HB 13—2007

Handbook

Electrical equipment for hazardous areas

This Australian Handbook was prepared by Committee P-012, Hazardous Areas Competency Standards Advisory Panel. It was approved on behalf of the Council of Standards Australia on 14 December 2007.
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- Australian Coal Association
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- Australian Petroleum Production and Exploration Association
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- New Zealand Hazardous Areas Electrical Coordinating Committee
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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.

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Electrical equipment for hazardous areas

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PREFACE

In the last decade there has been an increased awareness of the use of electrical equipment in potentially explosive gas and dust atmospheres. This has led to a substantial expansion of recognized explosion-protection techniques, construction and test specifications, codes of practice and safety legislation.

The range of equipment is extensive, offering designs and types to suit specific situations. An incorrect selection or installation of equipment may prove to be not only a costly error, but also unsafe.

Many people have an interest in the safe use of electrical equipment in hazardous areas—plant management, consulting engineers, manufacturers, electrical contractors, construction and maintenance personnel, electrical inspectors, workshops and insurance underwriters.

The main objective of this Handbook is to provide a basis for understanding the principles involved in the identification of a hazardous area, relevant statutory requirements and the selection and installation, maintenance, testing, overhaul and repair of appropriate electrical equipment.

This Handbook also provides a basic introduction to the relevant Australian, New Zealand, Joint (Australian/New Zealand) and International Standards dealing with hazardous areas.

During the 1990s two fundamental changes have occurred in the explosion-protected electrical equipment field, in Australia and New Zealand.

The first took place in the early 1990s, when an Active Cooperation Agreement between Standards Australia and Standards New Zealand was signed for the preparation and marketing of Joint Standards (Australian/New Zealand).

This Agreement came into effect on 1 July 1992 and since then several Joint Standards have been published within the Hazardous Areas field.

While not all Australian Standards applicable to hazardous areas have progressed to Joint Standards status, almost all the Australian Standards that are not joint, are applicable in New Zealand either through citation in regulations, principally by NZECP 24, or through citation in Joint Standards.

There are a small number of ‘New Zealand only’ Standards applicable to some aspects of hazardous areas, however they are generally not consistent with the homologous joint series and therefore should be considered as obsolescent Standards, which are retained for particular special applications.

As a consequence of this, the term ‘Joint Standard’ should be read in this document to include all Standards referenced, whether or not they are official Joint Standards. Where a particular Standard does not have applicability in New Zealand that aspect will be highlighted in the text.

In respect to Standards relating to competencies, there will be slight differences for New Zealand due to the differing competency and qualification frameworks; however these differences do not apply to the ‘technical’ aspects of the requirements and therefore the AS/NZS 4761 Series (EEHA Competency Standards) is fully applicable in New Zealand.

The second major change was the strategic decision made by the Joint Committee EL-014 in December 1996, to adopt all the relevant IEC Standards and publish them as Joint Standards (AS/NZS).

The rationale behind the adoption of the IEC Standards is: Australia and New Zealand are part of the global economy and must compete on such a basis and to allow freedom of trade. The IECEx Scheme permits apparatus certified in Member Countries of the Scheme to be used in Australia and New Zealand without further certification being required by an Australian or New Zealand testing laboratory (Section 7 for further details).

At the same time the European countries, who now operate under the ATEX Directives and EN (CENELEC) Standards, are moving to adopt the IEC Standards.

Leading up to the adoption of the IEC Standards as Joint Standards, both countries had considerable input into their formulation and it became clear that in the interests of rationalization there was no impediment from a technical or philosophical point of view in adopting the IEC Standards in their entirety.

Due to the ongoing alignment with IEC Standards the term ‘equipment’ is being replaced by the term ‘apparatus’, in the most recent published Joint Standards (AS/NZS). In this Handbook you may find in some sections references to one or another of these terms, but they should be considered equivalent.

Regarding the numbering of Standards in Australia and New Zealand, different patterns co-exist nowadays, and some examples are:

AS 2380.1 (valid in Australia and New Zealand)

NZ 5425 (valid only in New Zealand)

AS/NZS 3800 Joint Standard—Australia/New Zealand

AS/NZS 60079.0 Joint Standard—Australia/New Zealand—adoption of IEC 60079-0

As the long term future of this Handbook is still being discussed by the relevant Committees—P-012, EL-014 and EL-023—and considering that most of the references are out of date, Committee P-012 decided to embark on a light revision just for updating the references.

Therefore the changes introduced in this edition are basically those relating to the update of all the references included in this publication.

Committee P-012—*Hazardous Areas Competency Standards Advisory Panel* has overseen the preparation of this Edition.

The cooperation and assistance of CSE-Ex, Cooper Electrical Australia, Orica Engineering Ltd, Standards Australia and TAFE—NSW (Manufacturing and Engineering Education Services) in the preparation of photos, diagrams and figures (already used in the previous Edition) are recognized and highly appreciated.

WARNING

THE INFORMATION IN THIS HANDBOOK IS INTENDED ONLY AS A GUIDE TO PROVIDE INFORMATION ON THE BACKGROUND AND PRINCIPLES IN THIS EXTREMELY COMPLEX FIELD OF ELECTROTECHNOLOGY. THIS INFORMATION DOES NOT PURPORT TO COVER ALL THE ISSUES THAT MAY ARISE IN THE DESIGN, SELECTION, INSTALLATION, TESTING, MAINTENANCE, REPAIR, OVERHAUL OR MODIFICATION OF EXPLOSION-PROTECTED ELECTRICAL EQUIPMENT.

UNDER NO CIRCUMSTANCES CAN THE INFORMATION CONTAINED IN THIS HANDBOOK BE USED AS AN ALTERNATIVE TO THE RELEVANT STANDARDS OR THE EQUIPMENT CERTIFICATION/APPROVAL DOCUMENTATION.

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SECTION 1 WHAT IS A HAZARDOUS AREA?

1.1 INTRODUCTION

There is a danger of an explosion or fire occurring wherever flammable or combustible materials are handled. This is graphically illustrated by the dreadful toll taken by coal mining explosions in the past. For example in England in the last century hundreds of lives were lost every year.

The hazard today exists not only in the coal mining industry but also in many other industries. Major industries include the petrochemical, pharmaceutical, chemical, sewage treatment, and grain handling industries. In 1866, in a series of explosions in the Oaks Colliery, 361 people were killed in one accident alone. In 1988 the Piper Alpha oil and gas platform in the North Sea caught fire and exploded killing 167 workers. Smaller industries involve such areas as paint shops and dry-cleaning premises. In many cases the hazards occur in areas frequented by the public, for example petrol service stations.

In all these situations, electricity is used.

Where it is necessary to use electrical apparatus in an environment in which there may be an explosion it is essential that measures are taken to eliminate the likelihood of an explosive atmosphere occurring around any source of ignition ***or*** limiting the possibility of an ignition source, (e.g. arcs, sparks or hot surfaces) occurring.

To prevent any of the electrical apparatus becoming a source of ignition for an explosion, special precautions have to be taken in the design, construction, selection, installation and maintenance of such apparatus.

Many incidents around the world have driven governments into establishing regulating bodies and appropriate *Standard*s and codes of practice. The codes of practice and appropriate *Standard*s must be adhered to, for it is not the many tasks performed correctly but the ***one*** task performed ***incorrectly*** that could cause death, injury and plant destruction.

1.2 HAZARDOUS AREAS

A hazardous area is defined as an area in which an explosive atmosphere is present, or may be expected to be present, in quantities such as to require special precautions for the construction, installation, and use of potential ignition sources.

The explosive atmosphere may be caused by the presence of a flammable liquid, gas or vapour or by the presence of combustible dust in suspension or in layers or a combination of explosive gas and dust atmospheres.

In the design of industrial plants, every effort is usually made to minimize the extent of hazardous areas but it may be difficult to ensure that an explosive atmosphere will never occur.

Incorrect design of the plant may result in the occurrence of small, local fireballs which could ignite other flammable materials and lead to extensive damage to the whole plant, adverse effects to the environment and serious injuries to personnel.

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