

Australian Standard™

Gas cylinder test stations

Part 1: General requirements, inspection and tests—Gas cylinders



This Australian Standard was prepared by Committee ME-002, Gas Cylinders. It was approved on behalf of the Council of Standards Australia on 11 June 2004. This Standard was published on 30 August 2004.

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Air Conditioning and Refrigeration Wholesalers Association
Australasian Institute of Engineer Surveyors
Australian Chamber of Commerce and Industry
The Australian Gas Association
Australian Liquefied Petroleum Gas Association
Certification Bodies (Australia)
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STANDARDS AUSTRALIA

RECONFIRMATION

OF

AS 2337.1—2004

Gas cylinder test stations

Part 1: General requirements, inspection and tests—Gas cylinders

RECONFIRMATION NOTICE

Technical Committee ME-002 has reviewed the content of this publication and in accordance with Standards Australia procedures for reconfirmation, it has been determined that the publication is still valid and does not require change.

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Approved for reconfirmation in accordance with Standards Australia procedures for reconfirmation on 21 July 2016.

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NOTES

Australian Standard™

Gas cylinder test stations

Part 1: General requirements, inspection and tests—Gas cylinders

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PREFACE

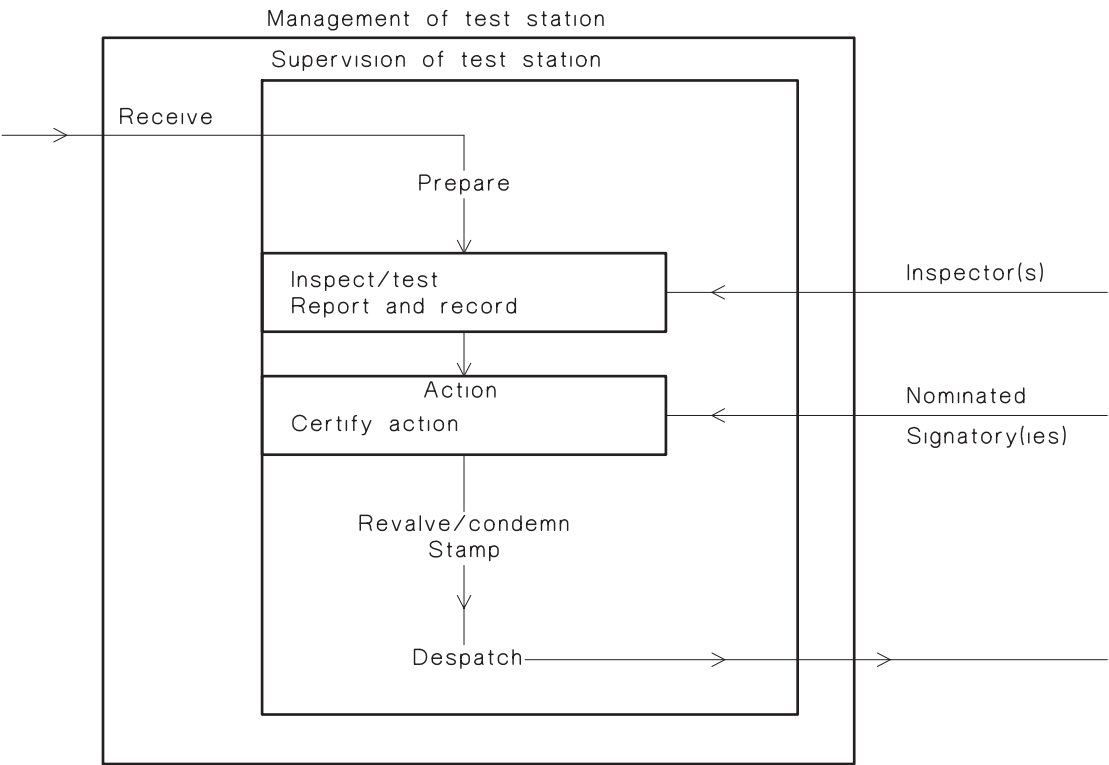
This Standard was prepared by the Australian members of the Joint Australia/New Zealand Standards Committee ME-002, Gas Cylinders to supersede AS 2337.1—1999. After consultation with stakeholders in both countries, Standards Australia and Standards New Zealand decided to develop this Standard as an Australian Standard, rather than an Australian/New Zealand Standard.

The objective is to provide gas cylinder test station operators with the requirements and procedures to carry out initial and periodic inspections to comply with regulatory needs.

This revision has arranged the steps in inspecting and testing gas cylinders in a similar way to those in ISO/DIS 6406, although significant differences still exist between the two Standards. The Committee is trying to align as far as possible, Australian Standards for gas cylinders with those prepared by ISO/TC 58 Gas Cylinders.

The division of functions within a test station has caused some difficulties where the titles of personnel do not match the positions of the organization in which the test station operates. It is necessary to cater for different types of organization, from one-person to a large operation with activities other than cylinder testing.

The diagram given below may help explain the intended function.



NOTE: The boxes show minimum tasks that may be taken up by the nominated person where this will not interfere with her/his primary responsibility.

A certificated gas cylinder test station scheme is operated by the appropriate Certification Organizations in Australia. Certification Organizations carry out the initial assessment and periodic audits.

From 1995 there has been, and will continue to be, a phasing out of State and Territory regulatory authorities approving and verifying compressed gas cylinder design and testing and a phasing in of competent bodies or persons to undertake this task.

The Standard removes references to matters of approval with regard to the State and Territorial regulatory authorities. Gas cylinder test stations will be given certificates of conformity with the appropriate Standard instead of approval. These changes align with the changes that have taken place within AS 2030.1. The Standard also introduces a new concept regarding testing. Acoustic emission test methods are introduced as an alternative to traditional hydraulic testing for tubes made to specified DOT Standards. This complements ultrasonic examination as recognized test methods based in newer technologies.

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

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.

IT SHOULD BE NOTED THAT COMPLIANCE WITH THIS STANDARD MAY NOT NECESSARILY FULFIL ALL LEGAL REQUIREMENTS.

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STANDARDS AUSTRALIA

Australian Standard
Gas cylinder test stations

Part 1: General requirements, inspection and tests—Gas cylinders

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE

This Standard sets out requirements and procedures for a gas cylinder test station to carry out initial and periodic inspection of gas cylinders covered by AS 2030.1. It also specifies requirements for test stations to obtain a certificate of conformity.

Specific requirements for inspection and testing of LP Gas fuel vessels, applied in accordance with AS/NZS 1425, and composite (FRP) gas cylinders, are given in AS 2337.2 and AS 2337.3.

NOTE: Appendix G provides flowcharts to illustrate testing procedures.

1.2 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

AS	
1349	Bourdon tube pressure and vacuum gauges
2030	The verification, filling, inspection, testing and maintenance of cylinders for the storage and transport of compressed gases
2030.1	Part 1: Cylinders for compressed gases other than acetylene
2337	Gas cylinder test stations
2337.2	Part 2: LP Gas fuel vessels for automotive use
2337.3	Part 3: Inspection and testing of fibre reinforced plastics (FRP) gas cylinders
2381	Electrical equipment for explosive atmospheres—Selection, installation and maintenance
2381.7	Part 7: Intrinsic safety i
2473	Valves for compressed gas cylinders (threaded outlet)
2613	Safety devices for gas cylinders
3848	Filling of portable gas cylinders
3848.2	Part 2: Filling of portable cylinders for self-contained underwater breathing apparatus (SCUBA) and non-underwater self-contained breathing apparatus (SCBA)—Safe procedures
MP 48	Certificated gas cylinder test stations
AS/NZS	
1425	LP Gas fuel systems for vehicle engines
2739	Natural gas (CNG) fuel systems for vehicle engines
ASTM	
E1419	Examination of seamless gas-filled pressure vessels using acoustic emission

CGA	
C-18	Methods for acoustic emission requalification of seamless steel compressed gas tubes
V-1	Compressed Gas Association standard for compressed gas cylinder valve outlet and inlet connections
EN	
1802	Transportable gas cylinders—Periodic inspection and testing of seamless aluminium alloy gas cylinders
1968	Transportable gas cylinders—Periodic inspection and testing of seamless steel gas cylinders

1.3 DEFINITIONS

For the purpose of this Standard, the definitions given in AS 2030.1 and those below and in Table 6.1 apply.

NOTE: Table 6.1 provides definitions of specific defects with illustrations and treatment.

1.3.1 Acoustic emission testing (AET) source

Physical mechanism which produces acoustic emissions (AE). Primary sources (e.g. flaw growth), secondary sources (e.g. fracture of entrapped mill scale), background noise (e.g. mechanical contact), reference source (used for checking sensitivity) are all included.

1.3.2 Acoustic emission testing (AET)

A non-destructive testing (NDT) method involving detection of elastic stress waves from test specimen whilst that specimen is under stress.

1.3.3 Certification organization

An organization accredited by a recognized body to grant certificates of conformity to gas cylinder test stations in Australia.

1.3.4 Design identification number

A number issued by an Australian Statutory Authority to record the registration of a gas cylinder design.

1.3.5 Nominated signatory

A person nominated as a signatory on the certificate of conformity.

1.3.6 Shall

Indicates that a statement is mandatory.

1.3.7 Should

Indicates a recommendation.

1.3.8 Test station

The combination of nominated personnel, equipment and procedures, in accordance with the requirements of this Standard. Certificated test stations are listed in MP 48.

1.3.9 Tube

A seamless compressed gas cylinder of greater than 500 kg water capacity with openings at both ends, and made to a recognized tube specification such as DOT-3A, 3AA, 3AAX, 3T, or equivalent.

1.4 TEST STATION COMPLIANCE

The terms of the certificate of conformity require the owner(s) of a registered test station to enter into a specific undertaking with the Certification Organization and uphold the conditions of that undertaking.

At any time, a test station shall be able to satisfy the Certification Organization that it is competent and complies with the requirements of this Standard.

The Certification Organization shall, upon successful verification, issue a certificate of conformity, which specifies the categories of cylinders that may be inspected and/or tested by that station, and the nominated personnel.

The certificate of conformity shall be kept in the premises or be carried with the testing equipment.

Before a certificate of conformity is granted, the Certification Organization shall allocate a unique test station number to the test station. The test station shall use this number in its test station stamp.

Failure to comply with the requirements and procedures of this Standard may result in the suspension or withdrawal of the certificate of conformity. If the test station ceases to operate for any reason, including suspension, the certificate shall immediately be returned to the issuing body. The issuing body should inform Standards Australia, so that MP 48 can be amended.

SECTION 2 CLASSIFICATION OF TEST STATION OPERATIONS

2.1 GENERAL

Test stations shall operate only within the limits of the certificate of conformity issued in writing by the Certification Organization.

As the certificate of conformity is subject to revision, any changes to the limits shall be valid only if given in writing by the Certification Organization. Such changes shall be incorporated into the certificate of conformity whenever a new certificate is issued.

2.2 TYPES OF CYLINDERS AND CONTENTS

A test station may be assessed to test one or more of the following classes:

- (a) Welded and brazed cylinders.
- (b) Seamless cylinders.
- (c) Composite cylinders (see AS 2337.3).
- (d) Automotive CNG cylinders (see AS/NZS 2739).
- (e) Automotive LP Gas vessels (see AS 2337.2).

2.3 MODES OF OPERATION

Test stations are classified in three main modes of operation as follows:

- (a) Static Test Station, which is located at a permanent address.
- (b) Mobile Test Stations, which may be either of the following:
 - (i) Vehicle-based Station, which shall be capable of carrying out the same range of testing as static test station, and which is linked to a permanent address for record purposes only.
 - (ii) Portable Station, which is linked to a permanent address for record purposes, and which is restricted to external visual examination in the following situations only:
 - (A) Commissioning new cylinders in accordance with the external examination requirements specified in Sections 5 and 6.
 - (B) Inspecting CNG cylinders for automotive fuel use, as permitted by AS 2030.1.

Records and reports for mobile stations shall be maintained at the address shown on the test station certificate of conformity, regardless of where the tests are actually conducted.

Where inspections are to be carried out other than at one permanent location, a copy of the test station certificate of conformity shall be available at the inspection site(s).

- (c) Integrated Gas Cylinder Test Station (IGCTS) which is attached to a cylinder manufacturer's plant. Requirements for IGCTS are set out in Appendix E.

The function of an IGCTS is to ensure that all new cylinders which are released from the plant, comply with the cylinder design, and pass the type tests, manufacturing tests and inspections that are required by the cylinder design specification, and by AS 2030.1, and are then stamped with the test station mark.

An IGCTS shall ensure that the manufacturing and test records are maintained for at least 20 years.

2.4 EQUIPMENT REQUIREMENTS

The equipment required for each class of test station above is set out in Appendix D.

SECTION 3 PERSONNEL, PROCEDURES AND BASIC EQUIPMENT

3.1 MANAGEMENT AND PERSONNEL

3.1.1 General

Each certificated test station shall have personnel for the following functions:

- (a) Test station manager.
- (b) Nominated signatory(ies).
- (c) Inspectors.

The manager and the nominated signatory(ies) shall be assessed by the Certification Organization, and shall be listed on the Certificate of Conformity or otherwise certified.

The number of personnel should be appropriate to the amount of inspection work carried out and the extent of other duties for which each person is responsible.

The functions shall provide for the requirements specified in Clauses 3.1.2 to 3.1.4 as appropriate.

NOTE: Where a large number of operations are involved, e.g. cylinder and vessel manufacture, a suitable inspection and testing scheme and adequate supervision may permit use of competent operators as inspectors. In certain circumstances, one person may be nominated for several roles, and this is a common practice.

Where a person accepted by the Certification Organization as complying with one or more of the positions specified in Clauses 3.1.2 and 3.1.3 transfers to another test station, continued acceptance by the Certification Organization will be agreed only where all of the following are complied with:

- (i) The position(s) is equivalent.
- (ii) The test station carries out equivalent inspection and testing.
- (iii) The Certification Organization has been notified.
- (iv) The Certification Organization acknowledged the transfer in writing.

3.1.2 Test station manager

The test station manager shall be qualified for the position, as indicated by previous relevant experience and technical qualification. The manager shall—

- (a) ensure the test station operates within the scope of the certification, the competence of personnel, and supervision;
- (b) ensure that all requirements specified in relevant Standards are complied with;
- (c) have a detailed knowledge of the hazards, procedures, and equipment associated with gas cylinders;
- (d) be familiar with the general requirements (as required by the Certificate of Conformity) of Standards and regulations for cylinders inspected and tested by the test station;
- (e) not be impaired in the execution of the role of manager by other duties extraneous to the operation of the test station; and
- (f) be named on the test station's certificate of conformity (subject to any subsequent change authorized in writing by the Certification Organization).

3.1.3 Nominated signatory(ies)

There may be more than one signatory. Each nominated signatory shall be familiar with the detailed requirements (as required by the Certificate of Conformity) of Standards and regulations for cylinders inspected and tested by the test station. A nominated signatory is the only person authorized to sign test reports, and all signatories shall be listed on the Certificate of Conformity (subject to any subsequent change authorized in writing by the Certification Organization).

A nominated signatory shall make technical judgements on the evidence available, and shall accept or reject each cylinder inspected, and report on that action.

A signatory shall have eyesight, either unassisted or assisted by spectacles, capable of reading a row of letters of sufficiently fine print (Jaeger No. 2 or finer) at a nominal distance of 300 mm.

3.1.4 Inspector(s)

The inspector(s) shall be—

- (a) competent to differentiate between acceptable and unacceptable cylinders as appropriate (in all aspects of testing undertaken by the test station);
- (b) aware of the hazards associated with inspecting of cylinders as appropriate; and
- (c) familiar with inspection procedures.

NOTE: Training of inspector(s) is normally the responsibility of the manager and/or the nominated signatory.

Evidence shall be gathered from each cylinder. This evidence is intended to be recorded as gathered, but not necessarily by direct entry into a test report. The manager or nominated signatory or some other person may enter the gathered evidence into any test report from the inspection record. The nominated signatory shall review the gathered evidence to decide on the appropriate action.

Inspectors shall have eyesight, either unassisted or assisted by spectacles, capable of reading a row of letters of sufficiently fine print (Jaeger No. 2 or finer) at a nominal distance of 300 mm.

3.1.5 Other personnel

Other persons may be engaged in non-inspection activities, such as preparation, handling, and completion of procedures after inspection and testing. Such persons shall be made aware of the hazards associated with the tasks they perform.

3.1.6 Mobile test stations

The inspector shall be a nominated signatory or shall be accompanied by a nominated signatory, so that the technical judgements can be made at the place of inspection.

3.2 OPERATIONS AND PROCEDURES

The following requirements apply:

- (a) Equipment and procedures shall be maintained as required by the Certificate of Conformity. The Certification Organization shall be made aware in writing, of any significant changes to equipment, procedures or nominated signatories.

NOTE: Failure to do so may result in the test station's Certificate of Conformity being suspended or cancelled.

- (b) Current reference Standards for the types of cylinders to be tested and MP 48 shall be available.

NOTE: The relevant reference Standards are AS 2337.1 (i.e. this Standard), any other Standard in the AS 2337 series referred to in the Certificate of Conformity for the test station, and the following as required:

- (i) For gas cylinders AS 2030.1.
- (ii) For CNG fuel systems AS/NZS 2739.
- (iii) MP 48.

A test station carrying out initial inspection and stamping of a gas cylinder shall also hold the manufacturing specification for that cylinder.

NOTE: MP 48 lists only those test stations certified prior to its publication. For up to date publication information, contact Standards Australia.

- (c) Data as necessary for inspecting and testing shall be available.
NOTE: Data are deemed to be available by reference to Standards held by the test stations or by reference to other suitable sources, not necessarily held by the test station.
- (d) A system of written records of all cylinders tested, all final reports issued, and all calibration reports on equipment shall be established and maintained. Calibration reports shall be kept at least until the test station is next assessed.
- (e) Signed and dated station procedures shall be established, made available to personnel, and implemented. The procedures shall be documented, shall comprise general methods and sequences of operations, and shall be followed in the operation of the test station. Such procedures are intended to ensure that errors are minimized. They shall include the following:
 - (i) Identification and segregation of cylinders at various stages of testing.
 - (ii) Recording of inspection and test results on a worksheet at the time the tests are made, and transfer of these to final test reports where appropriate.
 - (iii) Rounding off numerical readings in a consistent manner, and as specified in the marking Clause of the appropriate cylinder specification.
 - (iv) Devalving of cylinders in a safe manner, as specified in Clause 5.3.
 - (v) Safe disposal of gas contents.
 - (vi) Rendering failed cylinders unserviceable (see Clause 9.3).
- (f) For safety reasons, the permission of the cylinder owner shall be obtained to perform the tests herein specified, and advice from the owner shall be obtained concerning the contents of the cylinder.

3.3 WORKPLACE AND EQUIPMENT

3.3.1 Workplace

The principal operation of the workplace shall be the inspection and testing of cylinders, and no other activity shall interfere with these operations. The working conditions shall include the following:

- (a) Layout and general facilities shall be conducive to accurate and safe inspection and testing of cylinders.
- (b) There shall be adequate lighting.
- (c) There shall be adequate ventilation.
- (d) There shall be adequate space for the number of operators and the number of cylinders handled.
- (e) The area shall be clean, and, where hydraulic testing is carried out, shall be well drained.

Mobile test stations shall comply with this Clause where practicable.

Inspection of cylinders may be combined with filling operations, or cylinder manufacturing operations provided that suitable separation or segregation of the different activities is maintained. The integrity of the testing activity shall not be compromised.

3.3.2 Basic equipment

The minimum equipment for a test station inspecting and testing for routine re-qualification of cylinders shall include the following:

- (a) For the internal inspection of a cylinder that has contained a flammable gas or oxidizing gas, a fibre-optic illuminator with an external light source of sufficient intensity to enable viewing of all internal surface. For the internal inspection of other cylinders (that have contained non-flammable gas), an inspection light of extra-low voltage or a fibre-optic illuminator.

NOTE: Other light sources may be used in place of fibre-optic illuminators provided that they are intrinsically safe or explosion-proof to T4 levels. For guidance see AS 2381.7.

- (b) Aids to viewing internal and external surfaces where necessary, such as a hand-held light and a $\times 2$ magnification mirror for particular use in inspecting seamless cylinders.
- (c) Suitable cylinder clamping and handling facilities. These shall allow the cylinder to be securely held without causing damage while the valve is being removed and replaced.

Provision shall also be made, where necessary, for inverting the cylinder to permit easy viewing of the cylinder bottom, and the junction of any foot-ring. This facility is also useful when a boot is being removed from the cylinder base.

- (d) Obstructed valve equipment, which shall include a means of introducing a low pressure gas to the valve in accordance with Clause 5.3.2 or a means of applying suction on a valve, as well as suitable means of releasing pressure from an obstructed valve (see Clause 5.3.3).

NOTE: A suggested device for detecting obstructed cylinder valves is shown in Appendix F.

- (e) Surface-measuring devices, which shall include a straightedge of adequate length, and templates or other means of detecting and measuring bulges, dents, digs, and cuts.
- (f) Neck-thread checking and cleaning equipment, which shall include a tap for each size thread commonly encountered by the test station.

NOTES:

- 1 Various thread gauges are specified in AS 2473 which may be required to identify or check the accuracy of a valve and cylinder neck thread.
- 2 A suitable tap may be an acceptable means of checking the form of a parallel neck thread.
- 3 A suitable plug and/or ring gauge may be required for tapered threads.

- (g) Metal stamps, for marking the test station symbol and the date of inspection. These shall be of appropriate size in accordance with the specification of the cylinders commonly encountered by the test station.
- (h) Cleaning equipment, e.g. wire brushes, a blaster, rumbler, steam supply, and equipment for handling cleaning agents and solvents, as appropriate. Nylon and brass bristled bushes are useful for cleaning threads.
- (i) Where a mass-test is required, suitable scale. See Section 8.
- (j) Equipment to control the maximum torque applied to cylinder valves and to pressure test adaptors when required.

- (k) Additional items of equipment requires for hydrostatic and other tests as specified in the relevant sections and appendices.
- (l) An accurate means of determining cylinder wall thickness, where required.

Suitable equipment shall be available for particular inspections. It will be necessary to demonstrate that such equipment is available and can be operated satisfactorily when the test station is initially assessed and routinely audited.

Mobile test stations shall carry those items appropriate to the inspection and test performed.

SECTION 4 INSPECTIONS AND TESTS TO BE PERFORMED

4.1 IDENTIFICATION OF CYLINDER AND PREPARATION FOR INSPECTION AND TESTS

Before any work is carried out, the relevant cylinder data and its contents and ownership shall be identified from the labelling and stamping. Cylinders with incorrect or illegible markings, unknown gas contents or those that cannot be safely emptied of gas shall be set aside for special handling.

4.2 CYLINDERS ALREADY STAMPED WITH A CERTIFICATED TEST STATION MARK

Cylinders shall be subjected to inspection and tests specified in AS 2030.1 and, as appropriate, in this Standard.

It is recommended that the tests listed below be performed in the suggested sequence. In particular, the visual examinations (Clauses 6.2 and 6.3) should be carried out before the pressure test or ultrasonic examination (Section 7).

- (a) Identification of gas and valve removal (Clauses 5.2 and 5.3).
- (b) External visual inspection (Clause 6.2).
- (c) Internal examination (Clause 6.3).
- (d) Inspection of cylinder neck (Clause 6.4).
- (e) Pressure test or ultrasonic examination (Section 7).
- (f) Mass test (Section 8).
- (g) Operations on rejected cylinders (Section 9).
- (h) Operations on accepted cylinders (Section 10).
- (i) Complete records (Section 11).

Cylinders that fail the inspection or tests shall be rejected (see Section 9). The decision to reject a cylinder may be taken at any stage during the inspection and test procedure.

Where there are still doubts about the condition of the cylinder after the above tests, refer to Clause 6.5.

Heat exposure may affect the mechanical properties of cylinders, especially aluminium or composite materials. Therefore, the maximum temperature for any inspection or test operation shall be limited to the manufacturer's recommendation.

4.3 INSPECTION OF CYLINDERS WITHOUT A CERTIFICATED TEST STATION MARK

Before a gas cylinder can be stamped with a test station's certificated mark, prior to its first filling in Australia, it is necessary to verify the suitability of the cylinder for filling in accordance with AS 2030.1.

The following steps shall be followed:

- (a) Verify that all the required documentation and markings as specified in AS 2030.1 are correct (Clause 5.1).
- (b) Identification of contents, if the cylinder has been in service (Clause 5.2).

- (c) External visual inspection (Clause 6.2).
- (d) Internal visual inspection, when corrosion is suspected (Clause 6.3).
- (e) Pressure test or ultrasonic examination, if required (Section 7).
- (f) Mass test, if required (Section 8).

Subsequent to inspections and test, cylinders shall be treated as follows:

- (i) Operations on rejected cylinders (Section 9).
- (ii) Operations on accepted cylinders (Section 10).

Cylinders which do not pass all the inspection requirements of AS 2030.1 shall not have a test station mark applied.

4.4 INSPECTION WHERE THE CYLINDER SHOWS EVIDENCE OF A DEFECT PRIOR TO FILLING

A cylinder which is considered likely to fail to comply with the requirements of AS 2030.1 for examination by the filler prior to filling, shall be inspected and tested in accordance with Section 6, e.g. where there is evidence of mechanical damage, evidence of exposure to fire, or a cylinder is suspected of internal corrosion.

4.5 REPAIRED CYLINDERS

A cylinder repaired in accordance with AS 2030.1 shall be externally and internally inspected (Section 6) and subjected to a hydraulic pressure test and where appropriate, other pressure test or ultrasonic examination (Section 7).

4.6 CHANGE OF GAS TRAFFIC

A cylinder which is to be changed from one gas traffic to another shall be inspected as follows:

- (a) The contents purged in accordance with Section 5.
- (b) External examination in accordance with Table 6.1.
- (c) If the cylinder valve must be removed for any reason, an internal examination in accordance with Clause 6.3.
- (d) If necessary, internal cleaning, followed by complete drying, in accordance with Clause 6.3.
- (e) Other specific examinations, tests and procedures in accordance with AS 2030.1.