AS 17757:2020

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Earth-moving machinery and mining — Autonomous and semi-autonomous machine system safety (ISO 17757:2019, MOD)

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Australian Industry Group
Better Regulation Division — SafeWork NSW
Construction and Mining Equipment Industry Group
Department of Natural Resources, Mines and Energy, Qld
Department of Regional NSW
Engineers Australia / Mining Electrical and Mining Mechanical Engineering Society
Institute of Instrumentation, Control & Automation Australia
Minerals Council of Australia
University of Queensland

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Preface

This Standard was prepared by the Standards Australia Committee ME-063, Earthmoving Equipment.

The objective of this document is to provide safety requirements for autonomous machines and semi-autonomous machines (ASAM) used in earth-moving and mining operations, and their autonomous or semi-autonomous machine systems (ASAMS). It specifies safety criteria both for the machines and their associated systems and infrastructure, including hardware and software, and provides guidance on safe use in their defined functional environments during the machine and system life cycle. It also defines terms and definitions related to ASAMS.

This document applies to autonomous and semi-autonomous versions of the earth-moving machinery (EMM) defined in ISO 6165 and of mobile mining machines used in either surface or underground applications. The principles of this document and many of its provisions can be applied to other types of ASAM used on the worksites.

This document addresses additional hazards specific and relevant to ASAMS when used as intended.

This document is not applicable to remote control capability (covered by ISO 15817) or function-specific automated features, except when those features are used as part of ASAMS.

This document is an adoption with national modifications, and has been reproduced from, ISO 17757:2019, *Earth-moving machinery and mining — Autonomous and semi-autonomous machine system safety*. The modifications are additional requirements and are set out in Appendix ZZ, which has been added at the end of the source text.

Appendix ZZ lists the variations to ISO 17757:2019 for the application of this document in Australia.

As this document has been reproduced from an International Standard, a full point substitutes for a comma when referring to a decimal marker.

Australian or Australian/New Zealand Standards that are identical adoptions of international normative references may be used interchangeably. Refer to the online catalogue for information on specific Standards.

The terms “normative” and “informative” are used in Standards to define the application of the appendices or annexes to which they apply. A “normative” appendix or annex is an integral part of a Standard, whereas an “informative” appendix or annex is only for information and guidance.

Contents

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 127, *Earth-moving machinery*, Subcommittee SC 2, *Safety, ergonomics and general requirements*, in collaboration with Technical Committee ISO/TC 82, *Mining*.

This second edition cancels and replaces the first edition (ISO 17757:2017), which has been technically revised.

The main changes compared to the previous edition are as follows:

— added EMC requirements;

— adapted braking and steering testing methods for autonomous operations;

— provided information on possible radio equipment restrictions;

— provided additional information for cyber security;

— provided an example of a form that can be used to show conformity to the individual requirements.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

This document is a type-C standard as stated in ISO 12100.

This document is of relevance, in particular, for the following stakeholder groups representing the market players with regard to machinery safety:

— machine manufacturers (small, medium and large enterprises);

— health and safety bodies (regulators, accident prevention organisations, market surveillance, etc.).

Others can be affected by the level of machinery safety achieved with the means of the document by the above-mentioned stakeholder groups:

— machine users/employers (small, medium and large enterprises);

— machine users/employees (e.g. trade unions, organizations for people with special needs);

— service providers, e. g. for maintenance (small, medium and large enterprises);

— consumers (in case of machinery intended for use by consumers).

The above-mentioned stakeholder groups have been given the possibility to participate at the drafting process of this document.

The machinery concerned and the extent to which hazards, hazardous situations or hazardous events are covered are indicated in the Scope of this document.

When requirements of this type-C standard are different from those which are stated in type-A or -B standards, the requirements of this type-C standard take precedence over the requirements of the other standards for machines that have been designed and built according to the requirements of this type-C standard.

Mining input for this document was obtained through liaisons with the GMG (global mining guidelines group) and the Western Australia Mobile Autonomous Machine Systems Working Group.

Australian Standard®

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1 Scope

This document provides safety requirements for autonomous machines and semi-autonomous machines (ASAM) used in earth-moving and mining operations, and their autonomous or semi-autonomous machine systems (ASAMS). It specifies safety criteria both for the machines and their associated systems and infrastructure, including hardware and software, and provides guidance on safe use in their defined functional environments during the machine and system life cycle. It also defines terms and definitions related to ASAMS.

It is applicable to autonomous and semi-autonomous versions of the earth-moving machinery (EMM) defined in ISO 6165 and of mobile mining machines used in either surface or underground applications. Its principles and many of its provisions can be applied to other types of ASAM used on the worksites.

Safety requirements for general mobile EMM and mining machines, as well as operators, trainers or passengers on the machine, are given by other International Standards (e.g. ISO 20474, ISO 19296). This document addresses additional hazards specific and relevant to ASAMS when used as intended.

It is not applicable to remote control capability (covered by ISO 15817) or function-specific automated features, except when those features are used as part of ASAMS.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 2867, *Earth-moving machinery — Access systems*

ISO 3450:2011, *Earth-moving machinery — Wheeled or high-speed rubber-tracked machines — Performance requirements and test procedures for brake systems*

ISO 5010:2007, *Earth-moving machinery — Rubber-tyred machines — Steering requirements*

ISO 6165, *Earth-moving machinery — Basic types — Identification and terms and definitions*

ISO 9533, *Earth-moving machinery — Machine-mounted audible travel alarms and forward horns — Test methods and performance criteria*

ISO 10265:2008, *Earth-moving machinery — Crawler machines — Performance requirements and test procedures for braking systems*

ISO 12100:2010, *Safety of machinery — General principles for design — Risk assessment and risk reduction*

ISO 13766-1, *Earth-moving and building construction machinery — Electromagnetic compatibility (EMC) of machines with internal electrical power supply — Part 1: General EMC requirements under typical electromagnetic environmental conditions*

ISO 13766-2, *Earth-moving and building construction machinery — Electromagnetic compatibility (EMC) of machines with internal electrical power supply — Part 2: Additional EMC requirements for functional safety*

ISO 19296, *Mining — Mobile machines working underground — Machine safety*

ISO 20474-1, *Earth-moving machinery — Safety — Part 1: General requirements*