
1(a)	• withstand normal train forces without yielding, fracture, or buckling	QRR
1(b)	• withstand cyclic loading without fatigue failure during the design life	QRR
1(c)	• minimise risk of injury during collision and derailment	QRR
2.5.2	**Derailment Performance**	**HED**
1	To minimise risk of injury during derailments and to aid recovery, rolling stock must as far as practical have features to assist it remain coupled, upright and resist jack-knifing.	QRR



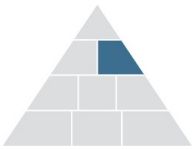
Clause	Requirements	Type
2.5.3	**Collision Protection**	**HED**
1	Ends of rolling stock which may be the leading end of rail traffic in normal operation must have features to reduce the effect of a collision. This may include an anti-climb device.	QRR
2.5.4	**Train Obstacle Deflector**	**HED**
1	A train obstacle deflector (cowcatcher) must be fitted to the leading ends of self-propelled passenger rolling stock, locomotives and on-track machines that travel at speeds exceeding 60km/h.	QRR
2	It must be designed to deflect objects clear of the track and prevent them from going under the train and causing damage and/or derailment.	QRR
3	To cater for wheel wear and suspension sag, train obstacle deflectors (cowcatchers) must be adjusted to be in the range 105mm to 120 mm when in service.	QRR
4	On-track machines less than 20 tonne gross mass and that travel at speeds not exceeding 60km/h must also have such a device unless a risk assessment has been completed that establishes that such a device is not required.	QRR
2.5.5	**Underframe Equipment**	**HED**
1	Underframe mounted equipment must be either robustly constructed or suitably protected to minimise damage from derailments, objects on the track and side impacts.	QRR
2	Support of underframe mounted equipment must be designed and maintained to prevent the equipment from falling onto the track.	QRR
2.5.6	**Fuel Tanks**	**HED**
1	Fuel tanks mounted beneath the underframe must be designed to have structural and puncture resistance properties to minimise the risk of fuel spillage as a result of derailments and collisions with objects on the track.	QRR
2	The filler and vent assembly must be designed to limit fuel spillage in the event of the vehicle rolling over.	QRR
2.5.7	**Floor Height**	**HED**
1	Rolling stock which will use Queensland Rail platforms for entry or exit must be compatible with the platforms to be used or use alterative safe methods.	QRR
2	Platform dimensions are available from Queensland Rail Operator Interface Section.	GUI
2.5.8	**Heritage Rolling Stock Additional Requirements**	**HED**
1	If heritage rolling stock does not comply, the rolling stock operator must take all reasonable steps to demonstrate compliance with the principles and intent of this standard including using alternative controls or must make modifications to comply.	QRR
2.6	**Pantograph Requirements**	**HED**
2.6.1	**General**	**HED**
1	The pantograph must be compatible with the contact wire system and be capable of withstanding the effects of transient and short circuit currents specified in module 1 section 1.2.	QRR

Clause	Requirements	Type
2	[VW 5-7-2021]: All pantographs must conform to the requirements of IEC 60494-1 Edition 2.0 2013-09 Railway Applications - Rolling Stock - Pantographs - Characteristics and Tests - Part 1 Pantographs for Mainline Vehicles.	QRR
3	The pantograph design must provide sparkless operation for the range of speeds from 0km/h to the maximum speed for which the rolling stock is designed to operate in both forward and reverse direction, under normal operating conditions.	QRR
4	The pantograph design must optimise the wear in the contact wire and the current collector of the pantograph.	QRR
5	The pantograph design must minimise the damage to the overhead wiring system and the pantograph in the event of an incident.	QRR
6	It is assumed the insulators are included as a part of the pantograph.	GUI
2.6.2	**Characteristics**	**HED**
1	[VW 5-7-2021]: The pantograph tuned nominal static contact force must 85N, with allowed variation in accordance to Appendix A of IEC 60494-1 Edition 2.0 2013-09 over the range of minimum to maximum static wire heights specified in module 1.	QRR
2	[VW 5-7-2021]: The pantograph must maintain the above static contact force over the working range on the overhead contact wire system including allowing for uplift and dynamic effects of the vehicle.	QRR
3	In the folded position the pantograph must comply with the rolling stock outline appropriate to the Queensland Rail track it will be operating on.	QRR
2.6.3	**Multiple Pantographs on Rail Traffic or Vehicle**	**HED**
1	The distance between pantographs on rail traffic must not be less than 20m.	QRR
2	[VW 5-7-2021]: For the pantograph static contact force specified in clause 2.6.2, item 1, and one pantograph operated on each locomotive or multiple unit; up to three locomotives or multiple units may be coupled together subject to meeting the minimum distance between pantographs.	QRR
2.7	**Drawgear**	**HED**
2.7.1	**General**	**HED**
1	All rolling stock that requires to be coupled and uncoupled from other rolling stock during normal operation must have a drawgear system fitted to each end that is suitable for the loads and application and is compatible with other rolling stock it couples to.	QRR
2	Either:	QRR
2(a)	• coupler heights must be within the range 710mm to 860mm under all service conditions; or	QRR
2(b)	• the rolling stock must only be assembled in rail traffic such that there is method for another locomotive to couple to the rail traffic from either end if the rail traffic has failed on a section	QRR
2.7.2	**Geometric Performance**	**HED**
1	Any coupling system used must engage positively with the coupling system of any rolling stock to which it is intended to operate and couple with, on all track features.	QRR
2	Couplers must not uncouple under anticipated service conditions unless the uncoupling mechanism is manually actuated.	QRR



Clause	Requirements	Type
3	It must be possible to determine visually on automatic couplers whether the mechanisms are locked on the mating couplers or not.	QRR
2.7.3	**Crashworthiness Performance**	**HED**
1	For all rolling stock, during a collision or derailment, the coupling system and its attachment to the rolling stock structure, must be designed to provide restraint that will resist:	QRR
1(a)	• adjacent coupled rolling stock moving significantly out of line	QRR
1(b)	• the uncoupling and over-riding of adjacent coupled rolling stock	QRR
1(c)	• overturning	QRR
2.7.4	**Recovery of Failed Trains**	**HED**
1	All rolling stock ends that may be required to be coupled to, for the recovery of failed rolling stock, must have a coupling system that enables safe recovery to be undertaken.	QRR
2	For automatic couplers, it must be possible to arrange manual uncoupling of two items of rolling stock if the systems normally required for this operation are unavailable.	QRR
2.7.5	**On-Track Machine Additional Requirements**	**HED**
1	On-track machines designed to tow or be towed by another on-track machine must be fitted with drawgear complying with section 2.7.1 to 2.7.3, except as follows:	QRR
1(a)	• couplers must be mounted at a suitable height for towing and recovery	QRR
1(b)	• all tow hitches and couplings, including backup coupling devices, must have a positive locking mechanism together with means of automatically retaining this mechanism in the locked position	QRR
1(c)	• a backup coupling device must be provided between on-track machines designed to tow or be towed that do not have a brake that automatically applies if they part during travel.	QRR
2.8	**Axles Bearings**	**HED**
2.8.1	**Hot Bearing Detection (HBD)**	**HED**
1	Unless hot bearing detection equipment is fitted to the rolling stock, the bearings must be outside the wheels.	QRR
2	When operating on routes with wayside infra-red HBD, axle boxes, full bore adaptors and any adjacent equipment must not obscure the line of sight between the HBD equipment and the HBD target area on the axle box as defined for inboard scan as detailed in AREMA C&S Manual Part 5.1.30.	QRR
3	For rolling stock that does not have hot bearing detection, the operator must have in place procedures for in-service bearing condition assessment, to qualify bearing status in the event a HBD raises an exceedance alarm.	QRR
2.9	**Rolling Stock Fire Performance**	**HED**
2.9.1	**Rolling Stock Requirements**	**HED**
1	Rolling stock must be designed, constructed, maintained, modified and operated with the following safety goals:	QRR
1(a)	• prevent fire occurring in the first place	QRR

Clause	Requirements	Type
1(b)	• if a fire does happen then suppress, retard and contain its growth	QRR
1(c)	• protect staff and passengers from the effects of fire	QRR
1(d)	• assist staff and emergency service operations	QRR
1(e)	• minimise impacts to Queensland Rail network assets, other operators, and service operations	
2	For new rolling stock, a risk analysis must be performed early in the design phase to identify all potential fire hazards and their consequences.	QRR
3	New rolling stock must be designed to control spark emissions under all expected operational load and speed conditions.	QRR
4	All existing rolling stock must be monitored on an on-going basis and maintained to a condition that minimises spark emissions under all operational load and speed conditions.	QRR
5	Where spark emissions are occurring:	QRR
5(a)	• systems must be developed and implemented to effectively manage these occurrences in both the short and the long term, and	QRR
5(b)	• appropriate modifications must be made to minimise the incidence of spark emission.	QRR
6	For existing rolling stock that is proposed to be operated under changed or new conditions that have an increased fire risk (e.g. operation through long tunnels), a risk assessment must be performed to assess the associated risks.	
2.10	**Structural Requirements for Railway Bogies**	**HED**
2.10.1	**Interfaces**	**HED**
1	To allow for lifting of the vehicle without detachment in the event of a collision or derailment:	QRR
1(a)	• the wheelsets must be suitably restrained within the bogie	QRR
1(b)	• the bogie must be suitably attached to the structure of the vehicle body	QRR
1(c)	• on rolling stock that does not feature bogies, the wheel or wheelset must be suitably restrained to remain attached to the vehicle during travel, work and derailments	QRR
2	The geometry of the bogie and associated components and their interaction with the vehicle structure needs to be considered to allow for the full dynamic envelopes to be encountered in service.	QRR
2.10.2	**Heritage Rolling Stock**	**HED**
1	If a heritage vehicle does not comply, the rolling stock operator must take all reasonable steps to demonstrate compliance with the principles and intent of this standard including using alternative controls or must make modifications to comply.	QRR
2.11	**Wheel Defect Identification and Rectification**	**HED**
2.11.1	**General Requirements**	**HED**
1	Rolling Stock Operators must have processes to identify and rectify wheel defects which may cause derailment or track damage. This includes the specific requirements in this section (2.11).	QRR

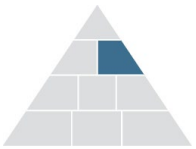


Clause	Requirements	Type
2	Some defects are not specified in this section but rolling stock operators must maintain their vehicles in a satisfactory condition with respect to other defects.	QRR
3	Rolling stock operators must issue specific instructions on dealing with vehicles found to have wheelset defects while enroute that will not give any additional safety or infrastructure risk.	QRR
4	In this section "remove from service" means remove the vehicle from the main line to the nearest yard or siding until the damaged wheelset is replaced by a serviceable wheelset	SUP
5	In this section "work out of service" means to arrange for a defective vehicle to be withdrawn from revenue service for repair upon reaching its current allocated destination, or on-route if reasonable to do so.	SUP
6	Wheel Impact Load Detectors (WILDs) are strategically located on Queensland Rail's Network to raise alarms for those wheels/wheelset defects that have the potential to do damage to the infrastructure.	SUP
2.11.2	**Wheel Flats (Skids)**	**HED**
1	Wheels found to have flats must be actioned to at least that specified in Table 25 Appendix 2.1).	QRR
2.11.3	**Shelled Tread**	**HED**
1	Wheels found to have shelled tread must be actioned to at least that specified in Table 27 (Appendix 2.1).	QRR
2.11.4	**Built Up Tread**	**HED**
1	Wheels found to have built up tread must be actioned to at least that specified in Table 26 (Appendix 2.1).	QRR
2.11.5	**Flange Defects**	**HED**
1	Wheels with the following irregularities must be removed from service:	QRR
1(a)	• wear grooves, gouges or deformation on the top portion of the flange or back face	QRR
1(b)	• undercut, coarse marks or a step-like surface caused by wheel machining	QRR
1(c)	• abrupt changes in flange profile	QRR
1(d)	• wide flat faces on the flange top	QRR
1(e)	• sharp or square flange top	QRR
2.11.6	**Wheel Cracks**	**HED**
1	Wheels with any crack running through the rim, web, or hub must be removed from service. When found en-route it must be examined by the rolling stock Operator and if the rolling stock Operator considers it safe to do so may be moved to the nearest siding then removed from the QR Network.	QRR
2.11.7	**Limiting Tread and Flange Dimensions**	**HED**
1	Wheels must not exceed the limiting dimensions in Figure 27 (Appendix 2.1).	QRR

Clause	Requirements	Type
2.12	**Hygiene Requirements**	**HED**
2.12.1	**Waste**	**HED**
1	If water refilling is carried out from a Queensland Rail supply, the refilling arrangements must be designed, maintained, and operated in a way which does not contaminate the supply.	QRR
2	Any waste material generated onboard rolling stock which is likely to be a health hazard (e.g. sanitary waste) must be adequately stored until it can be safely disposed.	QRR
3	Hazardous waste storage and disposal arrangements must be designed, maintained and operated such that the risk of spillage or bodily contact is avoided.	QRR
4	Waste decanting fittings must be compatible with the trackside decanting equipment	QRR
5	Appropriate signage to AS 1319 must be placed on any hazardous waste outlet.	QRR
2.13	**Dynamic Performance**	**HED**
2.13.1	**General**	**HED**
1	New rolling stock, modified rolling stock, and existing rolling stock which is not currently operating on Queensland Rail tracks must be evaluated to determine that the dynamic performance requirements will be met for that rolling stock class.	QRR
2	While existing vehicles which are currently operating on Queensland Rail tracks need not be evaluated this must be done for additional vehicles to be added to that class.	QRR
3	The evaluation for a class may be used for all vehicles in that class or a similar class providing the variation within the class or classes will have no appreciable detrimental effect on meeting dynamic performance requirements.	QRR
4	Unless specified otherwise in this section, evaluation may be by on track testing, static tests, computer simulation, or calculation as necessary to determine that the requirements will be met.	QRR
5	Evaluation by calculation or computer simulation must have sufficient static or dynamic tests to validate the methods used.	QRR
6	Rolling stock must be evaluated for:	QRR
6(a)	• hunting as per section 2.13.2	QRR
6(b)	• horizontal and vertical curve negotiation as per section 2.13.4	QRR
6(c)	• transition curve negotiation as per section 2.13.5	QRR
6(d)	• rollover as per section 2.13.8	QRR
6(e)	• negotiation of isolated track irregularities as per section 2.13.9	QRR
6(f)	• negotiation of cyclic track irregularities as per section 2.13.10	QRR
6(g)	• longitudinal forces in curves as per section 2.13.11	QRR
2.13.2	**Hunting (Lateral Instability)**	**HED**
1	Rolling stock must meet the requirements of AS 7509 Section 3 with respect to hunting with the following qualifications:	QRR

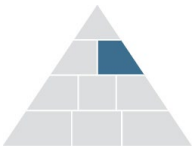
Clause	Requirements	Type
1(a)	• track condition for testing will be advised by Queensland Rail Operator Interface Section	QRR
1(b)	• dry rail	QRR
1(c)	• AS 7508 worn wheel test profile to be used when effective concentricity is controlled to a tighter limit than specified in these interface standards	QRR
1(d)	• wheels with the applied profile worn to the highest concentricity that is likely to be experienced may be used	QRR
2	Rolling stock which is less than 20 gross tonnes and does not exceed 40km/h is exempt from the requirements in this section (2.13.2).	QRR
2.13.3	**Base Ride Accelerations**	**HED**
1	Rolling stock should be evaluated for whether the vehicle will ride satisfactorily over track at the lower end of the quality likely to be encountered in service.	GUI
2	Rolling stock should meet the requirements of AS 7509 Section 4 with respect to base ride accelerations.	QRR
3	Issues regarding track quality should be addressed in the Interface Risk Management Plan.	GUI
2.13.4	**Horizontal and Vertical Curve Negotiation**	**HED**
1	Rolling stock assembled in its intended train configuration must be able to negotiate horizontal and vertical curves according to AS 7509 Section 5 for the curves on its intended route.	QRR
2	Queensland Rail Operator Interface Section is able to advise details of curves on the route.	GUI
2.13.5	**Transition Curve Negotiation**	**HED**
1	Ability of the rolling stock to safely exit a curve transition must be assessed by either:	QRR
1(a)	• static twist test and bogie rotational resistance assessment in accordance with sections 2.13.6, or	QRR
1(b)	• assessment of wheel L/V and axle L/V ratios as per section 2.13.7	QRR
2.13.6	**Twist Test and Bogie Rotational Resistance**	**HED**
1	If transition curve negotiation is assessed by static testing it must meet the requirements of this section.	QRR
1(a)	The RISSB has produced a Static Twist Test Guideline that would be helpful while undertaking physical testing.	SUP
2	The static Twist Test and bogie rotational resistance assessment must be carried out in accordance with Section 6.3 and 6.4 respectively of AS 7509 with the following qualifications:	QRR
2(a)	• limiting track twist in accordance with Figures 1 and 2 (Appendix 2.1)	QRR
2(b)	• friction in suspension to be relieved prior to each test	QRR
2(c)	• the test must be repeated by jacking the same wheelsets but on the other side of the car to check that there is no significant twist in the car body or bogies	QRR
2(d)	• if an active vertical suspension is used (e.g. air bag secondary springs), the tests must be repeated without power to this suspension	QRR

Clause	Requirements	Type
2(e)	• all dampers, bump stops and lifting devices must be in position and correctly adjusted during the tests	QRR
3	Articulated rolling stock, rolling stock with more than 2 bogies, rigidly coupled rolling stock and rolling stock with varying wheel diameters must be tested as follows:	QRR
3(a)	• the leading wheel-set of each bogie or group wheels of equal loading is placed at point A in Figure 1 (Appendix 2.1).	QRR
3(b)	• the direction of travel must be taken as down the ramp	QRR
3(c)	• non-symmetrical rolling stock, capable of travelling in both directions must be tested in both directions	QRR
3(d)	• the trailing bogie need not be tested	QRR
4	Transition curve negotiation under these tests must meet the following:	QRR
4(a)	• the calculated bogie X-factor must be less than the relevant limit specified within AS7509, and	QRR
4(b)	• the wheel unloading in a static twist test must be less than 60%.	QRR
5	The bogie X-factor must be calculated as X = T/ (WxA) where:	QRR
5(a)	• T = Torque required to rotate bogie relative to body to the angle required to • negotiate the minimum radius curve	QRR
5(b)	• W = Average axle load of bogie	QRR
5(c)	• A = Bogie wheelbase	QRR
6	Steam locomotives are required to pass the wheel unloading static twist test portion of this section. However, the calculated X-factor of this section is not applicable to steam locomotives.	QRR
2.13.7	**L/V Assessment**	**HED**
1	An alternative method for assessment of vehicle safety against derailment whilst negotiating curve exit transitions, for vehicles that do not comply with the twist test or bogie rotational resistance requirements, is by assessment of the individual wheel L/V ratio and sum L/V axle.	QRR
2	The L/V Assessment must be carried out in accordance with Section 6.5 of AS 7509	QRR
3	The acceptance criteria are given in Section 6.5.3 of AS7509.	
2.13.8	**Rollover**	**HED**
1	During curve negotiation, at the maximum cant deficiency, the minimum wheel load on the low rail must not fall below:	QRR
1(a)	• 40% of the static wheel load on average, or	QRR
1(b)	• 20% instantaneously during transient reactions to track irregularities	QRR
2	For rolling stock that will operate at no greater than 55mm cant deficiency, calculations may be used to verify this requirement.	QRR
2.13.9	**Negotiation of Isolated Track Irregularities**	**HED**
1	Rolling stock must be capable of negotiating isolated track irregularities of the limits given in Figure 6 (Appendix 2.1) for greater than 50 milliseconds:	QRR
1(a)	• maximum wheel unloading 90%, and	QRR



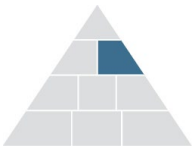
Clause	Requirements	Type
1(b)	• maximum sum L/V axle 1.5	QRR
2	The maximum speed for testing must be, the lesser of, either:	QRR
2(a)	• 110% of the rolling stock design speed, or	QRR
2(b)	• 110% of the track speed limit applicable to irregularities of that magnitude	QRR
3	Alternatively, if an instrumented wheel-set is not available then the wheel unloading limit above is only applicable when the lateral acceleration of the car body in the same time period is less than 0.3g.	QRR
4	When the lateral acceleration exceeds 0.3g, the wheel unloading must not exceed 60% for greater than 50 milliseconds.	QRR
2.13.10	**Negotiation of Cyclic Track Irregularities**	**HED**
1	Damping of the suspension must be sufficient so that the wheel unloading values specified in section 2.13.9 "Negotiation of Isolated Track Irregularities" are not exceeded for the following track conditions:	QRR
1(a)	• cyclic top irregularities spaced at the bogie centre distance on each rail. The series of irregularities on one rail are to be half the bogie centre distance out of phase with the other rail.	QRR
1(b)	• the irregularities must be of a magnitude as specified in Figure 6 (Appendix 2.1) when loaded. All the irregularities must be of the same sign (all dips or humps)	QRR
1(c)	• any speed up to and including 80km/h or the maximum speed of the rolling stock whichever is the lower.	QRR
2	Damping of the suspension, only to rolling stock capable of 80km/h or more, must be sufficient so that the wheel unloading values specified in section 2.13.9 "Negotiation of Isolated Track Irregularities" are not exceeded for the following track conditions:	QRR
2(a)	• approximately sinusoidal varying cant imbalance of 160mm peak to peak with a wavelength of 50m for one cycle	QRR
2(b)	• any speed from 80km/h to 110% of the rolling stock maximum design speed	QRR
2.13.11	**Longitudinal Forces in Curves**	**HED**
1	Rolling stock when assembled in its train configurations must meet the requirements of AS 7509 Section 10 for its route.	QRR
2.13.12	**Forces Exerted on the Track**	**HED**
1	The wheel to rail forces exerted by rolling stock, at any time during normal operations, must be less than the following limits:	QRR
1(a)	• the maximum lateral wheel/rail force (L) must not exceed 50kN. This force limit must apply to the maximum lateral force exerted on either rail by any wheel and is the maximum sustained force acting over the time interval taken for the rolling stock to travel 2m	QRR
1(b)	• the maximum lateral track shifting force (S) on concrete sleepers must not exceed 0.85x(10 + P/3) kN, where P is the static axle load in kN. This force limit must apply to the resultant lateral force exerted on both rails by any axle of the rolling stock. It must be defined as the maximum sustained force acting over the time interval taken for the rolling stock to travel 2m.	QRR
2	The Dynamic P2 force must be calculated using the formula in Figure 3 (Appendix 2.1).	QRR

Clause	Requirements	Type
3	The P2 force is to be calculated at its nominal maximum speed and nominal gross mass of the vehicle.	QRR
4	The values of Kt, Mt and Ct are shown in Figure 4 (Appendix 2.1).	QRR
5	The values for total joint angle and limiting P2 force are listed in Figure 5 (Appendix 2.1).	QRR
6	When the effective unsprung mass of the rolling stock can be calculated readily and the P2 force calculated is less than 180kN, physical confirmation measurements are not mandatory.	QRR
7	Rolling stock which has axle loads under 5 tonne and does not exceed 60km/h need not be measured for P2 force criteria.	QRR
8	For steam locomotives, and other vehicles having a connecting rod directly coupled to a crankpin on a wheelset:	QRR
8(a)	• the dynamic force exerted on the track in the vertical direction (hammer blow) by any wheels due to residual imbalance must not be greater than the limit calculated by the following formula, unless otherwise approved by Queensland Rail Operator Interface Section	
8(b)	• permissible imbalance force per wheel (N) = 1.4 x (speed in km/h)² but not more than 14kN	QRR
9	Refer to AS 7508 Appendix B for guidance on how to calculate the effective unsprung mass of the wheel(set).	GUI
2.13.13	**Base Ride Accelerations**	**HED**
1	Rolling stock susceptible to overturning in high winds should undergo wind loading assessment.	GUI
2	When or where the wind speeds predicted for vehicle overturning are likely to occur then operational controls (eg reduced overspeed, or cease operation) may be necessary.	GUI
3	Rolling stock operators must develop and comply with controls for preventing susceptible rolling stock overturning in high wind speeds.	QRR
2.13.14	**Horizontal and Vertical Curve Negotiation**	**HED**
1	The road /rail equipment must be attached to the RRV such that it will be guided evenly and parallel to the rail.	QRR
2	RRVs that share load between road drive wheels and rail guidance wheels must meet all static twist criteria with the guidance wheel maintaining at least 30% of the total load and the road wheel up to 70% of the total load.	QRR
2.14	**Emergency Requirements**	**HED**
2.14.1	**General**	**HED**
1	Rail traffic consists must have onboard appropriate emergency equipment to:	QRR
1(a)	• protect the rail traffic when it is stopped on track by accident, failure, obstruction or otherwise.	QRR
1(b)	• assist with recovery (eg emergency couplers)	QRR
2.14.2	**On-Track Machines Additional Requirements**	**HED**
1	On-track machines must have a safe procedure for recovery.	QRR



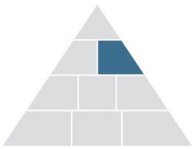
Clause	Requirements	Type
2	If an on-track machine cannot be removed manually from the track, then it must have a means of safely connecting to another on-track machine for recovery.	QRR
3	If an on-track machine cannot be removed manually from the track, then it must be possible to pack it up into a safe travel mode from any configuration.	QRR
4	All equipment necessary to provide this must be supplied with the on-track machine.	QRR
2.14.3	**RRV Additional Requirements**	**HED**
1	RRVs must have a backup system to enable the rail wheel assemblies to be raised or lowered in event of failure of the powered system.	QRR
2.15	**Wheelsets**	**HED**
2.15.1	**Design, Material and Manufacture**	**HED**
1	The minimum permissible wheel width for axle loads:	QRR
1(a)	• less than 20t is 127mm (nominal)	QRR
1(b)	• equal or greater than 20t is 140mm (nominal)	QRR
2	The minimum permissible wheel diameters for nominal axle loads:	QRR
2(a)	• ≤ 28t is 835mm, with a nominal diameter of 915mm	QRR
2(b)	• ≤ 20t is 680mm, with a nominal diameter of 760mm	QRR
2(c)	• ≤ 16t is 680mm, with a nominal diameter of 760mm	QRR
2.15.2	**Tread and Flange Profile**	**HED**
1	All new rolling stock must have the LW3 wheel profile and the shape of the profile's tread and flange must be in accordance with Figure 7 (Appendix 2.1) and the coordinates shown in Figure 8 (Appendix 2.1).	QRR
2	Existing rolling stock should be converted to the LW3 profile. However subject to the approval of the rolling stock operator and Queensland Rail Operator Interface Section, existing rolling stock may retain the use of the LW2 profile, as shown in Figures 9 and 10 (Appendix 2.1).	QRR
3	The machining tolerances for the profile on new wheels must be in accordance with Figures 11 to 13 (Appendix 2.1).	QRR
4	Machining tolerances for the re-profiled wheel must be in accordance with Figures 11 to 13 (Appendix 2.1), except that witness marks are allowed under the following conditions:	QRR
4(a)	• depth of witness mark must not be greater than 0.8mm	QRR
4(b)	• witness mark is permitted only at a vertical height of 10mm or greater from the tread (referenced to taping line); and	QRR
4(c)	• the profile of the witness mark must be smooth and blend evenly into the profile	QRR
2.15.3	**Track Circuit Detection**	**HED**
1	Electrical resistance of the wheelset must enable the vehicle to meet section 2.20 "Signalling of Trains".	QRR
2	Maximum separation of two adjacent axles on a vehicle unit must be 15m to prevent a vehicle straddling track circuits.	QRR

Clause	Requirements	Type
3	Minimum separation between two outermost axles on a vehicle must be 5m to prevent a vehicle falling in between track circuits.	QRR
4	Maximum distance between the coupling (or extremity) of a vehicle unit and the closest axle must be 3.5m.	QRR
5	On-track machine wheelsets that are insulated from track circuits must give an impedance of at least 20,000Ω at a potential difference between rails of 5v.	QRR
6	For on-track machines to operate track circuits and axle counters when travelling, every insulated wheel must be bypassed to the insulation bypass standard.	QRR
2.15.4	**On-Track Machine Additional Requirements**	**HED**
1	On-track machines that travel at speeds not exceeding 60km/h and are less than 20 tonne gross mass must comply with the requirements in Sections 2.15.1 to 2.15.3 except as modified in this section.	QRR
2	Wheels must have a P/D ratio < 0.11kN/mm, where P=wheel load and D=wheel diameter	QRR
3	On-track machines, that do not exceed 1 tonne per wheel and 25km/h, must have the angle of the wheel flange to the horizontal to be at least 60 degrees	QRR
2.15.5	**RRV Additional Requirements**	**HED**
1	If the RRV design does not feature suspension, the components on the entire vehicle must be considered as axle mounted and any reduction of the inertia forces must be proven by design calculation or testing.	QRR
2	RRV rail wheels must have a flange back spacing, tread width, and flange height and flange base width to conform with this section (2.15 "Wheelsets").	QRR
3	Road wheels must be designed to remain attached to the axles during single vehicle derailments, unless derail catch bars are fitted.	QRR
4	Rail wheelsets and bogies must be suitably restrained and attached to the structure of the bogie / vehicle body to allow for road travel.	QRR
5	Rail wheels must remain operational and attached to the axle during any on-rail forces, prior to and during derailment.	QRR
6	The tread surface of road wheels used to provide traction must completely cover the railhead at all times	QRR
7	If the road wheels exceed the allowable clearance outline, the operator must demonstrate how the vehicle can be operated safely using alternative controls or must make modifications to comply.	QRR
2.15.6	**Heritage Rolling Stock Additional Requirements**	**HED**
1	If a heritage vehicle does not comply, the rolling stock operator must take all reasonable steps to demonstrate compliance with the principles and intent of this standard including using alternative controls or must make modifications to comply.	QRR
2.16	**Brake System Requirements**	**HED**
2.16.1	**General**	**HED**
1	The brake system used must have proven safe and reliable operation on Queensland Rail or another major railway.	QRR



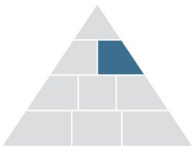
Clause	Requirements	Type
2	All rolling stock which can be readily coupled to or uncoupled from other rolling stock or operates alone must have an operating automatic train brake and parking brake which can be easily and separately isolated and released.	QRR
3	Rolling stock which cannot be readily coupled to or uncoupled from other rolling stock must have an operating automatic train brake on all vehicles and have a parking brake at least on the rolling stock at each end of a drawbar consist.	QRR
4	The automatic train brake system must be controlled and continuous at any time on rail traffic to provide a system of failsafe emergency braking.	QRR
2.16.2	**Train Braking Performance**	**HED**
1	The train braking performance must be equal or better than the stopping distances listed in Tables 1 to 3 in Appendix 2.2 for each listed track speed up to the maximum track speed relevant to the train and for the applicable braking curve on the route.	QRR
2	Queensland Rail Operator Interface Section can advise which braking curve (A, F, P etc.) applies on the route to be taken by the rail traffic.	GUI
3	The stopping distances are to be achieved with a full service brake application and the longest full service train brake delay for the rail traffic configuration.	QRR
4	The braking performance defined relies on the normal levels of adhesion associated with a clean dry rail being available. In conditions of low wheel/rail adhesion other measures to achieve the required stopping distance must be applied.	QRR
2.16.3	**Vehicle Braking Performance**	**HED**
1	The maximum deceleration rate of a single vehicle under normal conditions and full service braking is not to exceed 1.4 m/s^2 to reduce the risk of wheel slide.	QRR
2	Any wheelset on any vehicle in any loaded condition and with a deceleration rate greater than 1.0m/s^2 (under normal conditions) must have a wheel slide protection (WSP) system fitted to avoid skidding wheels under low adhesion conditions.	QRR
3	The deceleration rate of vehicles of any mass and from any speed up to a maximum +10km/h, when fitted with new brake actuating equipment and new friction braking surfaces, must be at least 3% higher than required by this standard.	QRR
4	The braking performance of a single vehicle must be sufficient for it to safely operate as part of the authorised consist and route. This includes safe stopping in case of unintended division of the train and recovery from reasonable contingencies. Where the vehicle has special marshalling or operating rules to achieve this they must be specified and advised to Queensland Rail Operator Interface Section.	QRR
2.16.4	**Brake System Energy**	**HED**
1	On all new and modified self-propelled passenger rolling stock, the control system must prevent the release of the brakes if the system is in such a condition that there would be insufficient energy to make a subsequent emergency brake application.	QRR
2.16.5	**Brake Control System**	**HED**
1	A means must be provided by which any type of brake application can be released manually if there is a failure of the normal method of release.	QRR
2	The brake control system must be designed so that an automatic train brake application results in bringing the train to a stand, if:	QRR
2(a)	• there is a failure of the medium providing the method of control for the emergency brake system	QRR

Clause	Requirements	Type
2(b)	• there is an accidental division of the rail traffic	QRR
2(c)	• the residual level of energy in a vehicle supplying energy to and controlling the braking system is insufficient for a subsequent emergency brake application it must be impossible to override the part of the system that makes the emergency brake application (except on existing rolling stock not so equipped)	QRR
3	The stopping distance given by the emergency brake application must be equal to or better than that produced by the normal full service application on all new rolling stock with due consideration of normal adhesion and minimizing the risk of injury to any passenger or worker.	QRR
2.16.6	**Brake Force Application - Friction, Dynamic and Regenerative**	**HED**
1	Material dissipated from, or transferred to a wheel, from brake blocks and disc pads (friction elements) must not adversely affect the ability of the signalling system to detect the presence/occupation of the rolling stock on the track.	QRR
2.16.7	**Brake System Coupling Between Vehicles**	**HED**
1	Brake system couplings to provide the required continuity may be automatically or manually connected.	QRR
2	Brake system couplings must be designed to prevent inadvertent disconnection while vehicles remain connected by the normal draw-gear but must disconnect easily if vehicles separate due to the failure of the draw-gear and thereby apply an automatic emergency train brake application.	QRR
2.16.8	**Parking Brake**	**HED**
1	A parking brake must be provided on all rolling stock, except for rolling stock within and not at either end of a consist coupled together with drawbar(s).	QRR
2	A parking brake(s) must hold the rolling stock or rail traffic stationary indefinitely and for all loaded conditions on at least a 1:40 grade after a prior full service or emergency brake application has released.	QRR
3	The wheel/rail adhesion requirement for non-powered rolling stock must be no greater than 6%.	QRR
4	The wheel/rail adhesion requirement for powered rolling stock, with a system for the application of adhesion improvers to the wheel/rail interface, must be no greater than 8%.	QRR
5	All rolling stock without a parking brake must on both sides and ends have signage to advise workers that this rolling stock has no parking brake and it must be otherwise secured against movement when uncoupled.	QRR
2.16.9	**On-Track Machine Additional Requirements**	**HED**
1	Brake systems in accordance with Section 2.16 "Brake System Requirements" must be fitted on:	QRR
1(a)	• on-track machines that can travel at speeds in excess of 60km/h and be towed on rail traffic by a locomotive	QRR
1(b)	• on-track machines fitted with an automatic brake	QRR
1(c)	• any on-track machine required to control rolling stock fitted with an automatic brake	QRR
2	Braking rates must be set so rail wheels cannot skid on clean dry track.	QRR



Clause	Requirements	Type
3	Rail mounted trailer on-track machines that do not exceed 25km/h are permitted to have only a manually applied brake that operates on sufficient number of wheels capable of holding a vehicle on a 1:40 grade with not more than 6% wheel/rail adhesion.	QRR
4	On-track machines, that cannot be towed in a train by a locomotive, must have at least two separate braking systems that operate independently from each other - one brake for service braking, and the other a secondary brake for emergency and parking functions.	QRR
5	The brakes for on-track machines, that cannot be towed on rail traffic by a locomotive, are acceptable as below:	QRR
5(a)	• automatic train brake functions may be provided by the service or secondary brake	QRR
5(b)	• on-track machines that operate in uncoupled consist must have braking performance exceeding the P curve but less than the A curve in Tables 1 to 3 (Appendix 2.2)	QRR
5(c)	• brakes must be able to be applied without wheel lockup	QRR
5(d)	• wheel slide protection is not required for on-track machines that brake at less than 0.75m/s² and travel less than 80km/h	QRR
5(e)	• an emergency brake application on these on-track machines must be possible at any time from any cabin before or during a brake application by any brake system	QRR
5(f)	• the stopping distance of the secondary brake must be at least compatible with the performance for the corridor it operates on, but not less than 50% of the stopping performance of the service brake	QRR
5(g)	• the braking of the secondary brake may be preset, or uncontrolled on an on-track machine	QRR
6	A secondary brake application must be able to be applied on all on-track machines coupled in a consist from any personnel area on any machine at any time.	QRR
2.16.10	**RRV Additional Requirements**	**HED**
1	RRVs with rubber tyres on rail must have two independent braking systems.	QRR
2	Brakes on RRVs complying with the requirements for Australian Design Rules (ADRs) will be acceptable provided:	QRR
2(a)	• the service braking performance on rail is in excess of the P brake curve in Tables 1 to 3 (Appendix 2.2)	QRR
2(b)	• the secondary brake operates on sufficient wheels to meet minimum adhesion requirements	QRR
2(c)	• the stopping distance of the secondary brake is at least compatible with the performance for the corridor it operates on, but not less than 50% of the stopping performance of the service brake	QRR
2(d)	• the braking of the secondary brake may be preset, or uncontrolled	QRR
2(e)	• the backup brake meets the requirements to hold the vehicle indefinitely on a 1 in 40 grade with 6% wheel/rail adhesion	QRR
3	All other RRVs must meet the braking requirements for on-track machines that travel at speeds up to 60km/h.	QRR
4	Brakes fitted to RRV rail wheels that are activated by the vehicle's braking system must be ADR compliant.	QRR

Clause	Requirements	Type
2.17	**On-Track Machines - Special Requirements**	**HED**
2.17.1	**Jacking and Lift Points**	**HED**
1	On-track machines must have a method for rerailing in the event of derailment.	QRR
2.17.2	**Maximum Rail Stress**	**HED**
1	If an on-track machine during work is capable of inducing stresses in the rail that exceed 90% of the rail yield stress, then an instruction must be clearly displayed in the Operator's Manual and near the appropriate controls indicating the correct operating procedure to ensure the rail is not damaged.	QRR
2.17.3	**On-Track Machines Pushed and Controlled by Workers at Walking Pace**	**HED**
1	The machine must be fully insulated from track circuits.	QRR
2	Machines insulated from track circuits and required to be earthed must provide a ground path through one rail only.	QRR
3	The machine must not be towed by other machines or travel in a consist.	QRR
4	The machine must be able to be lifted on and off the track by workers as required.	QRR
5	The machines are permitted to have only a manually applied brake that operates on more than one wheel capable of holding a vehicle on a 1 in 40 grade with not more than 6% wheel/rail adhesion.	QRR
6	A machine without a brake must have operational procedures in place to prevent the vehicle running away under all circumstances.	QRR
7	The machines are not required to meet any of the dynamic standard requirements.	GUI
2.17.4	**RRVs - Special Requirements**	**HED**
1	RRVs that travel at speeds not exceeding 60km/h and are less than 20 tonne gross mass must comply with the requirements for on-track machine trailers except for the following areas:	QRR
1(a)	• ride performance	QRR
1(b)	• structural requirements	QRR
2	When operating under live OverHead Line Equipment (OHLE) it must be physically impossible for any part of a RRV to exceed 3.9m above top of rail, under any circumstances.	QRR
3	The jacking system utilised for raising the vehicle above normal travelling height on RRVs must provide an electrical path back to the rails unless required to be insulated to prevent operation of track circuits.	QRR
4	If the jacking system is insulated, a permanent engraved warning plaque must be fitted to advise that an electrical path back to the rails must be made when jacking under live OHLE.	QRR
2.18	**Rolling Stock Electromagnetic Compatibility (EMC)**	**HED**
2.18.1	**General EMC Requirements**	**HED**
1	New rolling stock or electrical/electronic equipment to be used in rolling stock modifications must be designed, built and maintained with regard to EMC in order	QRR

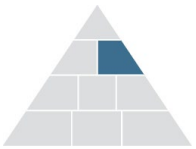


Clause	Requirements	Type
	that they operate safely throughout their operational life. This applies to all normal and reasonably foreseeable abnormal situations, including failures.	
2	As a minimum requirement, new rolling stock must comply with the requirements of EN50121-3-1.	QRR
3	During the design phase and prior to the introduction of new rolling stock to Queensland Rail track and as part of the EMC management plan, a detailed study of the interaction of the new rolling stock, existing rolling stock and fixed infrastructure must be undertaken to assess the immunity and emission issues.	QRR
4	As a minimum requirement, electrical or electronic equipment to be used as a part of a safety critical system on a vehicle or train must comply with the emissions and immunity requirements of EN50121-3-2.	QRR
5	During the design phase and prior to the introduction of the rolling stock modification to the Queensland Rail network, an EMC management plan must be prepared and submitted to Queensland Rail for review.	QRR
2.18.2	**Additional Immunity Requirements**	**HED**
1	The operator must demonstrate how immunity of the rolling stock is achieved in all normal and reasonably foreseeable abnormal situations. Immunity testing of the entire rolling stock is not required.	QRR
2	To comply with the requirements of harmonic injection into the overhead electrical system and also to minimise harmonic overvoltages on the overhead, the limits in Sections 2.18.3 to 2.18.10 must be met for new rolling stock operating on the specific overhead system types being:	QRR
2(a)	• North Coast Line	QRR
2(b)	• Gold Coast System	QRR
2(c)	• Brisbane Suburban Area	QRR
3	Details of non-Queensland Rail overhead networks should be obtained from that network manager.	GUI
2.18.3	**Harmonics**	**HED**
1	For new rolling stock, the individual harmonic current components per vehicle must under no circumstances exceed the limits and related duration specified for:	QRR
1(a)	• odd harmonics listed in the Figures 14 and 15 (Appendix 2.1).	QRR
1(b)	• even harmonics listed in the Figures 16 and 17 (Appendix 2.1).	QRR
2.18.4	**Total Harmonic Distortion (THD)**	**HED**
1	The total harmonic distortion (THD) must not exceed 1.5% (1 min average) of the corresponding fundamental current component.	QRR
2.18.5	**Psophometric Current**	**HED**
1	The Psophometric weighted disturbing current must under no circumstance exceed 0.5 A (rms) maximum (instantaneous), measured and calculated according to EN50121-3- 1.	QRR

Clause	Requirements	Type
2.18.6	**Signalling - Track Circuits**	**HED**
1	Four types of track circuits are currently in use. Two of these are audio frequency track circuits; the third type is the dc track circuit; and the fourth type is high voltage track circuits.	GUI
2	The audio frequency track circuits limit the tolerable levels of the individual components of the line current to the values given in the tables referred to below, to avoid signal replication. There must be no modulation within the frequency range given in Figures 18 and 19 (Appendix 2.1) between the two centre frequencies f1 and f2.	QRR
2.18.7	**Magnetic Field**	**HED**
1	The rail traffic must not produce a magnetic flux density (dc) at top of rail level of more than the limit in Figure 20 (Appendix 2.1).	QRR
2.18.8	**Longitudinal Voltage**	**HED**
1	Under no conditions (including credible fault conditions) must a vehicle or rail traffic cause a longitudinal voltage along the running rail, measured between any two axles in contact with the rail, of 200mVrms or more at the frequencies in Figure 21 (Appendix 2.1).	QRR
2.18.9	**DC Current Limits for Signalling Track Circuits**	**HED**
1	The maximum dc current produced by rail traffic on any track circuit (maximum length 750m) must not exceed the requirement in Figure 22 (Appendix 2.1).	QRR
2.18.10	**Interference to QR UHF Radio Equipment and Other On-Board Communications Systems**	**HED**
1	On board radio equipment and any other communications system must not be disturbed by emission from rolling stock or other sources and operate satisfactorily under all conditions on all tracks.	QRR
2	With particular reference to on board radio equipment, should any emission be generated by the rolling stock then such emission must not:	QRR
2(a)	• open the radio mute which is set to recommended factory level (0.5mV at 20dB SINAD)	QRR
2(b)	• cause desensing which exceeds 3dB	QRR
2.19	**Electrical Equipment Systems for Rolling Stock**	**HED**
2.19.1	**Earthing System**	**HED**
1	An earthing system is required for on all rolling stock, fitted with electrical equipment, or all rolling stock, required to operate in the Queensland Rail 25 kV ac electrified areas.	QRR
2	The earthing system must provide a low resistance path between the rolling stock main body structure and both rails. This must be confirmed by a combination of visual inspection and/or electrical continuity testing.	QRR
2.19.2	**Electrical Insulation System**	**HED**
1	An electrical insulation system is required between the differing live portions of electrical equipment, and between live portions of electrical equipment and earth.	QRR

Clause	Requirements	Type
2.20	**Signalling of Rail Traffic**	**HED**
2.20.1	**Track Circuit Detection**	**HED**
1	All extremity axles of rolling stock or on-track vehicles, intended to be detected, must create an impedance to enable a current of greater than 0.6 amperes to flow when a voltage of 300mV dc is applied to the web of the rail irrespective of the speed of travel.	QRR
2.20.2	**Axle Counter Detection**	**HED**
1	For axle counter detection the rail traffic wheels must be:	QRR
1(a)	• steel or cast iron	QRR
1(b)	• have a diameter of no less than 350mm	QRR
1(c)	• a tyre width of no less than 115mm	QRR
1(d)	• a speed of less than 200km/h	QRR
2.21	**Rail Traffic Safety Systems**	**HED**
2.21.1	**Protection from Driver Incapacity**	**HED**
1	All rail traffic must have a safety system which gives some protection to the rail traffic if the driver is incapacitated.	QRR
2	The system may function at intervals suitable for the route, speeds and type of traffic - for example a vigilance system on freight rail traffic.	QRR
3	Operation of the system must result in the rail traffic being brought to a stop.	QRR
2.21.2	**Protection from Exceeding Limit of Authority**	**HED**
1	All rail traffic must have a safety system which gives some protection against exceeding the limit of authority.	QRR
2	The minimum level is to alert the Rail Traffic Driver that the rail traffic is approaching:	QRR
2(a)	• a station, and/or	QRR
2(b)	• a restricted signal	QRR
3	Higher levels of protection, such as ATP and ETCS, can replace this warning with other system features.	QRR
4	Operation of the system must result in the rail traffic being brought to a stop.	QRR
2.21.3	**Protection from Exceeding Speed Limit**	**HED**
1	Self propelled rolling stock that can travel over 25km/h must be fitted with a speed indicator, accurate to the lesser of 5km/h or 10% of the speed reading, visible from any driving position and calibrated in kilometres per hour.	QRR
2.21.4	**On Track Machines**	**HED**
1	On track machines that travel at speeds not exceeding 60km/h and are less than 20 tonne gross mass are exempt from the above clauses 2.21.1 and 2.21.2.	QRR

Clause	Requirements	Type
2	On track machines that do not have a vigilance system and do not come to rest automatically in work and travel modes must have a deadman device if there is only one operator.	QRR
3	On track machines may suppress the vigilance, station protection or AWS system when in work mode or stationary.	QRR
2.21.5	**Infrastructure Based Systems**	**HED**
1	Where rail traffic safety systems interface with infrastructure components provided by Queensland Rail (eg SPD, AWS, ATP, ETCS), the rolling stock components must be compatible with the existing infrastructure components.	QRR
2	Details of the infrastructure components and routes they are installed on are available from Queensland Rail Operator Interface Section.	GUI
2.21.6	**Automatic Train Protection (ATP)**	**HED**
1	Where rail traffic utilises ATP, it must be fail-safe and apply the brakes, either with a full service brake or emergency brake application, when the ATP system predicts or detects an unsafe condition such as speed too high, potential or real signal passed at danger.	QRR
2	Rail traffic which utilise ATP must also have an alerting system. When the rail traffic enters ATP territory, the ATP system must become active and suppress the alerting system. On exiting ATP territory or whilst driving in ATP territory with the ATP system disabled, the alerting system must be enabled.	QRR
2.21.7	**Station Protection (SP)**	**HED**
1	Where SP is utilised, the leading vehicle must be fitted with a fail safe, magnetic detection device(s) to detect the station protection and AWS signal aspect magnets located on the track.	QRR
2	On a single vehicle, it is acceptable to have one detector head at one end.	QRR
3	On a multiple vehicle unit able to be driven from either end, there must be a detector at each end of the unit.	QRR
2.21.8	**Automatic Warning System (AWS)**	**HED**
1	Rolling stock which utilises AWS must be fitted with a fail safe AWS that receives signal aspect information from magnets placed on the track before the signal it repeats.	QRR
2	The track magnets must indicate to the AWS whether the signal is:	QRR
2(a)	• a proceed signal aspect (green) is recognised by the presence, within 0.5 seconds, of an energised south pole electromagnet immediately following a north pole.	QRR
2(b)	• a restricted signal aspect (double yellow, yellow, flashing yellow or red) is denoted by a north pole magnet	QRR
2.21.9	**Magnet Receiver**	**HED**
1	The magnet receiver must have the following properties:	QRR
1(a)	• the magnet receiver must be mounted at a height, with new wheels, of 150mm above top of rail and on the longitudinal centre line of the rolling stock	QRR
1(b)	• the magnet detector device must be capable of detecting a magnet that has a minimum flux of 35 Gauss measured 125mm vertically above the top of the casing. The top of the casing is 0 to 10mm below the head of the rail. This flux	QRR



Clause	Requirements	Type
	is constant over an area ±60mm in the transverse and ±90mm in the longitudinal directions from the magnet centreline	
2.22	**Powered Rolling Stock Operated By Remote Control**	**HED**
1	The term "remote control locomotive" (RCL) refers to a locomotive or other powered rolling stock which can be operated by a person not physically located within the locomotive cab by using a radio or other transmitter and receiver system or attached cable. This does not include distributed power.	QRR
2	Each remote control unit (RCU) should, at a minimum, have the following features:	GUI
2(a)	• directional control	GUI
2(b)	• graduated throttle or speed control	GUI
2(c)	• graduated locomotive independent brake application and release	GUI
2(d)	• train brake application and release control if this is a feature of the powered rolling stock	GUI
2(e)	• audible warning device control (horn)	GUI
2(f)	• headlight control	GUI
2(g)	• emergency air brake application switch if this is a feature of the powered rolling stock	GUI
2(h)	• switch or control to eliminate tractive effort to the locomotive	GUI
3	Although an RCU can have the capability to control, at different times, different locomotives equipped with remote-control systems, it must be designed to be capable of controlling only one remote control equipped locomotive at a time. (A locomotive may consist of one or more locomotives operated in multiple from a single control).	QRR
4	An RCU having the capability to control more than one RCL must have a means to lock in one RCL "assignment address" to prevent simultaneous control over more than one locomotive.	QRR
5	Each RCL must respond only to the RCU assigned to that locomotive.	QRR
6	The RCU must be designed to require at least two separate actions by the operator before RCL movement can begin (in order to prevent accidental movement).	QRR
7	When an RCU's signal to the RCL is interrupted for a set period, not to exceed five seconds, the remote-control system must:	QRR
7(a)	• apply a full service application of the locomotive and train brakes (if the train brakes are connected to the RCL)	QRR
7(b)	• disable locomotive tractive effort	QRR
8	If an RCU is equipped with an "on" and "off" switch, the switch, when moved from "on" to "off" position, must result in:	QRR
8(a)	• application of the locomotive and train brakes (if connected)	QRR
8(b)	• disabling of locomotive tractive effort	QRR
9	Each RCL must have a distinct and unambiguous audible or visual warning device that indicates to nearby personnel that the locomotive is under active remote control and subject to movement.	QRR

Clause	Requirements	Type
10	Each RCU must be equipped with an operator alertness device requiring acknowledgement by the operator within a timing sequence.	QRR
11	Failure to acknowledge alertness within the timing sequence must result in:	QRR
11(a)	• application of the locomotive and train brakes (if connected)	QRR
11(b)	• disabling of locomotive tractive effort	QRR
12	Each RCU must have a tilt feature that, when tilted to a predetermined angle, will result in:	QRR
12(a)	• application of the locomotive and train brakes (if connected)	QRR
12(b)	• disabling of locomotive tractive effort	QRR
13	If the RCU is equipped with a "tilt bypass" system enabling the tilt protection feature to be temporarily disabled, the bypass feature must deactivate after a set time, unless reactivated by the remote control operator.	QRR
14	If a protective alarm on the RCL would normally initiate safety action such as shutdown or a brake application then these must also apply when the RCL is in remote operation. The device must be manually reset on board the RCL.	QRR
15	When the RCL is changed from manual to remote or from remote to manual modes, application of the locomotive and train brakes (if connected) must be initiated to prevent unauthorised use of the system.	QRR
16	The control unit and the RCL must meet the EMF requirements of this module.	QRR
17	The remote control operator must hold authority for the vehicle to occupy the section of track, whether under a safeworking system or under local control (yards etc).	QRR
18	The remote control operator must always be able to clearly determine the location of the RCL in relation to the limit of authority.	QRR
2.23	**End-User Radio Communications Equipment**	**HED**
1	All Train Control Radios (TCRs) must be compatible with Queensland Rail's wide-area open-channel UHF TCR system.	QRR
2	Each rail traffic must be supplied with two radios.	QRR
3	Radio 1 must be dedicated to the train control channel and may be either of the following configurations:	QRR
3(a)	• 25 watt mobile radio fixed in the active driver's cab	QRR
3(b)	• 25 watt transportable radio located in the active driver's cab	QRR
4	Radio 2 must be compatible with local communications channels and may be any one of the following configurations:	QRR
4(a)	• 25 watt mobile radio fixed in the active driver's cab	QRR
4(b)	• 25 watt transportable radio located in the active driver's cab	QRR
4(c)	4 watt hand held portable radio located in the active driver's cab for rail traffic operating inside Brisbane's suburban and interurban areas being all lines including branches between Gympie North and Rosewood.	QRR

Clause	Requirements	Type
5	All mobile voice communications equipment must operate on a battery power supply.	QRR
6	All Maintenance Supervisory Radios (MSRs) must be compatible with Queensland Rail's wide-area open-channel UHF MSR system.	QRR
2.24	**Additional Requirements - Non Standard Rolling Stock**	**HED**
1	The requirements in this standard have been based on conventional rolling stock operated in the usual manner. Additional requirements for rolling stock and situations not covered by this standard may be specified by Queensland Rail Network Business or determined during the interface risk assessment.	QRR

Appendices

Appendix 1

Figure 1 – Dimensions for Track Twist Test

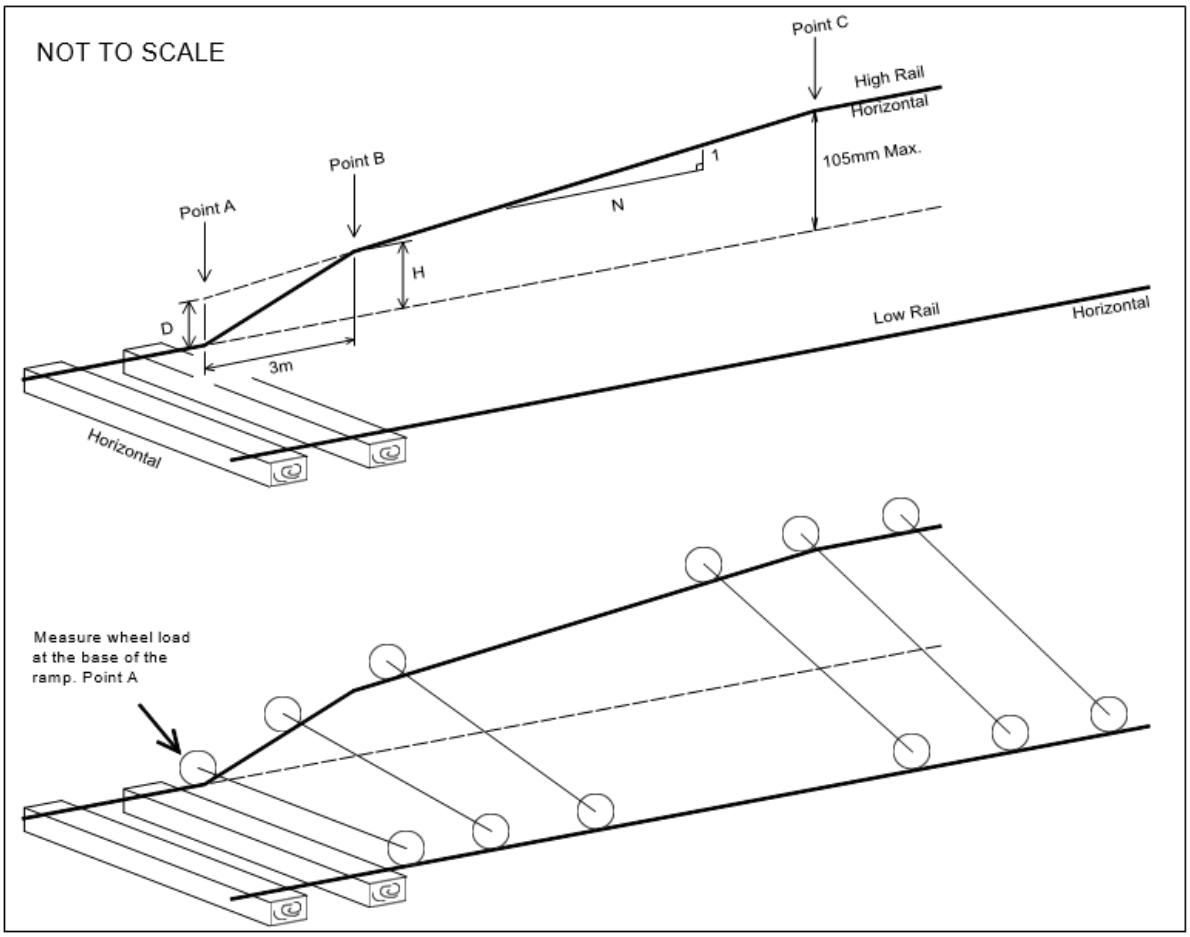


Figure 2 - Limiting Values for Track Twist Test (refer Figure 1)

Test Number	D (mm)	N	Lines on Which the Rolling Stock Will Operate
1	20	300	Lines maintained to category 7 or better
2	25	400	Lines maintained to category 7 or better
3	30	400	All other areas

Figure 3 – P2 Force Calculation

$$P_2 = P_0 + 2\alpha v\left[\frac{M_u}{M_u + M_t}\right]^{0.5} \times \left[1 - \frac{C_t \pi}{4\left[K_t (M_u + M_t)\right]^{0.5}}\right] \times \left[K_t M_u\right]^{0.5}$$

where:

P_2 = Force (kN)

P_0 = Vehicle static wheel load (kN)

M_u = Vehicle unsprung Mass per wheel (kg)

M_t = Equivalent track mass (kg)

K_t = Equivalent track stiffness (MN/m)

C_t = Equivalent track damping (kNs/m)

v = Vehicle velocity (m/s)

2α = Included angle of dip, nominally 0.01 or 0.014 radians

Figure 4 – Values of Kt, Mt and Ct

Rail (kg/m)	K_t (MN/m)	C_t (kNs/m)	M_t (kg)
>41	109	52	133

Figure 5 – P2 Force Limit

Total Joint Angle (Radians)	P_2 Force Limit	Queensland Rail Network Track Categories
0.01	200	Track categories 7, 8, 9 and 10 except as identified below
0.01	203	Track categories 5 and 6. Track category 7 only for: • Rockhampton to Durroburra • Kaili to Townsville • Townsville to Mt Isa
0.01	200	Track categories 7, 8, 9 and 10 except as identified below

Figure 6 – Track Defect Values

Single Parameter Defects	Top	120% of fig 1 appendix 1.1
	Versine	120% of fig 1 appendix 1.1
	Twist	120% of fig 1 appendix 1.1
Combined Defects	Top & Versine	120% for Top with 60% for Versine of fig 1 appendix 1.1
	Versine & Top	120% for Versine with 25% for Top of fig 1 appendix 1.1
	Twist & Versine	120% for Twist with 60% for versine of fig 1 appendix 1.1
	Versine & Twist	120% for versine with 25% for twist of fig 1 appendix 1.1
Cyclic Top Irregularities	Top	40% of fig 1 appendix 1.1
Repeated Defects for both Single Parameter and Combined Defects	All except single parameter top	75% of fig 1 appendix 1.1

Figure 7 – Wheel Profile LW3

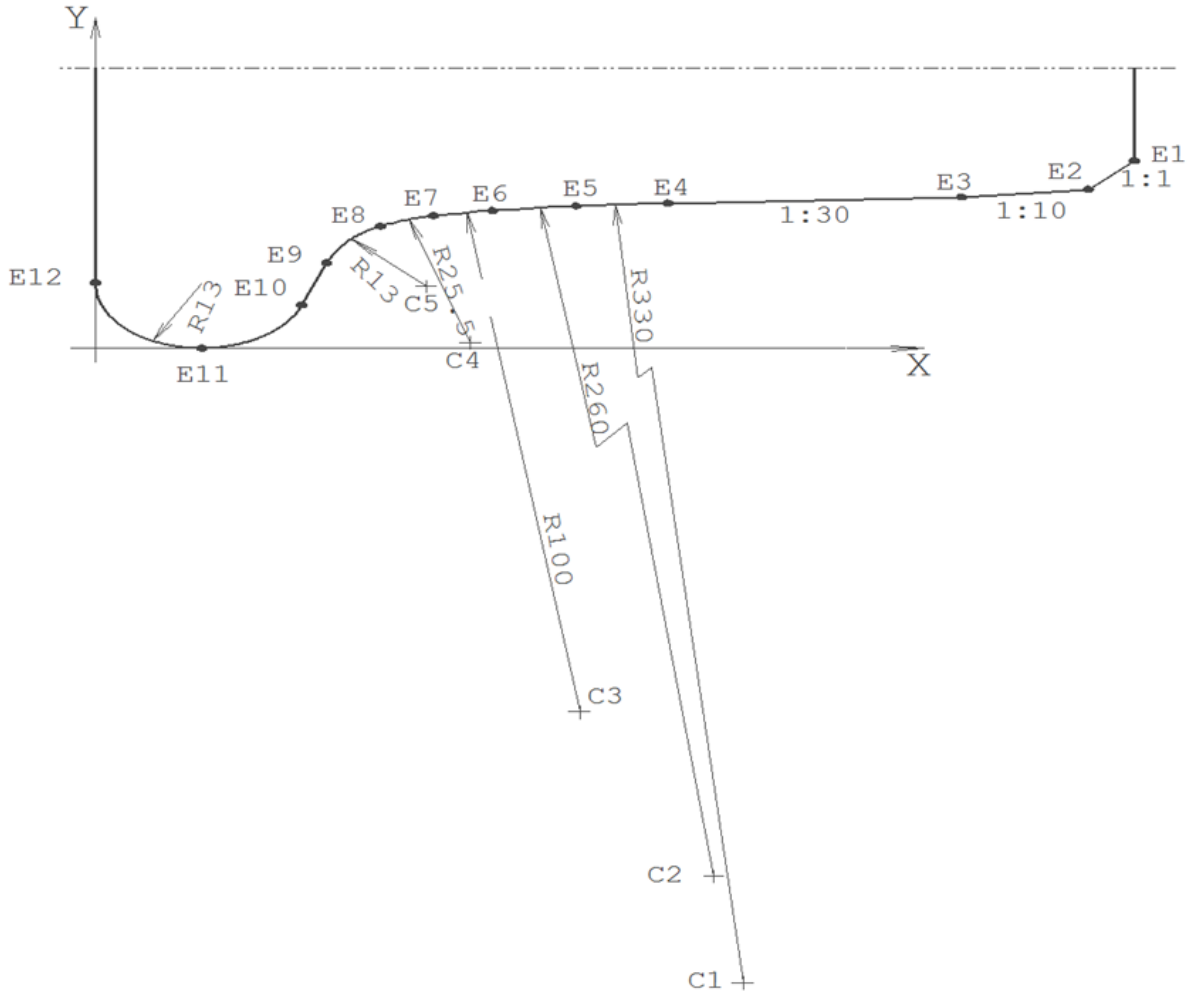


Figure 8 – Coordinates for LW3 Profile

Table 8A - For nominal wheel width A = 127mm			
End Point	Coordinate X mm	Coordinate Y mm	Centre
E1	127.0000	37.1523	
E2	121.3781	31.5305	
E3	105.8781	29.9805	
E4	69.9911	28.7842	
	80.9850	-301.0326	C1
E5	58.7785	28.2194	
	76.2745	-231.1912	C2
E6	48.5331	27.3245	
	59.2029	-72.1046	C3
E7	41.3056	26.2808	
	45.8694	1.1925	C4
E8	34.8653	24.1960	
	40.4753	12.4687	C5
E9	28.2593	16.9150	
E10	25.2160	8.5537	
E11	13.0000	0.0000	
E12	0.0000	13.0000	
Table 8B - For nominal wheel width A = 140mm			
End Point	**Coordinate X mm**	**Coordinate Y mm**	**Centre**
E1	140.0000	37.8657	
E2	134.3781	32.2638	
E3	114.8781	30.2638	
E4	69.9911	28.7842	
	80.9850	-301.0326	C1
E5	58.7785	28.2194	
	76.2745	-231.1912	C2
E6	48.5331	27.3245	
	59.2029	-72.1046	C3

End Point	Coordinate X mm	Coordinate Y mm	Centre
E7	41.3056	26.2808	
	45.8694	1.1925	C4
E8	34.8653	24.1960	
	40.4753	12.4687	C5
E9	28.2593	16.9150	
E10	25.2160	8.5537	
E11	13.0000	0.0000	
E12	0.0000	13.0000	

Figure 9 – Wheel Profile LW2

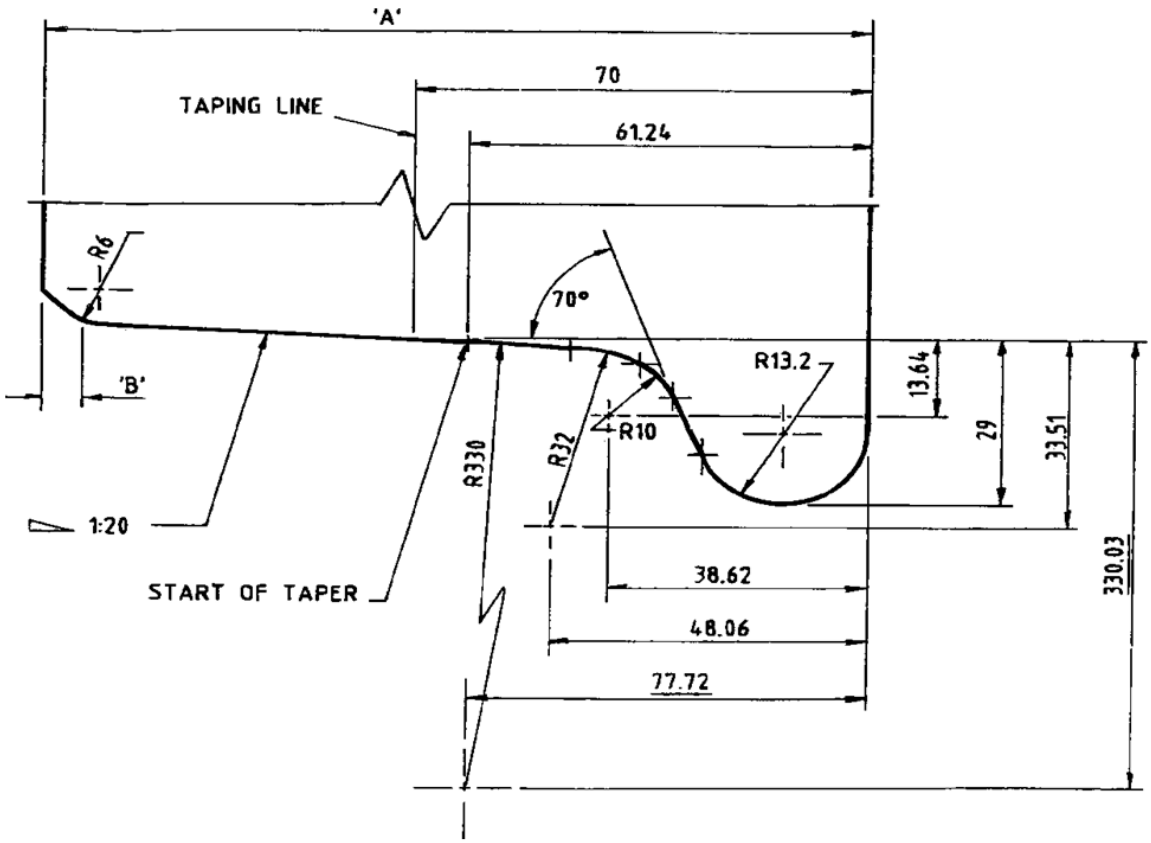


Figure 10 – Wheel Chamfer

Nominal Wheel Width "A"	Dimension "B" mm
>= 127	6 @ 45 degrees

Figure 11 – Profile Machining Tolerances

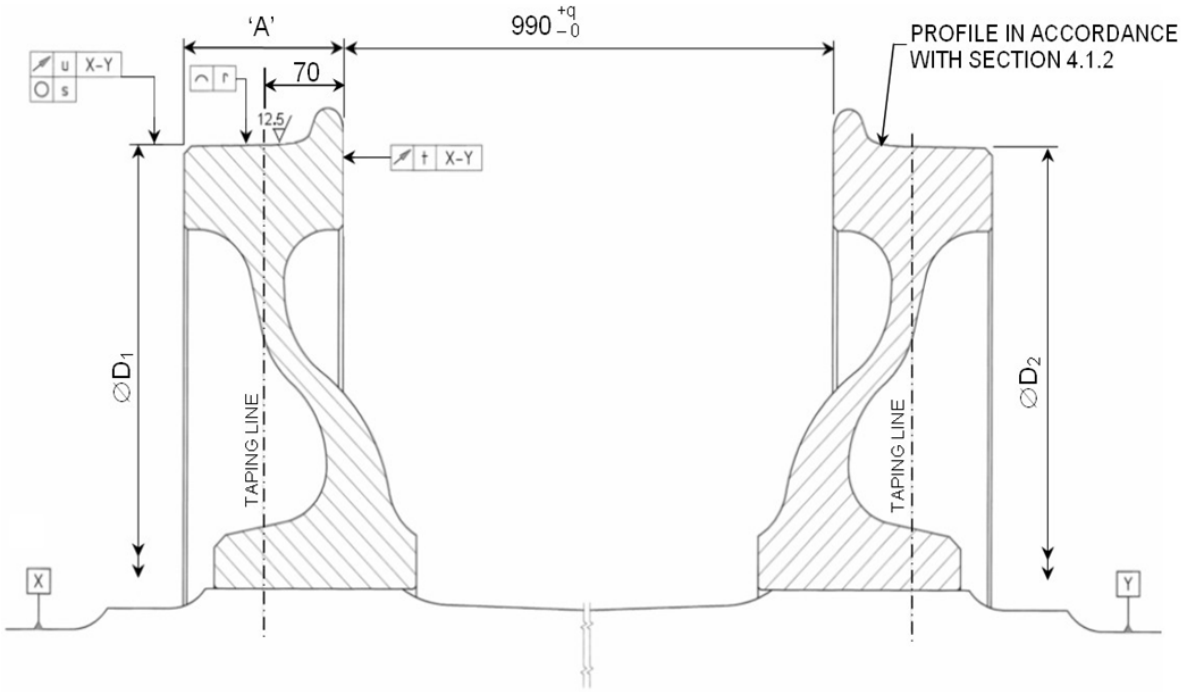


Figure 12 – Tolerance Class

Vehicle Type	Tolerance Class
Passenger vehicles approved for speeds > 100km/h	YH
Locomotives & passenger vehicles approved for 100 km/h	YN
Passenger vehicles approved for 80 km/h & all freight wagons	Z

Figure 13 – Tolerance Values

Geometry	Symbol	Tolerance Class		
		YH	YN	Z
Tread Roundness (mm)	s	0.2	0.2	0.2
Axial Runout (mm)	t	0.4	0.5	1.0
Radial Runout (mm)	u	0.2	0.2	0.75
Accuracy of Profile (mm)	r	0.25	0.5	0.5
Spacing Tolerance (mm) (See note 1)	q	2.0	2.0	2.0
Diameter difference	D1 - D2	0.25	0.5	0.5

Note 1: Wheels in service are permitted to have a tolerance spacing of 4.0mm

Figure 14 – Odd Harmonics North Coast Line

Current Component	Duration	Limits (Amps) Normal Operation	Limits (Amps) Abnormal Operation
d.c. component	-	0.4	0.4
3rd - 9th Harmonics	10 s	20	3
11th - 19th Harmonics	10 s	1	1
21st - 27th Harmonics	10 s	1	0.6
29th - 59th Harmonics	1.5 s	0.5	0.1
61st - 73rd Harmonics	10 s	0.6	0.6
75th and above	10 s	0.35	0.35

Figure 15 – Odd Harmonics Gold Coast System and Brisbane Suburban Area

Current Component	Duration	Limits (Amps) Normal Operation	Limits (Amps) Abnormal Operation
d.c. component	-	0.0325	0.4
3rd - 9th Harmonics	10 s	0.650	3
11th - 19th Harmonics	10 s	0.650	1
21st - 27th Harmonics	10 s	0.13	0.6
29th - 59th Harmonics	1.5 s	0.13	0.1
61st - 73rd Harmonics	10 s	0.13	0.6
75th and above	10 s	0.13	0.35

Figure 16 – Even Harmonics North Coast Line

Current Component	Duration	Limits (Amps) Normal / Abnormal Operation
2nd - 8th Harmonics	10 s	2
10th - 18th Harmonics	10 s	0.25
20th - 58th Harmonics	1.5 s	0.25
60th and above	10 s	0.3

Figure 17 – Even Harmonics Gold Coast System and Brisbane Suburban Area

Current Component	Duration	Limits (Amps) Normal / Abnormal Operation
2nd - 8th Harmonics	10 s	0.13
10th - 18th Harmonics	10 s	0.13
20th - 58th Harmonics	1.5 s	0.13
60th and above	10 s	0.13

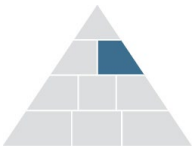


Figure 18 – Limits for Components of Line Current to avoid Signal Interference – ML type track circuits

Centre Frequencies			
f1	**f2**	**RMS Level**	**Time**
1532 Hz	1566 Hz	100 mA rms	1.5 s
1682 Hz	1716 Hz	100 mA rms	1.5 s
1831 Hz	1865 Hz	100 mA rms	1.5 s
1979 Hz	2013 Hz	100 mA rms	1.5 s
2129 Hz	2163 Hz	100 mA rms	1.5 s
2129 Hz	2163 Hz	100 mA rms	1.5 s
2279 Hz	2313 Hz	100 mA rms	1.5 s
2428 Hz	2462 Hz	100 mA rms	1.5 s
2576 Hz	2610 Hz	100 mA rms	1.5 s
The modulation rate between f1 and f2 shall not be between 1 and 15 Hz. The 3 dB bandwidth of centre frequencies can be taken to be 6 Hz. Note that the fundamental supply frequency can vary between 49.5 Hz and 50.5 Hz.			

Figure 19 – Limits for Components of Line Current to avoid Signal Interference – CSEE type track circuits

Centre Frequencies			
f1	**f2**	**RMS Level**	**Time**
1690 Hz	1710 Hz	100 mA rms	1.5 s
1990 Hz	2010 Hz	100 mA rms	1.5 s
2290 Hz	2310 Hz	100 mA rms	1.5 s
2590 Hz	2610 Hz	100 mA rms	1.5 s
The modulation rate between f1 and f2 shall not be between 10 and 30 Hz. The 3 dB bandwidth of centre frequencies can be taken to be 6 Hz.			

Figure 20 – Magnetic Flux Density Limits

Flux Density	Time
24 mT	for times longer than 0.01 seconds
2.4 x 10^-6 / t^2 T where t is the time in seconds	for times shorter than 0.01 seconds

Figure 21 – Longitudinal Voltage Limits

Bandwidth (-3 dB points)	RMS Level
d.c. (0 Hz) - 2.4 Hz	200 mV rms

Figure 22 – Current Limits

Bandwidth (-3 dB points)	RMS Level (Nominal)	Time
d.c. (0 Hz) - 2.4 Hz	**3.8 Amps**	**0.25 s**

Figure 23 – Axle Loads and Spacings – 4 Axle, 2 Bogie Vehicles (eg. Wagons)

Line	Max. Axle Load (t)	Minimum Coupler Centre to Axle 1 (mm)	Minimum Axle 1 to Axle 2 (mm)	Minimum axle 2 to axle 3 (mm)	Minimum axle 3 to axle 4 (mm)	Minimum Axle 4 to Coupler Centre (mm)	Wagon length (A+B+C+D+E) mm
Dimension		**A**	**B**	**C**	**D**	**E**	
Townsville to Mt Isa - 20t axle load lines							
Vehicle MIW1	20	1050	1675	4550	1675	1050	10000
Vehicle MIW2	20	1017	1675	7205	1675	1017	12589
Vehicle MIW3	20	1725	1675	7695	1675	1725	14495
North Coast Line - 20t Axle Load Lines							
Vehicle NCW1	20	2127	2135	7235	2135	2127	15759
Vehicle NCW2	20	1725	1675	7695	1675	1725	14495
Vehicle NCW3	20	1725	2135	7235	2135	1725	14955
15.75t Axle Load Lines							
Vehicle WSW1 (coal lines Columboola- Fish I))	15.75	1392	1675	8945	1675	1392	15079
Vehicle WSW2 (all lines)	15.75	1725	2135	7235	2135	1725	14955
Vehicle WSW3 (all lines)	15.75	1370	1675	9295	1675	1370	15385
Vehicle WSW4 (all lines)	15.75	1725	1675	7695	1675	1725	14495
10.62t axle load - all routes							
Vehicle QW1	10	1511	1676	7316	1676	1511	13690
Vehicle QW2	9.5	1827	1676	9294	1676	1827	16300

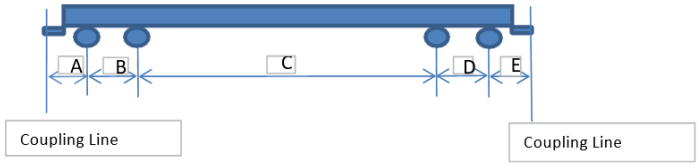


Figure 24 – Axle Loads and Spacings - Locomotives

Line	Max. Axle Load (t)	Minimum Coupler Centre to Axle 1 (mm)	Minimum Axle 1 to Axle 2 (mm)	Minimum axle 2 to axle 3 (mm)	Minimum axle 3 to axle 4 (mm)	Minimum axle 4 to axle 5 (mm)	Minimum axle 5 to axle 6 (mm)	Minimum Axle 6 to Coupler Centre (mm)	Total length (A+B+C+D+E+F+G) mm
Dimension		**A**	**B**	**C**	**D**	**E**	**F**	**G**	
Townsville to Mt Isa - 20t axle load lines									
Vehicle MIL1	20	2500	1900	1900	9400	1900	1900	2500	22000
Vehicle MIL2	19.5	2500	1800	1800	9216	1800	1800	2500	21416
Vehicle MIL3	16.7	2197	1905	1905	6045	1905	1905	2197	18059
North Coast Line - 20t Axle Load Lines									
Vehicle NCL1	20	2500	1900	1900	9400	1900	1900	2500	22000
Vehicle NCL2	19.5	2500	1800	1800	9216	1800	1800	2500	21416
Vehicle NCL3	16.7	2197	1905	1905	6045	1905	1905	2197	18059
Vehicle NCL4	18.7	2298	2600	4000	2600	4000	2600	2298	20396
15.75t Axle Load Lines									
Vehicle WSL1 (coal lines)	16	2197	1905	1905	6045	1905	1905	2197	18059
Vehicle WSL2 (all lines)	15.75	2197	1905	1905	6045	1905	1905	2197	18059
10.62t axle load - all routes									
Vehicle QL1	10.62	1917	1499	1746	3061	1746	1499	1917	13385

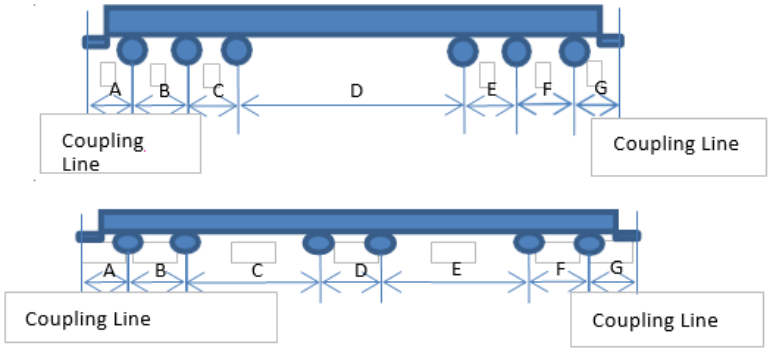


Figure 25 – Wheel Flats

Defect Class	Description	Action	Operating Restrictions
1	Single flat length less than 25 mm.	No action required	Normal Speed
2	Single flat length between 25 mm and 40 mm OR multiple Class 1 flats.	Re-examine carefully to ensure that no Class 3 Spalls exist.	Normal Speed
3	Single flat length between 40 mm and 60 mm or multiple class 2 flats	Work out of service	Normal Speed
4	Single flat length between 60 mm and 100 mm OR multiple Class 3 Flats	If found pre-trip or at a depot, the wheel must not enter service. If found en-route continue at reduced speed with the brakes cut out or remove from service.	Speed 40 km/h Maximum
5	Single flat length greater than 100 mm	If found pre-trip or at a depot, the wheel must not enter service. If found en-route, Remove built-up metal in the section before movement to the nearest siding at a speed assessed after inspection	Move to siding at restricted speed less than 40km/h.

Figure 26 – Built Up Tread

Defect Category	Description	Action	Operating Restrictions
1	Classification not relevant	No action	Normal Speed
2	Classification not relevant	No action	Normal Speed
3	Light surface smearing too small to measure with a standard rule.	Examine brake gear for defects.	Normal Speed
4 (i)	Scale height up to 5mm	If found pre-trip or at a depot, the wheel must not enter service. If found en-route,	Speed 25 km/h Maximum
4 (ii)	Scale height 5mm to 10mm	If found pre-trip or at a depot, the wheel must not enter service. If found en-route,	Speed 15 km/h Maximum
4 (iii)	Scale height 10mm to 15 mm	If found pre-trip or at a depot, the wheel must not enter service. If found en-route,	Speed 5 km/h Maximum
5	Scale greater than 15mm	If found pre-trip or at a depot, the wheel must not enter service. If found en-route,	Not to move until wheel is rectified

Figure 27 – Shelled Tread and Spalling

Defect Category	Description	Action	Operating Restrictions
1	Spalled regions less than 12 mm in diameter. Maximum 10% wheel coverage	No action required	Normal Speed
2	Spalled regions less than 25 mm in diameter. Maximum 20% wheel coverage. The edges of the spalls may be sharp and jagged.	Re-examine carefully to ensure that no Class 3 Spalls exist. Defects must be reported	Normal Speed
3	Spalled regions greater than 25 mm in diameter. The edges of the spalls may be sharp and jagged. Maximum 50% wheel coverage	Locomotives & Passenger: Work out of service within 14 days. Wagons & Infra Mntce: Work out of service	Normal Speed
4	Extensive spalling 3 mm or more deep, sharp and jagged. More than 50% wheel coverage.	If found pre-trip or at a depot, the wheel must not enter service. If found en-route continue at reduced speed with the brakes cut out or remove from service.	Maximum Speed 40 km/h

Figure 28 – Tread and Flange Limits

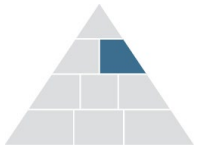
Dimension	Work out of service	Remove from service
Maximum flange height (mm) above tread running surface		35
Maximum tread hollowing (mm)	Approaching 3mm	3
Minimum flange thickness (mm) measured with standard	Approaching 22mm	22
Minimum flange angle		Less than 5 degrees from vertical

Appendix 2 – Train Stopping Distances

Table 1 – Stopping Distances (metres) – Tangent Level Track

Initial Speed (km/h)		5	10	15	20	25	30	35	40	45	50	55	60
Braking Curve	A	-	-	-	11	17	25	34	44	56	69	83	99
	P	-	-	-	40	54	71	89	109	131	154	180	207
	F	-	-	-	84	119	159	205	257	314	377	446	520
	I	-	-	-	193	254	319	388	463	542	626	715	808
	N	-	-	-	133	180	232	290	353	422	496	576	661
	S	-	-	-	140	189	243	304	370	442	519	602	691
	T	-	-	-	117	161	210	265	325	392	463	541	624
	W	-	-	-	129	175	227	284	348	417	491	571	657

Initial Speed (km/h)		65	70	75	80	85	90	95	100	105	110	115	120
Braking Curve	A	116	135	155	176	199	223	249	276	304	333	364	397
	P	236	268	300	335	372	410	450	492	536	582	630	679
	F	600	685	772	864	960	1062	1168	1280	1396	1518	-	-
	I	906	1009	1117	1229	1346	1468	-	-	-	-	-	-
	N	752	848	950	1057	1170	1288	-	-	-	-	-	-
	S	785	885	991	1102	1219	1341	-	-	-	-	-	-
	T	713	807	-	-	-	-	-	-	-	-	-	-
	W	749	846	949	1057	1172	1291	-	-	-	-	-	-



Initial Speed (km/h)		125	130	135	140	145	150	155	160	165	170		
Braking Curve	A	431	466	502	540	579	620	662	705	750	796		
	P	797	858	921	986	1053	1123	1195	1269	1345	1423		

Table 2 – Stopping Distance Curves on Tangent Down 1 in 50 Track

Initial Speed (km/h)		5	10	15	20	25	30	35	40	45	50	55	60
Braking Curve	A	-	-	-	13	20	29	39	51	65	80	97	115
	P	-	-	-	43	59	78	99	122	148	175	205	238
	F	-	-	-	137	197	267	348	438	539	650	771	902
	I	-	-	-	229	309	398	496	604	721	846	981	994
	N	-	-	-	188	266	356	549	574	701	841	994	1158
	S	-	-	-	201	285	318	492	615	752	902	1066	1243
	T	-	-	-	179	257	348	453	571	702	847	1005	1176
	W	-	-	-	190	271	365	472	593	727	874	1035	1209

Initial Speed (km/h)		65	70	75	80	85	90	95	100	105	110	115	120
Braking Curve	A	135	157	180	205	232	260	289	320	353	388	424	462
	P	272	309	348	389	433	479	527	577	629	684	741	801
	F	1044	1196	1358	1530	1713	1905	2108	2321	2545	2778	-	-
	I	1279	1441	1613	1794	1983	2182	-	-	-	-	-	-
	N	1335	1524	1726	1940	2167	2406	-	-	-	-	-	-
	S	1433	1636	1853	2083	2326	2583	-	-	-	-	-	-
	T	1360	1558	-	-	-	-	-	-	-	-	-	-
	W	1397	1597	1811	2039	2279	2533	-	-	-	-	-	-

Initial Speed (km/h)		125	130	135	140	145	150	155	160	165	170		
Braking Curve	A	501	542	584	628	674	721	770	820	873	926		
	P	999	1076	1156	1239	1325	1413	1505	1599	1696	1796		

Table 3 – Stopping Distance Curves on Tangent Up 1 in 50 Track

Initial Speed (km/h)		5	10	15	20	25	30	35	40	45	50	55	60
Braking Curve	A	-	-	-	10	15	22	30	39	49	60	73	87
	P	-	-	-	37	51	65	82	100	119	140	162	186
	F	-	-	-	67	93	123	155	192	232	276	323	374
	I	-	-	-	179	232	290	350	413	480	549	621	697
	N	-	-	-	117	155	197	242	290	343	398	457	520
	S	-	-	-	123	163	206	253	304	358	416	477	542
	T	-	-	-	101	135	173	214	259	308	360	416	475
	W	-	-	-	112	149	190	234	282	333	388	446	509

Initial Speed (km/h)		65	70	75	80	85	90	95	100	105	110	115	120
Braking Curve	A	102	118	136	155	175	196	218	242	266	292	320	348
	P	212	239	268	298	330	363	398	435	473	512	553	596
	F	428	486	547	612	681	753	829	908	991	1078	-	-
	I	776	858	943	1032	1123	1218	-	-	-	-	-	-
	N	586	656	729	806	886	970	-	-	-	-	-	-
	S	610	682	758	837	920	1007	-	-	-	-	-	-
	T	538	605	-	-	-	-	-	-	-	-	-	-
	W	574	644	716	793	873	957	-	-	-	-	-	-

Initial Speed (km/h)		125	130	135	140	145	150	155	160	165	170		
Braking Curve	**A**	378	408	440	474	508	544	581	619	658	699		
	P	670	720	772	826	882	939	999	1060	1123	1187		

Standard

Interface Standards
Module 3: Safeworking

MD-10-194

QUEENSLAND RAIL OFFICIAL

QueenslandRail

Table of Contents

Clause	Requirements	Type
3	**REQUIREMENTS**	**HED**
3.1	**Train Route Acceptance**	**HED**
3.1.1	**General Requirements**	**HED**
1	Rolling stock operators proposing to operate rail traffic on the Queensland Rail network must apply for access to Queensland Rail Access and Business Strategy and prior to any operation occurring must obtain:	QRR
1(a)	• an access agreement or internal access interface agreement	QRR
1(b)	• an Authority To Travel (ATT) for on-track tests or ad-hoc train movements	QRR
1(c)	• Train Route Acceptance (TRA)	QRR
2	As part of the access application process, the interface risks posed by the operation of a particular train service on the network must be assessed and managed through the train route acceptance process described in MD-10-170 Train Route Acceptance.	QRR
3	Rolling stock, and the rolling stock configuration, must be certified by the rolling stock operator as complying with the interface standards and authorised by Queensland Rail Operator Interface Section prior to operation on the network.	QRR
4	An item of rolling stock can be tested or audited at any time to ascertain if it is compliant with the interface standards.	QRR
3.1.2	**Train Criteria Factors**	**HED**
1	Rail traffic criteria to be considered by a rolling stock operator in its application for train route acceptance and during the interface risk assessment must include but not be limited to those factors listed below:	QRR
1(a)	• rolling stock brake systems	QRR
1(b)	• rolling stock compatibility with the electrical traction system	QRR
1(c)	• rolling stock compatibility with the signalling system	QRR
1(d)	• rail traffic safety systems	QRR
1(e)	• maximum speed	QRR
1(f)	• forces on the track (including out-of-balance forces such as hammer blow or lateral forces induced by excessive buff or draft forces)	QRR
1(g)	• static axle loads	QRR
1(h)	• rolling stock maintenance requirements	QRR
1(i)	• audible warning devices	QRR
1(j)	• communication systems and processes	QRR
1(k)	• compatibility with other rail transport operator's rolling stock (in an emergency)	QRR
1(l)	• wheel profiles	QRR
1(m)	• draw-gear strength	QRR

Clause	Requirements	Type
3.1.3	**Route Criteria Factors**	**HED**
1	Route criteria to be considered by a rolling stock operator in its application for train route acceptance and during the interface risk assessment must include but not be limited to those factors listed below:	QRR
1(a)	• train brake systems and stopping distances	QRR
1(b)	• rolling stock compatibility with the electrical traction system (including pantograph separation and generation of harmonics)	QRR
1(c)	• rolling stock compatibility with the signalling system	QRR
1(d)	• train safety systems	QRR
1(e)	• allowable rolling stock outline	QRR
1(f)	• allowable loading outline	QRR
1(g)	• allowable axle loads	QRR
1(h)	• grades and the ability of the train to stop, hold and start	QRR
1(i)	• train marshalling	QRR
1(j)	• length of crossing loops	QRR
1(k)	• facilities for passengers (including emergency detraining)	QRR
1(l)	• facilities for freight handling	QRR
1(m)	• detection and/or removal of overloads	QRR
1(n)	• contamination of ballast (e.g. oil, fuel, ashes, load spillage)	QRR
1(o)	• safeworking system	QRR
1(p)	• communication systems and processes	QRR
1(q)	• locomotive load tables	QRR
1(r)	• loading security	QRR
1(s)	• dangerous goods	QRR
1(t)	• speed of trains	QRR
1(u)	• draft and buff forces	QRR
1(v)	• track standards (for example - rail gauge, maintenance tolerances)	QRR
1(w)	• track curve and cant	QRR
1(x)	• operation of signalling / track circuits	QRR
1(y)	• ability to maintain train path	QRR
1(z)	• train handling (risk of derailment)	QRR
1(aa)	• legislative requirements	QRR

Clause	Requirements	Type
1(ab)	• noise	QRR
1(ac)	• environment	QRR
1(ad)	• water quality	QRR
1(ae)	• waste management	QRR
1(af)	• air pollution	QRR
1(ag)	• rolling stock limitations	QRR
3.1.4	**Interface Risk Assessment**	**HED**
1	The rolling stock operator must conduct an interface risk assessment jointly with Queensland Rail Access and Business Strategy to identify risks posed between the operation of the proposed rail traffic service and;	QRR
1(a)	• other rail traffic services	QRR
1(b)	• the rail infrastructure	QRR
1(c)	• workers	QRR
1(d)	• the public	QRR
1(e)	• the environment	QRR
2	Rolling stock operators seeking train route acceptance must advise Queensland Rail Access and Business Strategy of:	QRR
2(a)	• known limitations applicable to the rolling stock that may affect its operation on the network (eg unusual design features, non-standard couplings etc)	QRR
2(b)	• dangerous goods, out-of-gauge loads or other loadings that may have route • restrictions	QRR
2(c)	• legislative requirements (eg competent authority restrictions on the carriage of dangerous goods)	QRR
3.1.5	**Interface Risk Management Plan (IRMP)**	**HED**
1	The rolling stock operator must produce an IRMP jointly with Queensland Rail Access and Business Strategy detailing how the identified risks will be managed.	QRR
2	The rolling stock operator must liaise with Queensland Rail Access and Business Strategy in the development of the IRMP at the earliest possible stage so that all issues are included and concerns resolved as soon as possible.	QRR
3	The IRMP must:	QRR
3(a)	• detail each interface risk, that is identified and assessed in the interface risk • assessment.	QRR
3(b)	• detail the agreed control measures.	QRR
3(c)	• detail the responsibility for implementing each agreed control measure	QRR
3(d)	• identify which sections of the interface standard are applicable to the proposed train service	QRR
3(e)	• outline how and when the control measures must be implemented and refer to any supporting documentation as necessary	QRR

Clause	Requirements	Type
3(f)	• include a justification for any intended non-compliance with any agreed interface standard or element thereof	QRR
3(g)	• document the audit, inspection and review regime agreed with Queensland Rail Access and Business Strategy	QRR
3(h)	• be updated as necessary to reflect changes that occur	QRR
3.1.6	**On-Track Testing**	HED
1	Validation of new rolling stock or new rail traffic configuration compliance with the interface standards may require on-track testing.	GUI
2	Where on-track testing of rolling stock, or rolling stock operating outside of its authorised performance, is to occur, a test plan must be produced detailing:	QRR
2(a)	• the tests to be carried out	QRR
2(b)	• the items which must be validated as conforming to the interface standards by the tests	QRR
2(c)	• the parameters to be measured and the results which will indicate conformance to the interface standards	QRR
2(d)	• a co-ordination plan which details the system interfaces associated with the testing program	QRR
2(e)	• a safety risk analysis to identify the hazards associated with the proposed testing, an evaluation of the risks associated with these hazards and the controls to be used to manage these risks during the testing	QRR
2(f)	• special conditions to be met for each of the tests to be carried out	QRR
2(g)	• nomination of a person responsible for ensuring that each of the special conditions is met prior to the commencement of testing	QRR
3	Prior to carrying out on-track tests of rolling stock or rail traffic configurations, the rolling stock operator must obtain an Authority To Travel (ATT) issued by Queensland Rail Operator Interface Section.	QRR
4	If testing indicates that there are non-compliances with the agreed interface standards, then the IRMP must be reviewed taking into account the non-compliances and the proposed control measures.	QRR
3.1.7	**Environmental Risk Management**	**HED**
1	Prior to the commencement of operations on the network, the rolling stock operator must have in place an environmental management system that addresses the environmental risks and controls identified in the IRMP.	QRR
3.1.8	**Train Route Acceptance (TRA)**	**HED**
1	Before being granted a TRA, the rolling stock operator must certify that:	QRR
1(a)	• the rolling stock complies with the agreed interface standards	QRR
1(b)	• the rolling stock configurations comply with the agreed interface standards	QRR
1(c)	• control measures agreed at the interface risk assessment have been or will be implemented prior to the train service operating	QRR
1(d)	• the train service will operate in accordance with the train route acceptance	QRR

Clause	Requirements	Type
2	Before being granted a TRA to operate on the Queensland Rail network, the rolling stock operator must have an access agreement or internal access interface agreement with Queensland Rail Access and Business Strategy.	QRR
3.2	**Rolling Stock Authorisation**	**HED**
3.2.1	**General Requirements**	**HED**
1	Rolling stock (new or existing) to be operated on the Queensland Rail network must not be operated until authorised by Queensland Rail Operator Interface Section.	QRR
2	Authorisation will be recorded, or amended, by Queensland Rail Operator Interface Section once the rolling stock operator has demonstrated compliance by issued a certificate of interface compliance for the rolling stock and a certificate of compliance for the rolling stock configurations.	QRR
3	The rolling stock operator must have an auditable process to verify that:	QRR
3(a)	• rolling stock and rolling stock configurations are designed and constructed by people competent to perform the activity	QRR
3(b)	• validation and verification has been conducted to confirm that the rolling stock and rolling stock configurations have been designed and constructed competently	QRR
3(c)	• records are kept of validated safety critical performance parameters	QRR
4	A suitable process may include:	GUI
4(a)	• compliance plan	GUI
4(b)	• certificate of design conformance	GUI
4(c)	• certificate of construction conformance	GUI
4(d)	• certificate of type testing conformance	GUI
3.2.2	**Compliance Plan**	**HED**
1	A compliance plan may be developed to address each section of the interface standard that contains a rolling stock technical or physical safety requirement.	GUI
2	The compliance plan may contain the following:	GUI
2(a)	• the requirements of each section of the interface standard that are relevant to the rolling stock's intended operation and with which there is an intention to comply	GUI
2(b)	• the requirements that are not relevant to the rolling stock and justification as to why they are not relevant	GUI
2(c)	• the requirements that are relevant to the rolling stock but cannot be complied with and the alternative controls that control risk to the same level	GUI
3	Where it is intended to use a program of type and routine testing for a series of vehicles, this information should be clearly identified in the compliance plan.	GUI
4	The compliance plan should be drafted at the initial planning phase of new rolling stock and rolling stock configurations or modifications.	GUI
5	The plan should be updated as necessary to reflect changes which occur during the design, construction, and testing stages.	GUI

Clause	Requirements	Type
6	The plan may be submitted to Queensland Rail Operator Interface Section for comment at the earliest possible stage to allow concerns to be resolved as soon as possible.	GUI
7	If non-compliance with a section of the interface standards is proposed, alternative control measures must be used that provide a level of risk equivalent to or lower than that achieved by the interface standard.	QRR
3.2.3	**Certificate of Design Conformance**	**HED**
1	The certificate of design conformance, signed by a person competent to make such an assessment, is the documented evidence that the compliance activities defined in the design stage of the compliance plan have been satisfactorily completed.	GUI
2	Any deviations or unsatisfactory results should be detailed as special conditions on the certificate of design conformance.	GUI
3.2.4	**Certificate of Type Testing Conformance**	**HED**
1	The certificate of type testing conformance, signed by a person competent to make such an assessment, is the documented evidence that a process of physical testing, as intended in the design phase, validates the rolling stock's safety performance.	GUI
2	Any deviations or unsatisfactory results should be detailed as special conditions on the certificate of type testing conformance.	GUI
3.2.5	**Certificate of Construction Conformance**	**HED**
1	The certificate of construction conformance, signed by a person competent to make such an assessment, is the documented evidence that the compliance activities defined in the construction stage of the compliance plan have been satisfactorily completed.	GUI
2	Any deviations or unsatisfactory results should be detailed on the certificate of construction conformance.	GUI
3	A certificate of construction conformance may be for one or several items of rolling stock.	GUI
4	Routine tests may be considered part of the construction phase and should be covered by the certificate of construction conformance.	GUI
5	Where a design change occurs, subsequent to the issue of the certificate of construction conformance, an amended certificate should be issued to indicate that the construction of the design change has been validated as complying with the requirements of the design.	GUI
3.2.6	**Certificate of Interface Compliance**	**HED**
1	The certificate of interface compliance must not be issued until the rolling stock operator has validated the compliance of the rolling stock.	QRR
2	The certificate of interface compliance must detail the following:	QRR
2(a)	• a description of the rolling stock type and its purpose	QRR
2(b)	• the details of the rolling stock for which the certificate is applicable, in line with section 3.2.11	QRR
2(c)	• any special conditions relating to the use of the rolling stock resulting from the verification and validation processes required under this standard, and an expiry date if relevant for a special condition	QRR

Clause	Requirements	Type
2(d)	• non compliances with interface standards	QRR
3	On-track tests of rolling stock, or rolling stock which has had rolling stock modifications, requires that an interim certificate of interface compliance be issued for the rolling stock prior to carrying out these tests.	QRR
3.2.7	**Certificate of Compliance - Rolling Stock Configurations**	**HED**
1	The certificate of compliance for rolling stock configurations must not be issued until the rolling stock operator has validated the compliance of the rolling stock configurations.	QRR
2	The certificate of compliance must detail the following:	QRR
2(a)	• a description of the rolling stock configurations	QRR
2(b)	• the details of the rolling stock configuration for which the certificate is applicable, in line with section 3.2.12	QRR
2(c)	• any special conditions relating to the use of the rolling stock configuration resulting from the verification and validation processes required under this standard, and an expiry date if relevant for a special condition	QRR
2(d)	• non compliances with interface standards	QRR
3	On-track tests of rolling stock configurations, or rolling stock configurations which have had modifications, requires that an interim certificate of compliance be issued for the rolling stock configurations prior to carrying out these tests.	QRR
3.2.8	**Authorisation of Rolling Stock**	**HED**
1	New rolling stock or modified rolling stock must have a certificate of interface compliance certified by a competent signatory agreed with Queensland Rail Operator Interface Section.	QRR
2	An authorisation of rolling stock request is made to Queensland Rail Operator Interface Section.	QRR
3	If the certificate of compliance is accepted by Queensland Rail Operator Interface Section, the rolling stock details will be entered into the rolling stock authorisation system and the applicant advised.	QRR
4	Authorisation of rolling stock does not convey any authority to operate rolling stock on the Queensland Rail network.	QRR
3.2.9	**Authorisation of Rolling Stock Configurations**	**HED**
1	New rolling stock configurations or modified rolling stock configurations must have a certificate of compliance certified by a competent signatory agreed with Queensland Rail Operator Interface Section.	QRR
2	An authorisation of rolling stock configuration request is made to Queensland Rail Operator Interface Section.	QRR
3	If the certificate of compliance is accepted by Queensland Rail Operator Interface Section, the rolling stock configuration details will be entered into the rolling stock authorisation system and the applicant advised.	QRR
4	Authorisation of rolling stock configurations does not convey any authority to operate those rolling stock configurations on the Queensland Rail network.	QRR

Clause	Requirements	Type
3.2.10	**Interim Authorisation**	**HED**
1	Where it is required to operate rolling stock before final certification:	QRR
1(a)	• an interim certificate of compliance must be issued by the rolling stock operator, certified by a competent signatory agreed with Queensland Rail Operator Interface Section, and	QRR
1(b)	• an interim authorisation request made to Queensland Rail Operator Interface Section	QRR
2	Instances where interim authorisation is required include:	QRR
2(a)	• carrying out on-track testing for validation against relevant sections of the interface standard	QRR
2(b)	• where there is a need to move unauthorised rolling stock or rolling stock configurations under controlled conditions	QRR
2(c)	• rolling stock that has failed or deteriorated in such a way that it is no longer compliant with relevant sections of the interface standard	QRR
3	If the interim certificate of compliance is accepted by Queensland Rail Operator Interface Section, the rolling stock and configuration details will be entered into the rolling stock authorisation system.	QRR
4	Interim authorisation of rolling stock does not convey any authority to operate or move rolling stock on the Queensland Rail network.	QRR
3.2.11	**Rolling Stock Data**	**HED**
1	The following data is considered safety critical for operational purposes and must be included in the Certificate of Interface Compliance:	QRR
1(a)	• vehicle class	QRR
1(b)	• vehicle number	QRR
1(c)	• validity date	QRR
1(d)	• vehicle type	QRR
1(e)	• track gauge	QRR
1(f)	• vehicle tare	QRR
1(g)	• gross mass	QRR
1(h)	• vehicle length over coupling centrelines	QRR
1(i)	• number of axles	QRR
1(j)	• maximum axle load	QRR
1(k)	• maximum operating speed empty	QRR
1(l)	• maximum operating speed loaded	QRR
1(m)	• draw gear type	QRR
1(n)	• structure rating	QRR
1(o)	• rolling stock outline with which it complies	QRR

Clause	Requirements	Type
1(p)	• general arrangement drawing with principal dimensions and axle spacing	QRR
1(q)	• brake type	QRR
3.2.12	**Rolling Stock Configuration Data**	**HED**
1	The following data is considered safety critical for operational purposes and must be included in the Rolling Stock Configuration Certificate of Compliance:	QRR
1(a)	• proposed routes	QRR
1(b)	• details of each configuration (ie vehicle classes and order)	QRR
1(c)	• rail traffic type	QRR
1(d)	• maximum train gross tonnes (excluding hauling locomotives)	QRR
1(e)	• maximum comparison train length	QRR
1(f)	• maximum operating speed empty	QRR
1(g)	• maximum operating speed loaded	QRR
1(h)	• maximum axle load	QRR
1(i)	• does train convey out-of-gauge loads or rolling stock	QRR
1(j)	• any marshalling restrictions	QRR
3.3	**Safeworking**	**HED**
3.3.1	**General Requirements**	**HED**
1	The following safeworking documents must be referred to for any other information or requirements when operating on the Queensland Rail network:	QRR
1(a)	• MD-10-107 - General Operational Safety Manual	QRR
1(b)	• MD-10-109 - Observance of Signals Manual	QRR
1(c)	• MD-12-189 - Queensland Network Rules and Procedures	QRR
1(d)	• MD-10-111 - Remote Controlled Signalling Manual	QRR
1(e)	• MD-10-113 - Direct Traffic Control Manual	QRR
1(f)	• MD-10-114 - Staff and Ticket Manual	QRR
1(g)	• MD-10-117 - Automatic Train Protection (ATP) Manual	QRR
1(h)	• MD-10-119 - Automatic Warning System (AWS) Operations Manual	QRR
3.3.2	**Transportation of Dangerous Goods**	**HED**
1	Rolling stock operators transporting dangerous goods on the Queensland Rail network must have in place a documented emergency plan for containment and clean-up of all products at all locations the goods are to be transported.	QRR

Clause	Requirements	Type
2	Rolling stock operators transporting dangerous goods on the Queensland Rail network must have a 24 hour dangerous goods emergency response advice specialist.	QRR
3	The advice specialist must provide Queensland Rail and emergency services with advice on products potentially involved in a dangerous goods incident and advice concerning the rolling stock operator's rolling stock and procedures.	QRR
4	Rolling stock operators transporting dangerous goods must provide Queensland Rail with the details, for review, of all dangerous goods consignments before the train will be allowed to enter the Queensland Rail network.	QRR
5	Bulk flammable liquids, toxic gas, bulk flammable gas, explosives, radioactive and infectious materials must not travel between Roma Street and Bowen Hills via Central Station	QRR