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Australian Standard 2480—1981

ELECTRICAL EQUIPMENT FOR EXPLOSIVE ATMOSPHERES
FLAMEPROOF ENCLOSURE—TYPE OF PROTECTION d

STANDARDS ASSOCIATION OF AUSTRALIA
Incorporated by Royal Charter

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THE FOLLOWING SCIENTIFIC, INDUSTRIAL AND GOVERNMENTAL ORGANIZATIONS and departments were officially represented on the committee entrusted with the preparation of this standard:

Australian Coal Association

Australian Electrical and Electronic Manufacturers Association

Australian Institute of Petroleum

Confederation of Australian Industry

Department of Industrial Relations, N.S.W.

Department of Industry and Commerce

Department of Mineral Resources, N.S.W.

Department of Minerals and Energy, Vic

Department of Mines, Qld

Electrical Contractors Associations of Australia

Electricity Supply Association of Australia

Independent testing interests

Insurance Council of Australia

State electricity regulatory authorities

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AMENDMENT No 1
to
AS 2480—1981
ELECTRICAL EQUIPMENT FOR EXPLOSIVE ATMOSPHERES FLAMEPROOF ENCLOSURE—TYPE OF PROTECTION d

REVISED TEXT

SUMMARY: This amendment applies to Clauses 2.1, 2.3.1, 2.5.1, 2.5.4, 2.5.7, 2.11.4, 2.13.3, 2.17, 2.20, 3.4 and 3.7.2 and to Tables 2.1 and 2.2.

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ELECTRICAL EQUIPMENT FOR EXPLOSIVE ATMOSPHERES

FLAMEPROOF ENCLOSURE—TYPE OF PROTECTION d

AS 2480—1981

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PREFACE

This standard was prepared by the Association's Committee on Electrical Equipment in Hazardous Locations for the guidance of manufacturers, users, statutory authorities and associated interests and for use in association with the SAA Wiring Rules (AS 3000) and relevant Mining Regulations. It describes requirements in respect of design, construction and marking of flameproof enclosures and includes a section on testing. It supersedes AS C98—1970.

In its terminology, definitions and general treatment of the subject, this standard is similar to corresponding draft specifications issued by the International Electrotechnical Commission and the British Standards Institution.

The differences between this standard and AS C98—1970 are as follows:

(a) Reference is being made to AS 2380, Part 1, for grouping of apparatus, temperature classification and marking.

(b) Requirements for Group IIC enclosures have been amalgamated with requirements for other groups.

(c) The minimum flame path requirement for cemented windows (Figs 16, 17 and 18) has been amended.

(d) All imperial units have been deleted and reference to conduit threads updated to metric.

(e) The deletion of the requirement for a guard for windows with an area in excess of 50 cm^2.

This standard may require reference to the following Australian standards:

AS 1076	Code of Practice for Selection, Installation and Maintenance of Electrical Apparatus and Associated Equipment for Use in Explosive Atmospheres (Other Than Mining Applications) Part 1—Basic Requirements Part 2—Classification of Hazardous Areas Part 3—Apparatus With Type of Protection 'd'—Flameproof Enclosure
AS 1152	Test Sieves
AS 1825	Pressurized Enclosure of Electrical Equipment for Explosive Atmospheres
AS 1828	Cable Glands for Explosive Gas Atmospheres
AS 1829	Electrical Equipment for Explosive Atmospheres—Intrinsically Safe Apparatus—Type of Protection i
AS 1874	Aluminium Ingots and Aluminium Alloy Ingots and Castings
AS 1896	Method of Test for Ignition Temperature of Gases and Vapours
AS 1939	Classification of Degrees of Protection Provided by Enclosures for Electrical Equipment
AS 2034	Flameproof Electric Lighting Fittings for Explosive Atmospheres
AS 2052	Metallic Conduit and Fittings
AS 2380	Electrical Equipment for Explosive Gas Atmospheres—Explosion Protection Techniques Part 1—General Requirements
AS 2430	Classification of Hazardous Areas Part 1—Explosive Gas Atmospheres
AS 3000	SAA Wiring Rules
AS C100	Approval and Test Specification for Definitions and General Requirements for Electrical Materials and Equipment

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STANDARDS ASSOCIATION OF AUSTRALIA

Australian Standard

for

ELECTRICAL EQUIPMENT FOR EXPLOSIVE ATMOSPHERES—FLAMEPROOF ENCLOSURE—TYPE OF PROTECTION d

FOREWORD

The purpose of this standard is to establish requirements for flameproof electrical enclosures for use in flammable or explosive atmospheres in which gases or vapours may be present and as required by the SAA Wiring Rules or by the mining regulations for defined hazardous areas.

The classification of hazardous areas is dealt with in AS 2430 Parts 1 and 2. Part 1 applies to explosive gas atmospheres and recognizes the following zones:

Zone 0—an area in which an explosive gas atmosphere is present continuously, or is expected to be present for long periods, or for short periods which occur with high frequency.

Zone 1—an area in which an explosive gas atmosphere can be expected to occur periodically or occasionally during normal operation.

Zone 2—an area in which an explosive gas atmosphere is not expected to occur in normal operation and if it occurs is likely to be present only infrequently and for short duration.

Enclosures complying with this standard will be suitable for installation in a Zone 1 or Zone 2 area.

The standard acknowledges the practical difficulty of preventing eventual penetration of an enclosure by gas, and therefore assumes that flammable gas or vapour, if present in the surrounding atmosphere, will enter the enclosure. It further assumes that sparking may occur at any part of the electrical equipment within the enclosure, either as a normal condition of use (e.g. a switch), or in consequence of breakdown of insulation or of some mechanical failure.

To prevent an ignition or explosion within an enclosure from being communicated to a surrounding flammable atmosphere, the standard requires adequate strength of the structure and also gives close attention to the treatment of joints. In order that the effectiveness of the joints will be preserved over the life of the equipment, and in particular that such effectiveness will not be impaired by repeated removal of covers or other parts for maintenance or inspection, jointing or sealing devices, such as gaskets, gland packing and the like are not generally recognized. Instead, a minimum width of joint face ('flamepath') and maximum opening of gap according to the volume of the enclosure and the characteristics of the flammable gas concerned, are prescribed at joints, shafts, openings, venting devices and the like, to ensure that if an ignition or explosion occurs within the enclosure, the flame will be restricted or cooled to such an extent by its passage through the gap that no ignition of this surrounding flammable atmosphere can result.

It must be recognized that safe use of electrical equipment in flammable or explosive atmospheres may depend on many factors besides use of flameproof enclosures. For example:

(a) Proper installation, operation and maintenance, strict observation of design rating, and provision of adequate automatic protective devices are essential.

(b) Tests for enclosures designed for use with gases comprising acetylene, carbon disulphide, ethyl nitrate and water gas, are under consideration. For the time being, the use of flameproof enclosure in atmospheres where these gases are present is not covered by this standard.

(c) There are means other than flameproof enclosure whereby an explosion hazard may be controlled, e.g. adequate and reliable ventilation of hazardous locations, enclosure under positive pressure (see AS 1825), intrinsically safe apparatus and circuits (see AS 1829), and other approved specialized safeguards. Whilst some of these factors are mentioned in the clauses dealing with hazardous locations in the SAA Wiring Rules, such installations require special and expert attention.

The detailed considerations which must be taken into account in the installation of such apparatus are given in AS 1076, Parts 1, 2 and 3 and Section 9 of AS 3000.

SECTION 1. SCOPE AND GENERAL

1.1 SCOPE. This standard specifies requirements for the flameproof enclosure of electrical equipment. It prescribes constructional features necessary to ensure safety in service, the test requirements which the enclosure shall comply with and the marking to be applied to the enclosure.

The tests specified herein are intended as type tests.

The enclosure is suitable for housing electrical apparatus in atmospheres where a mixture of air and flammable gas or vapour may occur.

The standard provides for the grouping of enclosures according to the dimensions of their gaps between joint surfaces, and an indication is given of the explosive gas atmosphere for which each group is appropriate.

The standard does not at present apply to enclosure for explosive gas atmospheres for which safe gaps are smaller than those given in this standard.

Nor does it apply to enclosure kept charged with air or other non-flammable gas so as to prevent the entry of flammable gas, or to enclosure containing hydrocarbon oil and parts of equipment into which gaseous products from the oil may enter.

This standard deals only with flameproof enclosure and not with other means of protection against an explosion hazard. These are covered by separate standards referred to in the Foreword.

1.2 DEFINITIONS. For the purpose of this standard the following definitions apply:

1.2.1 Flameproof enclosure (hereinafter referred to as the 'enclosure(s)')—an enclosure for electrical equipment that will withstand, without damage, an explosion of a prescribed flammable gas or vapour within the enclosure and will prevent the transmission of flame such as will ignite the external prescribed flammable gas or vapour for which it is designed, and which operates at such an external temperature that will not ignite a surrounding flammable atmosphere.

A flameproof enclosure, in accordance with the foregoing definition, will not necessarily or ordinarily be weatherproof, dustproof, etc.

NOTES:

1. *Protection of circuit.* As the condition of flameproofness depends on operation of equipment within its rating, means should be provided so that the highest recognized overload of equipment, and moreover, for circuit-breakers, the rated breaking capacity, is not exceeded.

   The consequences of a destructive short-circuit within the equipment should be guarded against by the provision of means to achieve automatic interruption of the short-circuit elsewhere before the risk of destruction of the enclosure supervenes.

2. *Maintenance of structure.* As the condition of flameproofness depends on maintenance of the structure in its designed condition, it is essential that due attention be paid to this condition at all times, and that corrosion, deformation or wear of components be remedied before any design openings or gaps in the enclosure have enlarged beyond the limits laid down in this standard.

   The maintenance and use of flameproof equipment so that its safety will not be impaired is the responsibility of the user.

1.2.2 Volume—the total internal volume of the enclosure, except where the equipment installed within the enclosure is inseparable by construction, in which case the volume is the void within the enclosure when the equipment is installed.

1.2.3 Joints—the place where corresponding surfaces of the different parts of an enclosure come together, and where flamepaths from the inside to the outside of the enclosure occur.

1.2.4 Length of flamepath (width of joint)—the shortest distance, measured along the flamepath, from the inside to the outside of the enclosure.

1.2.5 Gap (diametral clearance)—the distance between the corresponding surfaces at a point, measured normally to the surfaces. For cylindrical surfaces, the gap is the difference between the two diameters and is usually referred to as the diametral clearance.

1.2.6 Shaft—a component of circular cross-section used for transmitting rotary motion.

1.2.7 Operating rod (spindle)—a component of circular cross-section used for transmitting control movements which may be rotary or linear or a combination of both.

1.2.8 Pressure piling—a condition resulting from ignition of compressed gases in compartments or subdivisions other than in which ignition was initiated.

1.2.9 Maximum surface temperature—the highest temperature attained by any external surface of the enclosure under conditions of operation within the rating or specified overload conditions of the equipment.

1.2.10 Time of explosion—the shortest time interval between the instant of ignition and the attainment of maximum pressure, when the mixture for maximum pressure is exploded inside the test vessel.

1.3 GROUPING. Apparatus shall be grouped in accordance with Clause 1.5 of AS 2380, Part 1, except that this standard does not apply to enclosures for acetylene.

The maximum gaps and diametral clearances for each group and sub-group of enclosures are given in Tables 1.1 to 1.4.

1.4 TEMPERATURE CLASSIFICATION. Enclosures shall be classified in accordance with Clause 1.6 of AS 2380, Part 1.