AS 2896—1991

Australian Standard®

Medical gas systems—Installation and testing of non-flammable medical gas pipeline systems

STANDARDS AUSTRALIA

This Australian Standard was prepared by Committee HT/4, Medical Gases and Pipeline Services. It was approved on behalf of the Council of Standards Australia on 5 June 1991 and published on 16 September 1991.

The following interests are represented on Committee HT/4:

Association of Consulting Engineers, Australia
Australian Society of Anaesthetists
Building Management Authority, W.A.
Confederation of Australian Industry
Department of Community Services and Health
Department of Health, N.S.W.
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Royal Australasian College of Surgeons
South Australian Department of Housing and Construction
South Australian Health Commission

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First published as part of AS CZ9-1956.
Second edition 1963.
Revised and redesignated AS 1169-1973.
Redesignated in part as AS 1169.2-1973.
Revised and redesignated AS 2896-1986.
Second edition 1991.

PUBLISHED BY STANDARDS AUSTRALIA
(STANDARDS ASSOCIATION OF AUSTRALIA)
STANDARDS HOUSE, 80 ARTHUR ST, NORTH SYDNEY NSW
ISBN 0 7262 6995 6

PREFACE

This Standard was prepared by the Standards Australia Committee on Medical Gases and Pipeline Services to supersede AS 2896—1986.

This Standard differs from the 1986 edition in that guidelines for fixed secondary equipment such as pendants and columns are now included, Appendix A has been modified, Figures 1.1, 1.2 and 1.3 have been amended, Table 4.1 has been altered and the use of UPVC pipes for vacuum has been excluded.

In medical establishments it is vital that high safety standards are maintained and also that there is no risk of failure of supply or plant without adequate warning. Thus particular attention is given in this Standard to the following:

(a) Design of equipment to ensure non-interchangeability between services.

(b) Use of correct materials, and cleanness of materials.

(c) Reserve supplies of gas and reserve plant.

(d) Warning systems for gas failure.

(e) Testing and commissioning of pipelines, in particular to detect cross-connections.

(f) Identification of pipelines.

Requirements in this Standard may be used as a guide for piping systems for other non-flammable medical gases and anaesthetic gas scavenging systems but variations in the requirements may be necessary. This Standard will be revised should such a gas come into general use.

Non-flammable medical gas pipeline systems are installed according to all national and local codes and regulations such as building, electrical and safety codes. It should be noted that for installation of a pipeline, a high quality of workmanship and experience is essential. For certain situations, e.g. hyperbaric conditions, special design and performance criteria for pipelines may be required.

Requirements for suction systems are included in this Standard. At this time there are two techniques widely used, namely pipeline vacuum and venturi ejector suction. Each has its particular advantages. This Standard and AS 2120 specify performance and safety aspects to which both should conform. Requirements for a reasonable reserve performance are incorporated in relevant sections of this Standard; further allowances should not be necessary, unless it is intended to extend the pipeline in question in the future. With regard to anaesthetic gas scavenging, currently available evidence suggests that there is no special hazard associated with venting of waste anaesthetic gases into a central suction system.

Many systems in use do not comply with the intent of Clause 3.5 on terminal units. Because the gas specific component of some terminal units can be removed, these units can become a hazard to patients. To obviate this risk it is recommended that panels with multiple terminal outlets be upgraded within 12 months of publication of this Standard, to the intent of Clause 3.5. It is recognized that replacement of single terminal outlet panels is less urgent because of the smaller risk.

A sleeve indexed fitting is given in Figure 3.3 for surgical tool gas. This connection is recommended as it contains a thread, and therefore by its design has a controlled detachment and reduces the risk of 'hose whip'. The use of adaptors with 'quick connect/disconnect' (Schrader) fittings is not advisable.

In the preparation of this Standard, cognizance was taken of ISO 7396—1987, *Non-flammable medical gas pipeline systems*.

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FOREWORD

Gas pipeline systems have some characteristic hazards, usually related to their original construction, modification, or repair rather than to problems arising during their working life. Hazards include plumbing errors; use of materials incompatible with the gases to be delivered; obstruction of flow by material left in the pipelines; gas contamination by residual debris or accumulated foreign matter such as scale and organic contamination; and gas contamination due to chemical interaction between the gases and the pipeline components or foreign matter and condensation in pipelines. A particularly hazardous situation can occur when even small amounts of grease or oil come in contact with oxygen.

For this reason, this Standard requires that the following procedures be taken to avoid gas pipeline hazards:

(a) Documentation of tests and results from those responsible for the construction shall be provided to the health care facility, and these shall form a permanent record.

(b) Independent inspection of the system by *the health care facility*, using its own qualified personnel, or an experienced agent which may be an independent outside contractor, to confirm and document the system's satisfactory operation.

The maintenance and servicing of the gas pipeline system is the responsibility of the health care facility but may be delegated.

Components of the medical gas system should be obtained and installed under the supervision of a person familiar with proper practices for their construction, installation and use. Construction and installation of central supply systems require great care and shall only be undertaken by experienced personnel. In order to establish this, the hospital authority should examine closely the previous experience of any constructor or installer proposing to work on or build a pipeline system. The authority should also determine if the constructor or installer is familiar with the contents of this Standard, which should be specified in the construction agreement.

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SECTION 1 SCOPE AND GENERAL

1.1 SCOPE This Standard sets out requirements for safety aspects, construction, testing, operation and maintenance of non-flammable medical gas pipeline systems used for patient care, including therapeutic, diagnostic and prophylactic applications, and for operating surgical tools. Non-flammable medical gas pipeline systems include suction pipeline systems.

The Standard is intended also to apply to suction systems for day-care centres and clinical situations but does not apply to suction systems for laboratories or hospital dental units.

Some requirements are given for the source of supply for the pipeline system as well as those for the pipeline system itself and the terminal units and related warning systems.

The Standard also gives guidelines for operating room pendants, columns and booms.

1.2 APPLICATION The Standard applies to systems providing the following services:

(a) Oxygen.

(b) Nitrous oxide.

(c) Medical breathing air.

(d) Surgical tool gas.

(e) Mixtures of medical gases (e.g. nominal 50 percent oxygen, 50 percent nitrous oxide).

(f) Carbon dioxide.

(g) Medical suction.

NOTE: The preferred term 'suction' in Australia corresponds with the internationally known term 'vacuum'.

1.3 REFERENCED DOCUMENTS A list of the documents referred to in this Standard is given in Appendix A.

1.4 DEFINITIONS For the purposes of this Standard, the definitions below apply.

1.4.1 Boom—a wall-mounted equipment module having a combination of integrally fitted terminal outlets for gas, mains electricity, communications, monitoring and extra-low voltage services.

1.4.2 Central bulk gas supply (central supply)—this consists of—

(a) a supply which is either a bank of gas cylinders (Figure 1.1) or a cryogenic liquid supply (Figure 1.2); or

(b) a system using compressors with or without a bank of gas cylinders (Figure 1.3); or

(c) a system using suction pumps.

1.4.3 Column—a floor-mounted equipment module extending to, and attached to, the ceiling having a combination of integrally fitted terminal outlets for gas, mains electricity, communications, monitoring and extra-low voltage services.

1.4.4 Control equipment—items such as pressure control regulators, relief valves, alarm initiators, manual and automatic valves, necessary to maintain gas supplies at a set pressure within the pipeline distribution system.

1.4.5 Cryogenic liquid system—a system incorporating a liquid supply, the storage pressure of which is thermally controlled. It consists of a primary and secondary supply which is liquid, and an emergency supply which is gaseous. The secondary supply is usually the residual cryogenic liquid below a predetermined level. This is commonly referred to as a vacuum-insulated evaporator (VIE).

1.4.6 Design flow rate—the free flow rate which is calculated from a knowledge of the number of terminal units to be supplied and from a knowledge of the expected equipment that will be connected, from a knowledge of the nursing/medical procedures and from a knowledge of the diversity of use factor agreed between the designer and the hospital's accredited representative for the project.

1.4.7 Emergency gas supply—a gas supply source which is available when primary and secondary supplies have been exhausted.

1.4.8 Emergency power supply—a no-break (uninterrupted power supply) electrical energy source normally provided from batteries.