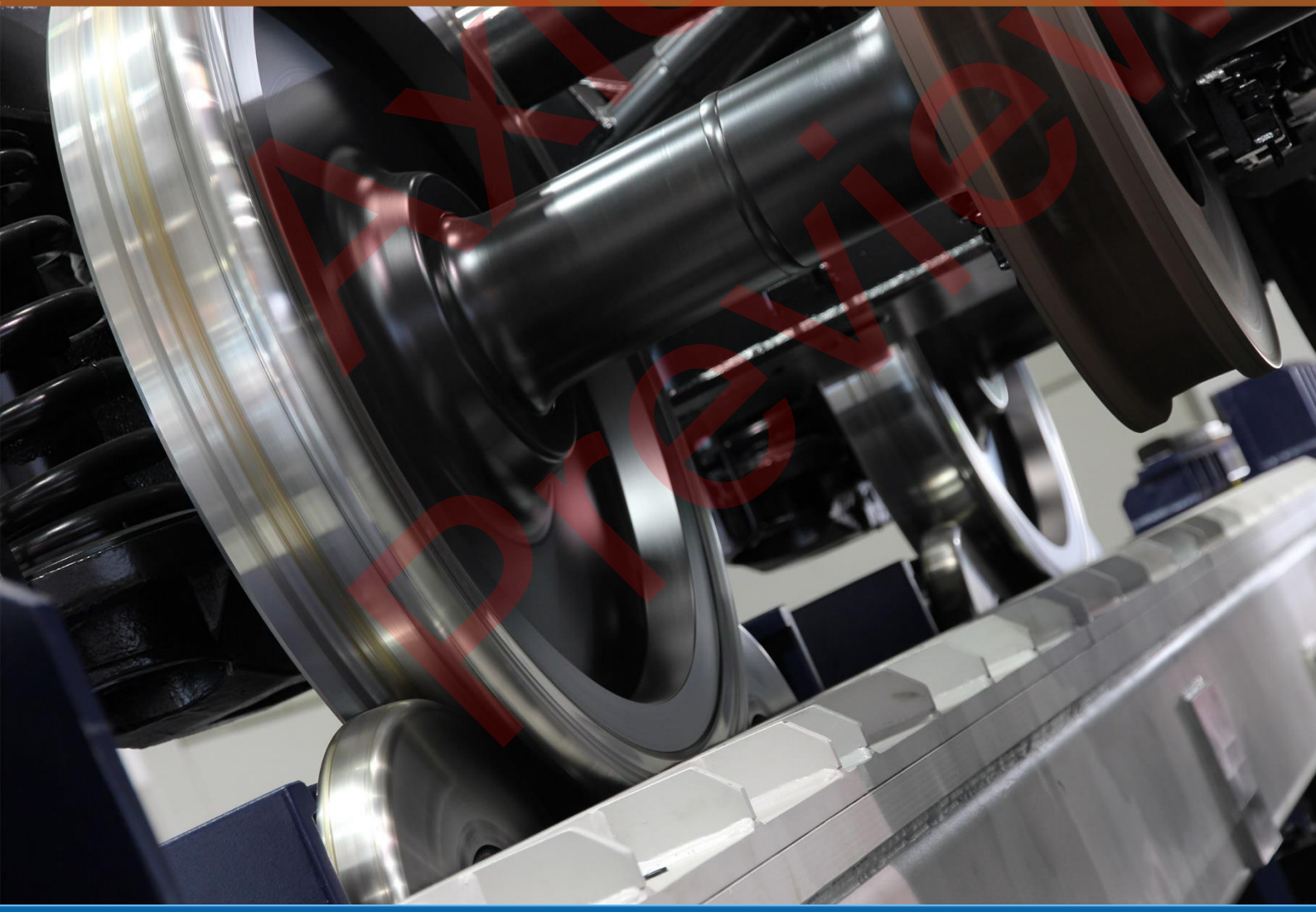
AS 7515:2014

Australian STANDARD®

Axles

RISSB
RAIL INDUSTRY SAFETY AND STANDARDS BOARD

Rolling Stock Standard



This Australian Railway Standard AS 7515 Axles was prepared by the RISSB Development Group. It was signed off by the Development Group and the Rolling Stock Standing Committee in October, 2014 and subsequently by the Development Advisory Board (DAB) in October, 2014. The DAB confirmed that the process used to develop the standard was in accordance with the RISSB accredited development process. On November 10, 2014 the RISSB Board approved the Standard for release.

Kevin Taylor
Chief Executive Officer
Rail Industry Safety and Standards Board

The following organisations were represented on the RISSB Development Group:

UGL Limited	Gemco Rail	Marais Consulting Engineers
Hardchrome Engineering	Transport for NSW	Downer
Bradken	Public Transport Authority of Western Australia	Bombardier Transportation

This standard was issued on two occasions for open review and was independently validated before being signed off and the approvals granted.

RISSB wish to acknowledge the participation of the expert individuals that contributed to the development of this Standard through their representation on the committees and through the open review periods.

Keeping Standards up-to-date

Australian Standards developed by RISSB are living documents that reflect progress in science, technology and systems. To maintain their currency, all Standards are reviewed every five years, and new editions are published. Between editions, amendments may be issued.

Australian Standards developed by RISSB may also be withdrawn. It is important that readers assure themselves they are using a current RISSB Standard, which should include any amendments that may have been published since the Standard was published.

Information about Australian Standards to be developed by RISSB, drafts, amendments, and new projects can be found by visiting www.rissb.com.au

RISSB welcomes suggestions for improvements, and encourages readers to notify it immediately of any apparent inaccuracies or ambiguities. Contact us via email at rissb@rissb.com.au or write to Rail Industry Safety and Standards Board, PO Box 4608, Kingston, ACT 2604.

AS 7515:2014

Axles

First published as AS 7515.1:2007, AS 7515.2:2007, AS 7515.3: 2007 and AS 7515.4:2007.

Copyright

Published by Rail Industry Safety and Standards Board (RISSB) ABN: 58 105 001 465

P O Box 4608, Kingston, ACT, Australia 2604.

ISBN 978-1-76035-028-4

Notice to Users

This RISSB product has been developed using input from rail experts from across the Rail Industry and represents good practice for the industry. The reliance upon or manner of use of this RISSB product is the sole responsibility of the user who is to assess whether it meets their organisation's operational environment and risk profile.

Justification

Specification of the Standard

The Australian Rolling Stock Standard AS 7515 Axles describes the requirements for the design, manufacture and maintenance of rolling stock axles which are designed for operating speeds up to and including 200 km/hr. It aims to prevent derailments caused by failure of axles.

It includes the design and manufacture of axles for new rolling stock and requirements for existing rolling stock, but excludes the operation of rolling stock, and axles used on light rail, cane railway and monorail networks. It specifies:

- That axles shall be designed for infinite life
- Suitable Australian standard grades of steel
- Axle identification, inspection and records to be kept
- Actions to be taken following in-service defects and derailments
- Repair, remanufacture and service of axles.

The standard describes acceptable good practice such as:

Magnetic particle inspection of axle wheel seats and bearing journals, including transition radii, shall be performed whenever the wheels are removed from the axle.

It also describes recommended better practices such as:

Axles should be visually inspected following incidents that could cause damage to the axles, such as draw gear failures or collisions with objects on the track.

The AS 7515 Axles standard was developed using Australian (including company specific) and international standards as a baseline, including those referenced in Section 1.4 of AS 7515 Axles.

In particular the standards that were used a basis for this standard include:

- AS 1171 Non-destructive testing - Magnetic Particle testing of ferromagnetic products, components and structures
- AS 1403 Design of rotating steel shafts
- AS 1442 Carbon steels and carbon-manganese steels - Hot-rolled bars and semi-finished products
- AS 1444 Wrought alloy steels - Standard and hardenability (H) series
- AS 1448 Carbon steels and carbon-manganese steels - Forgings (ruling section 300 mm maximum)
- AS 4292 Railway safety management

A list of hazards addressed by this standard is contained in the Hazard Register.

Identification of Benefits

Adoption of the standard is expected to contribute to safety of rolling stock, reliability of axles, standardisation of parts and the commensurate reduction in associated costs.

There is a strong industry demand for rolling stock standards (of which this the previous version of this standard was a key part), which has been measured by their likely adoption rate.

The 2014 RISSB Products Survey found current adoption rates for RISSB rolling stock products at 53% of industry surveyed, with a likely future increase to 90% of potential users. Specifically, adoption rates for AS 7515 Axles will increase from 51% to 78%.

The 2014 Products Survey reported an estimated safety risk reduction of 9%; and reductions of 8% and 9% for operational cost and training cost respectively, following adoption of RISSB products.

Valuation of the Benefits

D-Rail 2012 Report estimated a direct damage cost of 24700€ (approximately $35,000) per derailment[1]. The average economic cost of train derailments was estimated to be around $30 million per annum, compared to the total burden of railway safety incidents at approximately $360.1 million per annum. By helping to reduce derailment risks, AS 7515 can deliver a significant economic benefit. Further, significant indirect benefits could accrue from the rail industry implementing harmonised national standards. These cost savings were estimated to be approximately 1.4% for operational costs and 3.8% for both capital expenditure and training costs.[2]

The potential benefit from the AS 7515 Railway Rolling Stock Axles Standard was estimated at approximately $0.5 million per year (or present value of $3.2 million over the next 10 years). This estimate was derived from the 2014 RISSB products survey which also reported that the estimated benefit of the 21 rolling stock standards survey for rail safety performance, operational cost savings and workforce training costs were $3.6 million, $28.4 million, and $150K respectively. In total, the expected benefit for adopting the 21 rolling stock standards was $32.1 million per year.

Cost of Implementation

Adoption of the AS 7515 Axles standard is not expected to impose significant additional cost on the industry as it is consistent with existing practice and product offerings, with the equipment supply sector to respond by incorporating relevant requirement in their product development cycle. The previous version of this standard has been extant and in-use for over five years.

Case Studies

(a) Derailment of XPT Passenger Train ST22, Harden New South Wales, 9 February 2006

(b) Derailment of Pacific National Service MC92, Clifton, 23 November 2011

This standard contains controls considered so far as reasonably practicable, at the time of writing, to mitigate or contribute to the mitigation of the hazards that led to this incident.

[1] Development of the Future Rail Freight System to Reduce the Occurrences and Impact of Derailment, Report on Derailment Economic Impact Assessment, D-Rail November 2012
[2] Strategex estimates based on 'Cost Benefit Analysis of RISSB and its products' report by AECOM ("CBA of RISSB Products (2012) ").

Diligent, risk-based adoption of this standard, integrated with appropriate operational and safe working rules (such that the axle performance meets the requirements of the standard at all times) should help to prevent similar incidents from occurring in future.

Broader Industry and Economic Benefits

Development of a more complete suite of RISSB rolling stock products is expected to promote their recognition and further adoption by industry members, leading to greater harmonisation in the rail industry. A more harmonised national rail industry can become more competitive with other modes of transport, road in particular, by becoming more cost efficient through lower equipment cost and lower operating costs. Induced mode transfer (shifting passengers and freight from road to rail) can result in reduction of harmful emissions and road congestion.

The Cost Benefit Analysis of RISSB Products Report (2012) estimated the benefit cost ratio of investment in RISSB products for the industry at approximately 17 to 1 (i.e. for every $1 spent, the industry receives $17 of benefits). In addition, the broader economic benefits to the national economy have been estimated at between $92-142 million per year.

Application of the AS 7515 Axles is expected to deliver benefits to its individual users as well as contributing to the overall rail harmonisation process.

Document Control

Identification

Document Title	Date
AS 7515:2014 Axles	10 November 2014

Document History

Publication Version	Published Date	Page(s) Affected	Reason for and Extent of Change(s)
2014	10/11/2014	All	Review & four documents consolidated into one.
2007	14/12/2007	All	First published

Approval

Name	Date
Development Advisory Board (DAB)	30/10/2014
Rail Industry Safety and Standards Board (RISSB)	10/11/2014

Standard Change Procedures

RISSB maintains the master for this document and publishes the current version on the RISSB website.

Any changes to the content of this publication require the version number to be updated.

Changes to this publication must be approved according to the procedure for developing management system documents.

RISSB will identify and communicate changes to this publication.

Contents

Appendix Contents

1 Introduction

1.1 Purpose

This document describes requirements for rolling stock axles.

The main purpose of the requirements is to reduce the risk of derailment arising from axle failure.

1.2 Scope

Sections 2, 3 and 4 of this document apply to new rolling stock axles, all other sections apply to new and existing rolling stock axles.

New axles are considered to be new axle designs, and axles modified to be used in new applications.

The document covers the design, manufacture and maintenance of rolling stock axles.

Operation of rolling stock is not covered.[3]

Rolling stock axles used on light rail, cane railway and monorail networks are not covered.[4]

This standard applies to axles designed for operating speeds up to and including 200 km/hr.

1.3 Compliance

There are two types of control contained within RISSB Standards:

(a) mandatory requirements

(b) recommended requirements

Each of these types of control address hazards that are deemed to require controls on the basis of existing Australian and international Codes of Practice and Standards.

A **mandatory** requirement is a requirement that the standard provides as the only way of treating the hazard.

Mandatory requirements are identified within the text by the term shall.

A **recommended** requirement is one where the standard recognises that there are limitations to the universal application of the requirement and that there may be circumstances where the control cannot be applied or that other controls may be appropriate or satisfactory, subject to agreement with the Rolling Stock Operator, Rail Infrastructure Manager and/or Rail Safety Regulator.

Recommended requirements are to be considered when compliance with the standards is being assessed.

Recommended requirements are identified within the text by the term should.

Hazards addressed by this standard are included in an appendix. Refer to the RISSB website for the latest Hazard Register Guideline: www.rissb.com.au

[3] Operation of rolling stock is covered in the Operations section of the Code.
[4] Currently excluded.