AS 2896—2011

Australian Standard®

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

This Australian Standard® was prepared by Committee HE-017, Medical Gas Systems. It was approved on behalf of the Council of Standards Australia on 13 January 2011.
This Standard was published on 8 February 2011.

The following are represented on Committee HE-017:

- Australian Chamber of Commerce and Industry
- Australian Industry Group
- Australian Society of Anaesthetists
- Australian and New Zealand College of Anaesthetists
- Master Plumbers and Mechanical Contractors Association of New South Wales
- Therapeutic Goods Administration

This Standard was issued in draft form for comment as DR AS 2896.

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 and through the public comment period.

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Australian Standard®

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

Originated as part of AS CZ9—1963.
Previous edition AS 2896—1998.
Fourth edition 2011.

Published by SAI Global Limited under licence from Standards Australia Limited, GPO Box 476, Sydney, NSW 2001, Australia

ISBN 978 0 7337 9761 3

PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee HE-017, Medical Gas Systems, to supersede AS 2896—1998. After consultation with stakeholders in both countries, Standards Australia and Standards New Zealand decided to develop this Standard as an Australian Standard rather than an Australian/New Zealand Standard.

It should be noted that for installation of a pipeline, a high quality of workmanship and experience is essential. For medical gases that are not referenced in Clause 1.2, special pipeline designs may be required, and these are not covered by this Standard. For certain situations, e.g. hyperbaric conditions, special design and performance criteria for pipelines may be required.

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.

The Sleeve Indexing System (SIS) for gas specific connections for terminal units previously in the Standard is now covered by AS 2902—2005, including connections for surgical tool gas along with other gases. The new surgical tool gas connection is recommended as it contains a thread, and reduces the risk or 'hose whip'. The use of adaptors with 'quick connect/disconnect' (Schrader) fittings does not comply with this Standard.

In the preparation of this Standard, cognizance was taken of ISO 7396:2007 *Medical gas pipeline systems*—Part 1: *Pipeline systems for compressed medical gases and vacuum*.

The differences between ISO 7396 and this Standard are as follows:

(a) Testing procedures in this edition are more in keeping with Australian industry practice.

(b) Performance criteria vary substantially.

(c) Copper pipe specifications differ.

(d) Medical participation in commissioning is required by AS 2896.

All medical oxygen cylinder valve outlets will be yoke type connections after 2011. Flexible cylinder leads will be replaced as part of this program. See AS 2473.3—2007 for details.

The terms 'normative' and 'informative' have been used in this Standard to define the application of the Appendix to which they apply. A 'normative' Appendix is an integral part of a Standard, whereas an 'informative' Appendix is only for information and guidance.

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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. Medical gas pipelines are a life support system and as such require careful consideration of their design, construction and installation. 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 and nitrous oxide.

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 are required to be provided to the health care facility, and 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.

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 should 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.

All companies involved in the design, installation, testing, commissioning, and maintenance of medical gas systems, should have suitable quality management systems.

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

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Australian Standard

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

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE

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

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

The supply of oxygen from pressure swing absorption and similar techniques is not covered in this Standard.

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 requirements for operating room pendants, columns and booms.

NOTES:

1 Patient care encompasses both medical and dental applications.

2 Users of this Standard should be aware that medical gas systems may be subject to regulatory requirements, e.g. from Therapeutic Goods Administration, OHS Regulatory Authorities or Plumbing Industry Commission. Compliance with this Standard may not fulfil all such requirements.

1.2 APPLICATION

This Standard applies to gases and suction services in common use where pipeline reticulation is appropriate and economic. It does not apply to special gas mixtures used in small quantities.

The Standard applies to systems providing the following:

(a) Oxygen.

(b) Nitrous oxide.

(c) Medical air.

(d) Surgical tool gas.

(e) CO_2 (less than or equal to 7%) in oxygen.

(f) Nitrous oxide/oxygen 50/50.

(g) Helium-oxygen mixtures.

(h) Carbon dioxide.

(i) Medical suction.

NOTE: In this Standard, ‘suction’ is the preferred term, and corresponds with the internationally known term ‘vacuum’.

(j) Scavenging.

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 Alarm system

A system comprising sensors, one or more indicating panels, power supply and interconnecting wiring, which continuously monitors the status of a medical gas supply system.

1.4.2 Boom

Service support arm for medical gas, outlets for gas, mains electricity, communications, monitoring and extra-low voltage services.

1.4.3 Central bulk gas supply (central supply)

A supply which is either a bank of gas cylinders or a cryogenic liquid supply, or a system using compressors with or without a bank of gas cylinders, or a system using suction pumps.

1.4.4 Column

A floor-mounted or free-standing 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. It may be fixed or mobile.

1.4.5 Connector

A gas specific female SIS end fitting, permanently attached to one or both ends of a flexible hose assembly.

1.4.6 Control equipment

Items such as pressure regulators, relief valves, alarm initiators, manual and automatic valves, necessary to maintain gas supplies at a set pressure within the pipeline distribution system.

1.4.7 Coupler

A gas specific male SIS end fitting permanently attached to only one end of a flexible hose assembly.

1.4.8 Cryogenic liquid system

A system incorporating one or more liquid supplies, the storage pressure of which is thermally controlled. It consists of a primary and secondary supply which is liquid, and an emergency supply which may be gaseous. The secondary supply is usually the residual cryogenic liquid below a pre-determined level.

1.4.9 Design flow rate

The flow rate which is calculated from a knowledge of the number of terminal units to be supplied; from a knowledge of the expected equipment to 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. The flow rate is referenced to an atmospheric pressure of 101.3 kPa and an ambient temperature of 23°C.

NOTE: For vacuum systems, pump capacity is usually designated by the rarified air volume which will be much greater than the design flow.

1.4.10 Emergency gas supply

That portion of the source which is immediately available to continue supply and is the last source of supply in a system.

1.4.11 Emergency power supply (uninterruptible power supply)

An electrical supply system arranged so that failure of the normal supply does not cause any immediate loss of supply to the installation.

NOTE: These supplies can be either an essential supply with an additional battery backed supply which results in no loss of power during establishment of the essential supply, or, supplies that are powered by batteries that are trickle charged from the essential supply. When charged from the essential supply an uninterruptible power supply will be available for a limited time only.

1.4.12 Essential power supply

Electrical energy provided from an alternative source to the normal power supply (e.g. from duplicate supply mains or generator set) which may be subjected to a minor supply break due to switching or starting the generator.

1.4.13 Extra-low voltage (ELV)

Electric voltage not exceeding 32 V alternating current or 115 V direct current.

1.4.14 Ferrule

The non-reusable portion of the hose end fitting.

1.4.15 Fixed secondary equipment (FSE)

The collective name used to identify the equipment modules defined in Clauses 1.4.2, 1.4.4, 1.4.27, 1.4.28 and 1.4.43.

1.4.16 Gas specific

Having characteristics which prevent interchangeability, thereby allowing assignment to only one gas service or suction service.

1.4.17 Hose

A colour coded flexible tube suitable for medical gases.

1.4.18 Hospital-accredited representative

A person authorized by the health care facility to carry out or supervise testing.

1.4.19 Isolating valve (shut-off valve)

A manual or automatic valve which, when closed, will prevent flow in either direction.

1.4.20 Line pressure safety valve

A valve to protect the pipeline downstream of secondary (line pressure) regulators.

1.4.21 Medical air

Normal air of the lower atmosphere entering a medical air pipeline system with a purity as defined in AS 2568.

1.4.22 Medical air compressor system

Air compressors with associated equipment as a source of supply, designed to provide medical air to a pipeline distribution system at a constant pressure.

1.4.23 Medical gas pipeline system

Central supply with control equipment, a distribution pipeline and terminal units (see Figure 1.1). This includes piped vacuum and venturi ejector suction systems.

1.4.24 Non-return valve

A valve which permits flow in one direction only.

1.4.25 Normal power supply

Normal electrical energy supply provided by the electricity supply authority.

1.4.26 Occluded suction

Pressure achieved at a suction terminal unit under no-flow conditions.

1.4.27 Pedestal

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

1.4.28 Pendant

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

1.4.29 Pipeline distribution system

That part of the medical gas supply system that links the source of supply to the terminal units. It includes isolation valves, pressure relief valves, and any secondary pipeline pressure regulators.

NOTE: Depending on its location and function in the medical gas system, an isolation valve may be referred to as main, secondary and the like.

1.4.30 Primary gas supply

That portion of the source of supply (see Clause 1.4.38) which is actually supplying the system during normal operation.

1.4.31 Primary pressure safety valve

A valve to relieve pressure downstream of a primary pressure regulator.

1.4.32 Pressure regulator

A device which reduces the inlet pressure and maintains the set outlet pressure within specified limits.

NOTE: Depending on its location and function in the medical gas system, a pressure regulator may be referred to by its location, e.g. primary, secondary, source, main.

1.4.33 Secondary gas supply

That portion of the plant which automatically supplies the system when the primary supply becomes exhausted.

1.4.34 Self-sealing valve

A valve which remains closed until opened by the attachment of an appropriate connector.

1.4.35 Service facility

A connection which only functions as a source of supply when service is being carried out.

1.4.36 Service head

That part of the fixed secondary equipment containing the services accessible to the user, e.g. general purpose outlets (GPO) and terminal units.