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

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

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Preface

This Standard was prepared by the Standards Australia Committee HE-017, Medical Gas Systems, to supersede AS 2896—2011.

The objective of this Standard is to set out requirements for the safety aspects, construction, testing and certification, operation and maintenance of non-flammable medical gas pipeline systems (MGPS) used for patient care, operating surgical tools, and therapeutic and diagnostic purposes. Non-flammable medical gas pipeline systems include medical suction pipeline systems.

Some of the major changes in this Standard include:

(a) Distinguishing Levels 1 and 2 installations, based on the complexity of the health care facility and required MGPS.

(b) Addition of Appendix K — Roles and responsibilities, to assist healthcare facilities in determining the commissioning process for medical gas pipeline systems.

(c) Addition of Appendix M — Commissioning plan for Levels 1 and 2 installations.

(d) Use of non-medical gases in reticulated systems and requirements for the detection and prevention of leaks and cross connection have been considered.

(e) Addition of a requirement to ensure that any change-over alarm signals cannot be cancelled without first replacing empty cylinders on auto change-over manifolds.

(f) Revision of the pressure and flow performance requirements and testing.

(g) Introduction of requirements for the testing of purity for medical and surgical tool air.

(h) Back-up for special care locations.

(i) Additional requirements for gas scavenging.

A high quality of workmanship and experience is essential in the installation of medical gas pipelines. For medical gases not listed in Clause 1.2, special pipeline designs may be required which 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 inclusion of roles and responsibilities in AS 2896:2021 was approved by the Standards Development Committee on 2 November 2017, as a one-off exemption to the directives of Standardization Guide 009: Preparation of Standards for Legislative Adoption.

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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Introduction

Medical gas pipeline systems (MGPS) 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 may occur when any amount of a hydrocarbon, such as oil, grease or other combustible compounds, comes in contact with oxidizing gases such as oxygen or nitrous oxide.

For this reason, this Standard contains requirements that procedures be taken to avoid gas pipeline hazards, such as —

(a) provision of documentation of tests and results from those responsible for the construction to the healthcare facility and retained as part of the facility's permanent records; and

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

The risks associated with the characteristic hazards as outlined above are increased where medical gases, apart from oxygen, medical air, surgical tool air or suction are reticulated in the healthcare facility or any MGPS where there are special care locations. For this reason the Standard has introduced the distinction between Level 1 and Level 2 works, on which further information can be found in Appendix K. Levels 1 and 2 responsibilities checklists are detailed in Table K.1 and Table K.2 respectively.

Components of the medical gas system should be obtained and installed under the supervision of a person familiar with proper practices for its construction, installation and use. In order to establish competence of the personnel, the healthcare facility manager or operator should closely examine the previous experience of any contractor or installer proposing to work on or build a pipeline system. The healthcare facility manager or operator should also determine if the contractor or installer is familiar with the contents of this Standard, which should be specified in the construction agreement. Unless otherwise specified, changes to the Standard do not act retrospectively.

All companies involved in the design, installation, testing, commissioning, and maintenance of medical gas systems should have suitable quality management systems, e.g. AS/NZS ISO 9001.

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

NOTES

Australian Standard®

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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 (MGPS) used for patient care, operating surgical tools, and therapeutic and diagnostic purposes. Non-flammable medical gas pipeline systems include suction pipeline systems used for human patient care.

The supply of oxygen from pressure swing absorption, oxygen concentrators and similar techniques is not covered in this Standard. The supply of synthetic air from proportioning units is not covered in this Standard.

The Standard does not apply to suction systems for laboratories and dental suction.

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

The Standard also contains requirements for operating room services modules at which terminal units for medical gases are situated.

NOTE Patient care encompasses both medical and dental applications.

1.2 Application

This Standard applies to medical gases and suction services used in a MGPS.

The Standard applies to systems providing any of the following —

(a) Oxygen;

(b) Nitrous oxide;

(c) Medical air;

(d) Surgical tool air;

(e) Carbon dioxide in oxygen ($CO_2 \leq 7$ %);

(f) Nitrous oxide/oxygen 50/50;

(g) Helium/oxygen mixtures ($O_2 \geq 20$ %);

(h) Helium/oxygen mixtures ($O_2 < 20$ %);

(i) Helium;

(j) Carbon dioxide;

(k) Medical suction;

NOTE In this Standard, “suction” is the preferred term, and corresponds with the internationally known term “vacuum”.

(l) Scavenging.