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**Recommendations for the handling
of contaminated SF₆ gas, and
associated arc decomposition
products, in or from electrical
equipment**



STANDARDS AUSTRALIA



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This Australian Standard was prepared by Committee EL/7, Power Switchgear. It was approved on behalf of the Council of Standards Australia on 18 November 1988 and published on 13 March 1989.

The following interests are represented on Committee EL/7:

Australian-British Chamber of Commerce
Australian Electrical and Electronic Manufacturers Association
Confederation of Australian Industry
Electricity Supply Association of Australia
Institution of Engineers, Australia
Railways of Australia Committee
Testing authorities

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Suggestions for improvements to Australian Standards, addressed to the head office of Standards Australia, are welcomed. Notification of any inaccuracy or ambiguity found in an Australian Standard should be made without delay in order that the matter may be investigated and appropriate action taken.

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FOREWORD

Sulfur hexafluoride (SF_6) gas is inert, colourless, tasteless, odourless non-flammable, non-toxic, heavier than air (relative density 5.11) and chemically stable in the normal conditions of use of electrical equipment.

At high temperatures (above 800°C) such as when exposed to an electric arc, some decomposition of SF_6 takes place producing contaminating SF compounds which may be toxic.

Special filters may be fitted in the gas compartments of some equipment to absorb certain SF_6 decomposition products.

The solid products resulting from the decomposition of metals subjected to electric arcs in the presence of SF_6 gas exist in the form of a whitish powder which hydrolizes in the presence of moisture to form a sticky grey deposit which is normally acidic. This material has an irritating action on the skin, eyes, and respiratory and mucous membranes.

Experience shows that in the rare event of any SF_6 decomposition products being present in the atmosphere, warning indications will be apparent at very low concentrations, in the form of a pungent and nauseous odour. This will be evident well before any toxic effects can take place.

PREFACE

This Standard was prepared by the Standards Australia Committee on Power Switchgear. The Standard is a series of recommendations, to users of sulfur hexafluoride (SF₆) gas-filled equipment, for guidance in the preparation of instructions to their maintenance personnel. It does not attempt to replace any instructions provided by the manufacturer of SF₆ gas-filled equipment, rather it seeks to augment those instructions, where appropriate.

It consists of recommendations for the provision of appropriate protective clothing, safety equipment and facilities for the protection of personnel who handle, or come into contact with, contaminated SF₆ gas or materials that have been decomposed by electric arcs in an atmosphere of SF₆ gas. The recommendations cover safety procedures, personal hygiene, first aid treatment, cleansing of reusable protective clothing, and the treatment of contaminated waste materials.

In the preparation of this Standard, consideration was given to BSI document ZZ5621v, *Draft Code of Practice for the Maintenance of Electrical Switchgear for Voltages Above 36 kV*, and acknowledgement is made of the assistance received from that source.

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STANDARDS AUSTRALIA

Australian Standard

**Recommendations for the handling of contaminated SF₆ gas,
and associated arc decomposition products in or
from electrical equipment**

1 SCOPE. This Standard is a series of recommendations for the guidance to users of sulfur hexafluoride (SF₆) filled equipment in the preparation of instructions to their maintenance personnel. The recommendations cover the provision of basic facilities and precautions that should be taken when handling (SF₆) gas which has been partially decomposed by electric arcing and also any solid decomposition products (generally metallic fluorides produced by the erosion of various materials by arcing in an atmosphere of SF₆ gas).

It covers different procedures and precautions that should be taken depending on whether the gas is contained in equipment—

- (a) large enough for personnel to work bodily inside it for maintenance purposes;
- (b) installed in the open air;
- (c) installed in rooms and enclosed spaces;
- (d) which the hand or arm only is required to enter for maintenance purposes; or
- (e) not intended to be maintained.

This Standard does not cover requirements for electrical safety or apply to work carried out on equipment containing uncontaminated SF₆ gas or not containing arc decomposition products.

2 APPLICATION. This Standard applies to electrical equipment containing SF₆ gas used for insulating or arc extinguishing functions. Such equipment may include, but is not necessarily restricted to the following:

- (a) Switchgear and controlgear.
- (b) Disconnectors and earthing switches.
- (c) Circuit-breakers.
- (d) Fuse-switch combinations.
- (e) Motor starters.
- (f) Gas insulated metal-enclosed switchgear.
- (g) Busbar systems.
- (h) Instrument transformers.

3 REFERENCED DOCUMENTS. The following documents are referred to in this Standard.

- AS
1319 Safety signs for the occupational environment
1716 Respiratory protective devices
3544 Industrial vacuum cleaners for particulates hazardous to health

4 CLASSIFICATION OF SF₆ EQUIPMENT WITH REGARD TO PROCEDURES. This Standard recognizes three basic classes of SF₆ equipment, installed indoors or outdoors, which require different considerations for the handling of contaminated SF₆ gas and arc decomposition products. These classes are as follows:

- (a) *Class 1 equipment.* Class 1 equipment requires bodily entry (at least head and shoulders) to gas compartments in order to maintain equipment therein.
- (b) *Class 2 equipment.* Class 2 equipment requires only the entry of a hand or arm to gas compartments in order to maintain equipment therein.
- (c) *Class 3 equipment.* Class 3 equipment comprises gas-filled equipment forming the whole or part of a device, which is sealed for the duration of its working life and only its safe replacement or disposal is required.

5 RECOMMENDED FACILITIES FOR CLASS 1 AND CLASS 2 SF₆ EQUIPMENT. (See Clauses 4(a) and 4(b).)

5.1 General facilities. For Class 1 and Class 2 SF₆-filled equipment, it is recommended that the following facilities be provided:

- (a) A clear space, for the period of work on the SF₆ gas-filled equipment, designated for the purpose of changing and storing protective clothing, having cold water supplies and containers for the storage of soiled protective clothing. The purpose of this space is to facilitate adequate hygiene by minimizing the spread of decomposition products and also to assist in obtaining the high standard of cleanliness required during maintenance of SF₆ equipment.

It is important that this space is not used for eating, drinking or smoking or for the storage of outdoor clothing or other materials not connected with the maintenance of contaminated SF₆ equipment. The size of the space and its facilities will be dependent on the size of the installation and the mass of gas involved.

- (b) First-aid equipment in accordance with local industrial regulations, including equipment and materials detailed in Clause 9.
- (c) Means of contacting emergency services.