AS 4825—2011

Australian Standard®

Tunnel fire safety

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The following are represented on Committee FP-023:

- AUSTROADS
- Australasian Fire and Emergency Service Authorities Council
- Australian Automobile Association
- Australian Tunnel Operators Group
- CSIRO Manufacturing and Materials Technology
- Engineers Australia
- Fire Protection Association Australia
- Main Roads Department, Queensland
- Main Roads Western Australia
- Society of Fire Safety
- RailCorp
- Risk Management Institution of Australasia
- Roads and Traffic Authority of NSW

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Standards Australia wishes to acknowledge the participation of the expert individuals that contributed to the development of this Standard through their representation on the Committee and through the public comment period.

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PREFACE

This Standard was prepared by Standards Australia Committee FP-023, Tunnel Fire Safety.

Whilst a number of existing overseas Standards and guidance documents were considered by the committee during the preparation of this first edition of the Standard, the document is not based upon any other Standard.

The committee decided that the most appropriate format for the Standard is to facilitate the current Australian practice of adopting a performance-based approach to fire safety in tunnels. Such an approach is reliant on fire safety engineering methodologies similar to those described in the *International Fire safety engineering Guidelines* which is extensively used in Australia for performance-based design for fire safety in buildings.

The Standard is intended to provide a generic framework for establishing the fire safety systems that are required in road, rail or bus tunnels to provide an acceptable level of safety in case of fire. This Standard is intended to guide professional fire safety engineers in the development of a fire safety strategy, the design and documentation of fire safety systems for tunnels.

Specifically, this Standard—

(a) recommends appropriate performances of the fire safety system;

(b) provides guidance on appropriate fire safety strategies;

(c) provides information on what may constitute appropriate trial concept design for various tunnels;

(d) does not restrict innovative approaches or new technology provided that the required performance can be demonstrated;

(e) outlines what may be appropriate analysis methodology;

(f) allows for both deterministic and probabilistic (risk-based) analysis and approach;

(g) specifies what may constitute appropriate acceptance criteria;

(h) provides general guidelines on system installation and maintenance, which is intended to facilitate making appropriate assumptions in the engineering analysis; and

(i) refers to other Standards providing greater detail where appropriate.

It is not the purpose of this Standard to prescribe an acceptable level of fire safety for tunnels rather to provide a framework for establishing the required fire safety systems.

As it not possible to prescribe either the fire safety measures or the analysis required, the Standard has been written as an ‘informative’ document providing guidance to competent designers to undertake a performance-based design for fire safety. Further, the information presented permits a systematic consideration of a fire safety strategy with fire safety measures that can form the input into the fire safety engineering analysis to demonstrate to stakeholders that an acceptable level of safety can be achieved by the design.

This Standard incorporates a Commentary on some Clauses. The Commentary directly follows the relevant Clause, is designated by ‘C’ preceding the Clause number and is printed in italics in a panel.

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FOREWORD

The design and implementation of fire safety measures and a management system for a tunnel will be influenced by the varying needs and operational requirements pertinent to the tunnel's use. Factors such as traffic volume, nature of vehicles, length of tunnel, and traffic conditions, all influence the risk and hence the level of safety within tunnels. Thus, fire safety measures that may be adequate to provide an acceptable level of risk under one set of operating conditions, may not be adequate under a different set of circumstances. Therefore, it is not possible to provide a prescriptive list of fire safety measures suitable for tunnels that, at first glance, are similar in specific characteristics (e.g. length).

The acceptability of a specific tunnel design is a matter for all the stakeholders, which include authorities having a regulatory function, in addition to the tunnel's owner and operator.

Fire safety engineering is an iterative process consisting of the evaluation of an initial concept design and a series of design assumptions that are tested through an analysis process. If the analysis reveals that the acceptance criteria are not met, then the concept design is modified until an acceptable outcome is obtained. The design assumptions used in the analysis then needs to be implemented in both the design and the built works to arrive at a tunnel with an acceptable level of safety.

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S E C T I O N 1 S C O P E A N D G E N E R A L

1.1 SCOPE

This Standard provides guidelines for fire safety in new road, rail and bus tunnels. It covers uni-directional and bi-directional tunnels of various lengths meeting the limitations outlined in Clause 1.3.

This Standard can be applied to tunnels involving vehicles with no drivers such as driverless trains, although special additional considerations may apply. For rail and bus tunnels, this Standard addresses the tunnel/station interface. This Standard addresses tunnels used to carry both passengers and freight, and the combustible materials and goods carried by those vehicles.

This Standard is not specifically intended for existing tunnels; however, the general principles may be applied to the upgrade of existing tunnels to improve fire safety. In the case of modification works to a tunnel, the modification should be treated as building a new tunnel for interpretation of this Standard. The existing constraints however, may limit the choice of fire safety measures that can be implemented. Such constraints may result in the fire safety measures not being able to fully satisfy the objective contained in this Standard.

1.2 OBJECTIVE

The objective of this Standard is to provide guidance on design, system selection, construction, operation and emergency management of road, rail and bus tunnels in order to satisfy fire safety objectives and other objectives identified by the stakeholders.

1.3 LIMITATIONS OF STANDARD

This Standard does not apply to the following types of tunnels:

(a) Tunnels that do not meet the definition of a tunnel in Clause 1.6.

(b) Funicular tunnels.

(c) Service tunnels.

(d) Pedestrian or bicycle tunnels.

(e) Railway and bus stations.

(f) Tunnels for vehicles with no persons onboard.

This Standard does not cover transportation of dangerous goods through tunnels.

NOTE: Transportation of dangerous goods usually involves a comprehensive risk assessment as to the optimum transportation route and other safety considerations. If dangerous goods or bulk fuels are to be transported through a tunnel, consideration should be given to any additional fire safety measures or precautions required to that are given in this Standard.

This Standard does not address fire safety during construction.

