

Australian/New Zealand Standard™

**Electrical equipment for coal mines—  
Introduction, inspection and  
maintenance**

**Part 1: For hazardous areas**



## **AS/NZS 2290.1:2014**

This Joint Australian/New Zealand Standard was prepared by Joint Technical Committee EL-023, Electrical Equipment for Mines and Quarries. It was approved on behalf of the Council of Standards Australia on 3 December 2013 and on behalf of the Council of Standards New Zealand on 12 December 2013. This Standard was published on 11 February 2014.

---

The following are represented on Committee EL-023:

Australian Cablemakers Association  
Australian Chamber of Commerce and Industry  
Australian Coal Association  
Australian Industry Group  
Aviation and Marine Engineers Association  
Consult Australia  
Department of Mines and Petroleum, WA  
Department of Natural Resources and Mines, Qld  
Mining Electrical and Mining Mechanical Engineering Society  
Ministry of Business, Innovation and Employment, New Zealand  
National Association of Testing Authorities Australia  
NSW Department of Trade and Investment, Regional Infrastructure and Services  
University of Newcastle  
WorkCover New South Wales

---

### **Keeping Standards up-to-date**

Standards are living documents which reflect progress in science, technology and systems. To maintain their currency, all Standards are periodically reviewed, and new editions are published. Between editions, amendments may be issued. Standards may also be withdrawn. It is important that readers assure themselves they are using a current Standard, which should include any amendments which may have been published since the Standard was purchased.

Detailed information about joint Australian/New Zealand Standards can be found by visiting the Standards Web Shop at [www.saiglobal.com.au](http://www.saiglobal.com.au) or Standards New Zealand web site at [www.standards.co.nz](http://www.standards.co.nz) and looking up the relevant Standard in the on-line catalogue.

For more frequent listings or notification of revisions, amendments and withdrawals, Standards Australia and Standards New Zealand offer a number of update options. For information about these services, users should contact their respective national Standards organization.

We also welcome suggestions for improvement in our Standards, and especially encourage readers to notify us immediately of any apparent inaccuracies or ambiguities. Please address your comments to the Chief Executive of either Standards Australia or Standards New Zealand at the address shown on the back cover.

---

*This Standard was issued in draft form for comment as DR AS/NZS 2290.1.*

---

# Australian/New Zealand Standard™

## **Electrical equipment for coal mines— Introduction, inspection and maintenance**

### **Part 1: For hazardous areas**

Originated in Australia as AS 2290.1—1979.  
Previous edition AS/NZS 2290.1:2005.  
Fourth edition 2014.

#### **COPYRIGHT**

© Standards Australia Limited/Standards New Zealand

All rights are reserved. No part of this work may be reproduced or copied in any form or by any means, electronic or mechanical, including photocopying, without the written permission of the publisher, unless otherwise permitted under the Copyright Act 1968 (Australia) or the Copyright Act 1994 (New Zealand).

Jointly published by SAI Global Limited under licence from Standards Australia Limited, GPO Box 476, Sydney, NSW 2001 and by Standards New Zealand, Private Bag 2439, Wellington 6140.

## PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee EL-023, *Electrical Equipment for Mines and Quarries*, to supersede AS/NZS 2290.1:2005, *Electrical equipment for coal mines—Introduction and maintenance, Part 1: For hazardous areas*.

The objective of this Standard is to facilitate the safe, efficient and productive use of electrical explosion-protected equipment and cables in underground coal mine hazardous areas, by specifying requirements and recommendations for the inspection and maintenance of such equipment.

This Standard is part of a series of standards on the maintenance and overhaul of electrical equipment used in association with underground mining machines. The series is as follows:

- (a) AS/NZS 2290.1, *Electrical equipment for coal mines—Introduction and maintenance, Part 1: For hazardous areas* (this Standard).
- (b) AS 2290.3, *Electrical equipment for coal mines—Maintenance and overhaul, Part 3: Maintenance of gas detecting and monitoring equipment*.

In addition, this Standard aligns with AS/NZS 3800:2012, *Electrical equipment for explosive atmospheres—Repair and overhaul*.

The principal differences between this edition and the 2005 edition are as follows:

- (i) Life-cycle management of explosion-protected equipment has been embraced.
- (ii) The range of inspections has been expanded to include initial and periodic inspections.
- (iii) A risk-based process is required for the identification of ‘readily accessible components’ and the determination of ‘inspection frequency’; however, recommended inspection schedules for individual explosion-protection techniques have been retained.
- (iv) An electrical engineering manager has been specified as the process owner and responsible decision maker.
- (v) General inspection requirements that are applicable to all explosion-protection techniques have been included.
- (vi) The range of explosion-protection techniques has been expanded to address currently installed equipment.
- (vii) This Standard has been aligned with the AS/NZS 60079 series, where compatible with Group I requirements.
- (viii) An alternate risk assessment method encompassing equipment protection levels (EPLs) for Ex equipment is discussed in an informative appendix.

NOTE: See Appendix M.

The term ‘informative’ has been used in this Standard to define the application of the appendix to which it applies. An ‘informative’ appendix is only for information and guidance.

Statements expressed in mandatory terms in footnotes to tables are deemed to be requirements of this Standard.

## CONTENTS

	<i>Page</i>
FOREWORD.....	5
SECTION 1 SCOPE AND GENERAL	
1.1 SCOPE.....	6
1.2 NORMATIVE REFERENCES .....	6
1.3 DEFINITIONS.....	7
SECTION 2 GENERAL REQUIREMENTS	
2.1 LIFE CYCLE MANAGEMENT.....	10
2.2 DOCUMENTATION.....	11
2.3 COMPETENCY .....	12
2.4 INSPECTIONS .....	13
2.5 INITIAL INSPECTION REQUIREMENTS.....	15
2.6 PERIODIC INSPECTION REQUIREMENTS .....	16
2.7 PRE-OVERHAUL AUDIT REQUIREMENTS .....	17
2.8 MAINTENANCE REQUIREMENTS .....	19
2.9 ENVIRONMENTAL CONDITIONS .....	20
2.10 ISOLATION OF EQUIPMENT.....	20
2.11 EARTHING AND EQUIPOTENTIAL BONDING .....	21
2.12 SPECIFIC CONDITIONS OF USE .....	22
2.13 MOBILE, PORTABLE AND TRANSPORTABLE EQUIPMENT AND ITS CONNECTIONS .....	22
2.14 GENERAL INSPECTION REQUIREMENTS .....	22
SECTION 3 SPECIFIC INSPECTION REQUIREMENTS	
3.1 GENERAL.....	25
3.2 TYPE OF PROTECTION ‘d’—FLAMEPROOF ENCLOSURE .....	25
3.3 TYPE OF PROTECTION ‘e’—INCREASED SAFETY .....	30
3.4 TYPE OF PROTECTION ‘i’—INTRINSIC SAFETY.....	31
3.5 TYPE OF PROTECTION ‘p’—PRESSURIZED ENCLOSURE .....	36
3.6 TYPE OF PROTECTION ‘m’—ENCAPSULATION .....	37
3.7 TYPE OF PROTECTION ‘o’—OIL-IMMERSION.....	37
3.8 TYPE OF PROTECTION ‘q’—POWDER-FILLING.....	37
3.9 TYPE OF PROTECTION ‘s’—SPECIAL PROTECTION .....	37
3.10 EXPLOSION PROTECTED CAPLIGHTS .....	38

## APPENDICES

A	INSPECTION FLOWCHART .....	39
B	CORROSION OR SURFACE INDENTATION TOLERANCES.....	40
C	TYPICAL METHOD FOR TEMPORARY, IN SITU REPAIR OF A DAMAGED HOLE OR THREAD IN A FLAMEPROOF ENCLOSURE .....	42
D	DOCUMENTATION CHECK SHEET—TYPICAL FORMAT .....	44
E	TYPICAL EXTERNAL INSPECTION REPORT FORM Ex ‘d’.....	45
F	TYPICAL INTERNAL INSPECTION REPORT FORM Ex ‘d’.....	46
G	TYPICAL EXTERNAL INSPECTION REPORT FORM Ex ‘e’.....	48
H	TYPICAL INTERNAL INSPECTION REPORT FORM Ex ‘e’.....	49
I	TYPICAL EXTERNAL INSPECTION REPORT FORM Ex ‘i’ .....	51
J	TYPICAL INTERNAL INSPECTION REPORT FORM Ex ‘i’.....	52
K	TYPICAL EXTERNAL INSPECTION REPORT FORM Ex ‘p’.....	53
L	TYPICAL PRE-OVERHAUL AUDIT REPORT SHEET.....	54
M	INTRODUCTION OF AN ALTERNATIVE RISK ASSESSMENT METHOD ENCOMPASSING ‘EQUIPMENT PROTECTION LEVELS’ FOR Ex EQUIPMENT.....	55
	BIBLIOGRAPHY.....	60

## FOREWORD

Electrical installations in hazardous areas have features specially designed to make them suitable for operation in such areas. For safety reasons, it is essential that the integrity of those special features is maintained throughout the life of the installations. Therefore they require an initial inspection and regular periodic inspections by competent persons in accordance with this Standard.

NOTE: Correct functional operation of hazardous area installations does not mean, and should not be interpreted as meaning, that the integrity of the special features referred to above is preserved.

The use of this Standard and safe electrical engineering practice will assist in the management of electrical hazards.

The implementation of this Standard will contribute significantly to the—

- (a) prevention of ignition of explosive gases or dusts;
- (b) prevention of electric shock and burns;
- (c) prevention of arcing faults that have sufficient energy to invalidate the type of explosion-protection as a result of damage to the enclosure or generation of an excessive pressure rise beyond that for which the electrical enclosure was designed; and
- (d) prevention of fires caused by the malfunction of electrical equipment.

The risk management process should be utilized to identify relevant controls. There are a number of controls associated with using electricity in hazardous areas, including the following:

- (i) Fit-for-purpose electrical explosion-protected equipment.
- (ii) Fit-for-purpose cables for hazardous areas in a mining environment.
- (iii) Fit-for-purpose electrical protection.
- (iv) Fit-for-purpose earthing systems.
- (v) Reduction of the potential for phase-to-phase arcing faults.
- (vi) Fit-for-purpose lightning protection.
- (vii) Fit-for-purpose tools and test equipment.
- (viii) Isolation and electrical testing procedures.
- (ix) Removal/restoration of power procedures.
- (x) Proper classification of hazardous areas.
- (xi) Correct first aid treatment for persons who receive an electric shock and burns.

This Standard covers many of these particular aspects, but also takes a holistic approach to the electrical system and recognizes that many of the controls interact and that each of the life cycle stages interact. It is up to the user of this Standard to make judgements and decisions with all of this in mind.

## STANDARDS AUSTRALIA/STANDARDS NEW ZEALAND

**Australian/New Zealand Standard****Electrical equipment for coal mines—Introduction, inspection and maintenance****Part 1: For hazardous areas**

## SECTION 1 SCOPE AND GENERAL

**1.1 SCOPE**

This Standard sets out requirements for the inspection and maintenance of electrical equipment designed for use in hazardous areas in and around underground coal mines.

Section 2 provides general requirements that are fundamental to the safe use of electrical equipment in hazardous areas. Section 3 provides specific requirements for each type of explosion-protection technique.

This Standard is intended to be applied where there is a potential risk due to the presence of explosive gas, dust mixtures and combustible dust layers. It does not apply to—

- (a) surface infrastructure, typically Group II or Group III classified areas, other than gas drainage and borehole dewatering areas that could negatively impact on an underground mine workings;
- (b) areas where a risk can arise due to the presence of hybrid mixtures;
- (c) areas where small quantities of flammable materials are introduced for maintenance purposes; or
- (d) shotfiring activities and associated equipment.

This Standard does not include—

- (i) electrical installation and inspection requirements not directly associated with an explosion-protection technique;
- (ii) the regulatory compliance assessment of electrical equipment; or
- (iii) the permanent repair, reclamation and overhaul of explosion protected equipment.

**1.2 NORMATIVE REFERENCES**

The following are the normative documents referenced in this Standard. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE: Documents for informative purposes are listed in the Bibliography.

## AS/NZS

3000	Electrical installations (known as the Australian/New Zealand Wiring Rules)
3800	Electrical equipment for explosive atmospheres—Repair and overhaul
4761	Competencies for working with electrical equipment for hazardous areas (EEHA) (series)
4801	Occupational health and safety management systems—Specification with guidance for use