

Australian Standard[®]

CNG refuelling stations



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- Association of Accredited Certification Bodies
 - Bus Industry Confederation
 - CNG Refuelling System Suppliers
 - Department for Transport, Energy and Infrastructure, SA
 - Department of Consumer and Employment Protection, WA
 - Department of the Premier and Cabinet, SA
 - Energy Networks Association
 - International Association for Natural Gas Vehicles
 - Motor Trades Association of Australia
 - State Public Transport Operations Interests
-

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PREFACE

This Standard was prepared by the Standards Australia Committee, AG-009, Natural Gas Vehicle Refuelling Stations, to supersede AG 901—1996, *Code of Practice for NGV Refuelling Stations*. It retains the same format and much of the previous text but with technical and editorial amendments reflecting changes to Standards and regulations that have occurred since AG 901 was last comprehensively reviewed.

The objective of the Standard is to provide manufacturers, designers, regulatory authorities, testing laboratories, installers and similar organizations with minimum uniform requirements for the safety, installation, performance and operation of CNG refuelling stations.

The minimum requirements set out in this Standard are to be read in conjunction with—but do not take precedence over—any Statutory Regulations that may apply. In its preparation consideration has been given to—

- (a) continuity of satisfactory operation of components and equipment;
- (b) the prevention of injury to persons or property;
- (c) the prevention of fire hazards and explosions;
- (d) gas rules and regulations now in force; and
- (e) relevant Australian Standards as identified in Clause 1.2.

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.

Statements expressed in mandatory terms in notes to tables and figures are deemed to be requirements of this Standard.

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STANDARDS AUSTRALIA

Australian Standard CNG refuelling stations

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE

This Standard specifies requirements for the design, construction, operation and maintenance of compressed natural gas (CNG) refuelling stations, which can be one of the following:

- (a) fast fill, where vehicles are filled in a period of minutes, analogous to liquid refuelling;
- (b) time fill, where one or (in most cases) a number of vehicles are filled simultaneously over a period of some hours; or
- (c) a combination of fast fill and time fill.

It does not cover equipment sizing and refuelling performance (the latter to be agreed between the purchaser and station constructor to suit the particular requirements of each station).

This Standard does not cover the requirements for the following:

- (i) Liquefied Natural Gas (LNG) refuelling stations; or
- (ii) Vehicle Refuelling Appliances (VRA) installations, which are covered by AG 806.

NOTES:

- 1 Appendix D contains a checklist that provides guidance on the aspects of the station that should be checked prior to putting the station into service and during annual safety inspections.
- 2 To the extent this Standard provides, in addition to minimum requirements, guidance in areas relating to the design and installation of CNG refuelling stations, such guidance should not be regarded as a design specification or an instruction manual.

1.2 REFERENCED DOCUMENTS

The documents below are referred to in this Standard.

AS

AG 807	Approval requirements for natural gas flexible hose and hose assemblies for pressures above 2.6 MPa
1349	Bourdon tube pressure and vacuum gauges
1530	Methods for fire tests on building materials, components and structures
1530.4	Part 4: Fire-resistance test of elements of construction
1674	Safety in welding and allied processes
1674.1	Part 1: Fire precautions
1725	Chain-link fabric security fencing and gates
1851	Maintenance of fire protection systems and equipment
2030	Gas cylinders
2030.1	Part 1: General requirements

AS	
2441	Installation of fire hose reels
2444	Portable fire extinguishers and fire blankets—Selection and location
2473	Valves for compressed gas cylinders
2473.1	Part 1: Specifications, type testing, and manufacturing tests and inspections
2832	Cathodic protection of metals
2832.1	Part 1: Pipes and cables
3814	Industrial and commercial gas-fired appliances
4041	Pressure piping
4332	The storage and handling of gases in cylinders
4343	Pressure equipment—Hazard levels
4564	Specification for general purpose natural gas
5601	Gas installations
AS/NZS	
1850	Portable fire extinguishers—Classification, rating and performance testing
3000	Electrical installations (known as the Australian/New Zealand Wiring Rules)
3788	Pressure equipment—In-service inspection
60079	Explosive atmospheres
60079.10.1	Part 10.1: Classification of areas—Explosive gas atmospheres (IEC 60079-10-1, Ed. 1.0:2008 MOD)
60079.17	Part 17: Electrical installations inspection and maintenance (IEC 60079-17, Ed. 4.0:2007 MOD)
ISO	
11439	Gas cylinders—High pressure cylinders for the on-board storage of natural gas as a fuel for automotive vehicles
14469	Road vehicles—Compressed natural gas (CNG) refuelling connector
ANSI	
ANSI/IAS	Basic Requirements for Compressed Natural Gas Vehicle (NGV) Fuel Containers
CSA	
CSA B51	Part 2: Boiler, Pressure Vessel and Pressure Piping Code

1.3 DEFINITIONS

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

1.3.1 Approved, approval

Acceptable to, and meeting the prescribed standards of, the Technical Regulator (see Clause 1.3.22).

1.3.2 Authority

Regulatory authority having jurisdiction or such authority as delegated (see also Technical Regulator).

NOTE: See Appendix A for more information.

1.3.3 Compressed natural gas (CNG)

A compressed gaseous fuel composed of natural gas of pipeline quality as defined in AS 4564.

1.3.4 Compressed gas storage systems

Group of cylinders or pressure vessels connected together, which may or may not be connected into separate 'banks' (i.e. sections), and complying with the requirements of this Standard.

1.3.5 Dispenser/fill post

A unit for filling compressed natural gas into CNG cylinders, which may or may not incorporate metering.

1.3.6 Fire Resistance Level (FRL)

The rating of the ability of an element of building construction to fulfil its required load bearing function, integrity and thermal insulation in a standard fire resistance test as determined in accordance with AS 1530.4 for—

- (a) structural adequacy;
- (b) integrity; and
- (c) insulation.

It is expressed in minutes in the above order (e.g. 60/60/30).

1.3.7 Hazardous area (on account of explosive gas atmospheres)

An area in which an explosive gas atmosphere is or may be expected to be present in such quantities as to require special precautions for the construction, installation and use of equipment.

1.3.8 Ignition source

A source of energy sufficient to ignite a flammable atmosphere that may include a naked flame, exposed incandescent material, an electrical welding arc, a mechanical or static spark and electrical or mechanical equipment not suitable for use in a hazardous location.

NOTE: For the purposes of this Standard, a motor vehicle entering a hazardous area associated with any part of a refuelling station is not regarded as an ignition source.

1.3.9 Master shut off valve

A quarter turn manual valve capable of being locked off but not locked on, in order to isolate all equipment downstream of the compressed gas storage system (see Clause 1.3.4).

1.3.10 Mobile gas storage

Multiple cylinders or pressure vessels permanently mounted on a special carriage and used for the transportation of CNG to other refuelling stations.

1.3.11 Non-return valve

A valve which permits flow in one direction only.

1.3.12 Operating pressure

The internal pressure to that a pressure containing component is subjected under normal operating conditions.

1.3.13 Pressure

Gauge pressure unless noted as absolute pressure.

1.3.14 Protected place

Any of the following:

- (a) A dwelling, place of worship, public building, school or college, child care facility, hospital, theatre or any building or open area in which persons are accustomed to assemble, whether within or outside the property boundary of the station.
- (b) A factory, workshop, office, store, warehouse, shop or building where people are employed that is outside the property boundary of the station.
- (c) A ship lying at permanent berthing facilities.
- (d) Any storage facility for dangerous goods that is outside the property boundary of the station.

1.3.15 Public place

Any place, other than private property, open to the public and including a street or road.

Parking areas for commercial and public buildings are not considered public places.

1.3.16 Refuelling connector

Joined assembly of refuelling nozzle and receptacle.

1.3.17 Refuelling nozzle

Device that permits the safe, quick connection and disconnection of the refuelling hose assembly to the refuelling receptacle.

1.3.18 Refuelling receptacle

Device connected to a vehicle or storage system that receives the refuelling nozzle and permits safe transfer of CNG.

1.3.19 Refuelling hose assembly

An assembly incorporating a flexible hose, a breakaway coupling, a refuelling hose valve (where used) and a refuelling nozzle.

1.3.20 Refuelling hose valve

A valve located in the refuelling hose assembly to stop the flow of gas and to depressurize the section between the refuelling nozzle and the valve.

1.3.21 Screen wall

A structurally sound wall that—

- (a) has a fire resistance level (FRL);
- (b) is impervious to vapour; and
- (c) is constructed of materials that are substantially resistant to attack by the substances being screened.

1.3.22 Technical Regulator

Persons, bodies or other entities appointed by the government under applicable legislation in the respective state or territory to have jurisdiction over the implementation of safety and other standards and regulations applicable to any refuelling station.

1.3.23 Vapour barrier

An impervious, non-combustible barrier constructed with the object of preventing the passage of vapour from any one place to another.

1.4 ADDITIONAL REQUIREMENTS FOR PUBLIC REFUELLING STATIONS

Additional requirements applying to public refuelling stations should be agreed on a case by case basis between the involved parties (station constructor, technical regulator(s), site owner and operator, and the relevant certifying/accrediting bodies).

1.5 APPROVALS

1.5.1 Technical Regulators' requirements

A refuelling station shall meet the requirements of the Technical Regulators.

NOTE: Refer to Appendix A for a list of regulators, functions and contact details in each jurisdiction.

1.6 SUPPLY ENQUIRIES

1.6.1 Gas supplier

At a preliminary stage, an application should be addressed to the gas supplier regarding—

- (a) natural gas availability;
- (b) supply pressure;
- (c) gas specification; and
- (d) gas connection, gas equipment and piping installation.

1.6.2 Electricity supplier

At a preliminary stage, an application should be addressed to the electricity supplier regarding electricity supply and installation requirements.

SECTION 2 COMPONENTS

2.1 GENERAL

Enquiries shall be made of the natural gas supplier to determine whether there are any components in the gas to be compressed that may adversely affect refuelling station components or negatively impact on fuelling operations (refer Clause 1.6.1(c)).

All components shall be compatible with the natural gas to be compressed and shall be designed or selected for the full range of pressures, temperature and loadings to which they are subjected.

Where the natural gas supplied has a water content that, in conjunction with prevailing ambient temperatures, gives rise to hydrate build-up to the extent that refuelling operations are affected, then consideration should be given to the use of a gas drying system.

2.2 GAS-FIRED APPLIANCES

Gas-fired appliances used in the CNG refuelling station, e.g. gas engines for driving CNG compressors, shall meet the requirements of AS 3814.

NOTE: State gas supply regulation may require that such gas-fired appliances be certified.

2.3 COMPRESSORS

2.3.1 General

These requirements apply to mechanically, electrically or hydraulically powered compressors designed for the compression of natural gas.

Compressors intended for outdoor installation shall have all controls and electrical wiring adequately protected from climatic conditions to ensure safe and reliable operation.

Compressors shall be provided with clear and permanent markings that are readily accessible and easy to read when the compressor is in the installed position.

Such markings shall include the following:

- (a) Manufacturer's trade name.
- (b) Model designation.
- (c) Serial number and year of manufacture.
- (d) Rated capacity at a designated inlet pressure.
- (e) Maximum discharge pressure.
- (f) Operating speed.
- (g) Maximum and minimum supply pressure.

2.3.2 Separators

Separators shall be fitted after compression stage coolers to remove, as far as is possible, any oil, water or condensate droplets present in the gas.

2.3.3 Separator drainage

Provision shall be made for the removal and collection of any liquids accumulating in the separators. Any gas escaping with the drained liquid shall be separated and piped to the compressor inlet.

The separator drainage system may be either manual or automatic. It shall be operated at frequencies that ensure the re-entrainment of intercepted liquids is avoided.

2.3.4 Compressor unloading/blow down systems

Where an unloading/blow down system is incorporated the blown down gas shall be returned to the compressor inlet and be designed to ensure that the rated pressure of the inlet system is not exceeded.

2.3.5 Relief valves

Each stage shall be fitted with a spring-loaded relief valve sized for the compressor capacity. The set pressure shall exceed the operational discharge pressure of the associated stages to the extent necessary to avoid discharge in normal service (typically 15% for inter stage and 10% for final stage relief valves) but shall not exceed the respective design rated pressures.

Discharge piping of such relief valves shall be in accordance with Clause 3.8.2.

2.3.6 Instruments

Gas compressors shall be fitted with indicators to monitor the following:

- (a) Gas pressure(s)—A pressure gauge that complies with Clause 2.7 shall be fitted after each stage of gas compression.
- (b) Lubricating oil pressure(s) (if applicable)—Equipment utilizing pressure lubrication system(s) shall be fitted with an oil pressure gauge (or gauges).
- (c) Crankcase pressure (if applicable)—Compressors with a crankcase operating under positive pressure should be fitted with a crankcase pressure gauge.
- (d) Temperature(s)—Temperature measurement shall be provided on the outlet of the compressor.
- (e) Oil level(s)—Provision shall be made to indicate all oil level(s).
- (f) Provision shall be made to indicate 'hours run'.

2.4 PIPING (INCLUDING FLEXIBLE PIPING/HOSES AND TUBING)

2.4.1 Gas inlet train components

Gas inlet train components used shall be in accordance with AS 5601 and any additional requirements of the Technical Regulator (see Clause 1.3.22).

2.4.2 Compressor skid piping and hoses

Piping and hoses from the flexible hose at the compressor inlet connection, between compression stages, coolers and separators and up to the non-return valve at the end of the compressor outlet flexible piping, shall be in accordance with the compressor manufacturers' standard practice. The piping used shall have a rated pressure in excess of the maximum pressures that can occur in the locations where the piping is used.

2.4.3 Discharge piping/tubing

Discharge piping/tubing shall be in accordance with AS 4041 or equivalent Standard.

2.4.4 Hose assemblies (other than compressor skid hoses)

All flexible hose assemblies used for gas transmission at pressures above 2.4 MPa shall meet the requirements of AG 807.

Flexible hose assemblies used for gas transmission at pressures below 2.4 MPa shall be suitable for natural gas service and have rated pressures in excess of the maximum pressures that can occur in the locations where they are used.

Flexible hose assemblies used for pressure sensing shall be suitable for natural gas service and have rated pressures in excess of the maximum pressures that can occur in the locations where they are used.

2.5 VALVES, PIPING AND TUBING COMPONENTS

2.5.1 General

All valves, pipes and components such as strainers, compression fittings and no break couplings, separator bodies and similar fittings shall have a rated pressure in excess of the maximum pressures that can occur in the locations where used. In addition, materials, especially elastomers, shall be suitable for use with compressed natural gas.

The manufacturer shall stamp, or otherwise permanently mark, valves and components to indicate the manufacturer's name or trademark and part number.

Isolating valves shall operate with a quarter turn from open to closed.

2.5.2 Gas inlet train

Valves and components up to and including the appliance valve(s) shall be in accordance with AS 5601.

2.5.3 Valves and components for the compressor skid

From the compressor inlet to the non-return valve at the end of the compressor outlet flexible piping, valves and components shall comply with the compressor manufacturer's standard practice.

2.5.4 Pressure valves

Cylinder valves shall comply with AS 2473.1 or an equivalent Standard.

2.6 SAFETY DEVICES FOR PRESSURE PROTECTION

Spring controlled pressure relief valves shall—

- (a) be clearly marked by their manufacturer or agent with the pressure at which they are set to start to discharge;
- (b) have a rated discharge capacity greater than the input capacity from the system; and
- (c) not be fitted with lifting devices to prevent tampering by unauthorized persons; and
- (d) incorporate a means for adjusting the pressure set point that can be sealed.

2.7 PRESSURE GAUGES

Pressure gauges—

- (a) shall comply with AS 1349 or equivalent and shall have a dial graduated to read between 1.2 to 2 times the operating pressure; and
- (b) shall comply with AS 1349 or equivalent where used on storage vessels and shall have a dial graduated to read between 1.2 to 2 times the maximum developed pressure.

NOTE: For gauges at operating pressures of 2500 kPa or above, special provisions apply in AS 1349.

2.8 ELECTRICAL EQUIPMENT AND WIRING

All electrical wiring and equipment shall be suitable for the specific hazardous area in which it is located, in accordance with AS/NZS 3000.