AS 7637:2014

Australian STANDARD®

Hydrology and Hydraulics

RISSB
RAIL INDUSTRY SAFETY AND STANDARDS BOARD

Infrastructure Standard

This Australian Railway Standard AS 7637 Hydrology and Hydraulics was prepared by the RISSB Development Group. It was signed off by the Development Group and the Infrastructure Standing Committee in May, 2014 and subsequently by the Development Advisory Board (DAB) in August, 2014. The DAB confirmed that the process used to develop the standard was in accordance with the RISSB accredited development process. On September 08, 2014 the RISSB Board approved the Standard for release.

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Aurizon	ATRS	RISSB
CMT Solutions		

This standard was issued for an open review and was subject to a combined workshop. It was also 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.

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Justification

Specification of Standard

The AS7637 Hydrology and Hydraulics describes the hydrologic and hydraulic requirements (functions, performance, design constraints and risk attributes) for the design and assessment of railway infrastructure in relation to all forms of drainage and flood-prone areas. The Standard provides a framework that promotes consistency and efficiency in design, construction, commissioning, maintenance, monitoring and decommissioning of track drainage and waterway crossings.

The scope of the Standard covers public and private railways and railway drainage systems on a whole of life basis, and any other drainage related work affecting the rail corridor. The subgrade is given equal importance for track performance as rail and ballast. This Standard addresses primarily the hydraulic design of surface and sub-surface drainage systems including river and floodway crossings, culverts, pipes, channels, pits and grates.

The Standard has included reference to a number of Australian standards as well as AS4292, the Australian guide to flood estimation and the Rail National Safety Law and its state based equivalents.

Objectives of Standard

The purpose of AS7637 is to specify the requirements for the adequate planning and design procedures, and the development of a Flood Management Plan and Emergency Response Plan so as to mitigate flood risk to railway infrastructure, rail traffic and personnel. AS7637 Flood Risk Assessment gives consideration to: tolerability of the existing flood risk, location of existing flood risks, future flood risks, cultural and social impact.

The 2014 RISSB Products Survey reported an average reduction of 11% in safety risks that may result from adoption of RISSB products in the infrastructure products category (AS7637 was not included in the survey because it had not been published at that stage). Based on these assessments, it is broadly concluded that adoption of the AS7637 is likely to lead to a significant reduction in the risks associated with rail incidents.

Identification of Benefits

An important indicator of the benefit of AS7637 Hydrology and Hydraulics is the level of industry demand for this standard, which is measured by its likely adoption rate. While the AS7645 Standard was not included in the 2014 RISSB Products Survey, 15 infrastructure standards and the Code of Practice were listed. The 2014 survey results indicate that adoption rates for RISSB infrastructure products are high, currently at around 38% and likely to increase in future to 78% of potential users . This result, together with the fact that AS7637 helps to complete existing suite of products, suggests that the industry demand for the standard and its adoption rate following introduction will likely be high.

Another important indication of the benefit of AS7637 is the estimated benefits of RISSB infrastructure products to their users. The 2014 Products Survey reported the following possible

reductions in risks and operating costs for adopting members of infrastructure products: 11% for safety risk, 14% for asset costs, 11% for operational costs and 6% for training costs. In addition, users rated potential operational improvement at 5.4 (from 1 to10). Based on these estimates and as AS7637 Standard also helps to complete an existing suite of RISSB infrastructure products, its adoption is expected to lead to significant benefits.

Valuation of the Benefit

The average annual economic burden of railway safety incidents during the past 8 years was estimated to be approximately $360.1 million. The safety incidents included in this estimation are Signals Passed at Danger (SPADs), signal restored, level crossing collisions – persons and vehicles, load irregularity, fatalities and serious injuries (excluding level crossing) and collisions (trains, rolling stock, infrastructure) . The significant amount of economic burden associated with safety incidents in Australia means that a small percentage improvement in safety performance can translate into a significant economic benefit.

The quantification of the benefit that would be obtained from AS7637 Hydrology and Hydraulics is estimated to be $2.4 million per year or present value of $16.6 million over the next 10 years. This estimate was derived from the 2014 RISSB products survey which reported that the estimated benefit of the 16 infrastructure standards for rail safety performance, asset cost savings, operational cost savings and workforce training costs were $3.2 million, $16.8 million, $27.3 million and $100K respectively. In total, the total benefit for adopting the 16 infrastructure standards was $47.3 million per year.

Cost of Implementation

Adoption of the AS7637 is not expected to impose significant additional cost on the industry, with Rail Infrastructure Managers incorporating relevant requirements in their business practice.

Case Study

A land slip caused a brick wall to collapse onto Harris Park train station in Sydney's west (July 2013). The spokesman said heavy rain caused the wall to collapse. The tracks and platform at the station were covered with debris after the retaining wall gave way about 5.50pm on Sunday. It was very fortunate that there wasn't a train at the time and nobody was injured. Rail passengers heading west out of central Sydney experienced delays for several following days. The imputed cost of this incident would amount to several million dollars, if the risks of fatalities and injuries were factored into the assessment.

In December 2011, a freight trained derailed at the Edith River rail bridge near Katherine in the Northern Territory. This derailment resulted in injury to train crew and significant damage to the bridge and train rolling stock. The Australian Transport Safety Bureau (ATSB) investigation found that the derailment was caused by a track collapse resulting from wash away caused by torrential rains in the aftermath of cyclone 'Grant'. Estimated costs of bridge repair for this incident exceeds 4 million dollars.

The requirements of the AS7637 Standard will help avoid these types of incidents from occurring in the future.

http://www.smh.com.au/nsw/wall-collapse-at-train-station-in-sydneys-west-20130630-2p5kq.html#ixzz3B5VewwYc

http://www.atsb.gov.au/publications/investigation_reports/2014/rair/ro-2014-014.aspx

Broader Industry and Economic Benefits

Development of a more complete suite of RISSB infrastructure products will promote their recognition and further adoption by industry members which, leads to greater harmonisation in the rail industry. A more harmonised national rail industry will be more cost-efficient as well as being more competitive with other modes of transport, in particular, road transport, which, in turn, brings the following benefits: lower equipment cost, lower operating costs and cost competitive rail. Induced mode transfer (shifting passengers and freight from road to rail) can result in GHG reductions and road decongestion.

The CBA 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.

Release of the AS7637 Hydrology and Hydraulics Standard can deliver benefits to its individual users as well as contributing to the overall rail harmonisation process.

Document Control

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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.

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Preface

The aim of this Standard is to describe the hydrological and hydraulic requirements (functions, performance, design constraints and risk attributes) for the design and assessment of railway infrastructure in relation to whole-of-life approach to the management of hydrological and hydraulic design. This approach includes the requirements in relation to hydrological and hydraulic requirements in terms of design, supply, construction and maintenance of track in relation to drainage and flood-prone areas for a range of operational track gauges used in Australia.

For the purposes of this Standard, all clauses containing the term 'shall' are considered mandatory requirements; all clauses containing the term 'should' are considered recommendations, and all other clauses are explanatory statements.

All RISSB standards provide controls for hazards contained in RISSB's hazard guideline. In this particular standard, the reference number of the hazard being addressed is identified in an attached appendix. RISSB's hazard guideline can be found on the RISSB website at www.rissb.com.au.

1 Introduction

1.1 Purpose

This Standard describes the hydrological and hydraulic requirements (functions, performance, design constraints and risk attributes) for the design and assessment of railway infrastructure in relation to all forms of drainage and flood-prone areas.

This Standard is intended to govern public and private railways and railway drainage systems on a whole of life basis, and any other drainage related work affecting the rail corridor.

The subgrade is considered to be equally important for track performance as rail and ballast, and the main purpose of this Standard is to provide a framework that promotes consistency and efficiency in design, construction, commissioning, maintenance, monitoring and decommissioning of track drainage and waterway crossings.

This Standard is concerned primarily with the hydraulic design of surface and sub-surface drainage systems including river and floodway crossings, culverts, pipes, channels, pits and grates.

1.2 Scope

The scope of this Standard covers hydrological and hydraulic requirements for construction of new railways and maintenance of existing lines. Requirements to be considered include:

(a) drainage and stability of the track formation, supporting embankments, associated cuttings (including rock faces) and access roads adjacent to the track

(b) all track, whether placed on natural surface or constructed on formation or structures such as bridges and concrete supports

(c) levees, basins, diversion drains, stream training and interconnecting catchments.

This Standard covers the management of surface run off only, through either above or below ground (underground) drainage systems, but is not intended to cover the management of ground water flows (i.e. hydrogeology).