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GAS CYLINDER TEST STATIONS Part 3—INSPECTION AND TESTING OF FIBRE REINFORCED PLASTICS (FRP) ALUMINIUM ALLOY GAS CYLINDERS— HOOP OVERWRAPPED



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Australasian Steamship Owners Federation
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This standard was issued in draft form for comment as DR 84071.

AUSTRALIAN STANDARD

GAS CYLINDER TEST STATIONS
Part 3
INSPECTION AND TESTING OF
FIBRE REINFORCED PLASTICS
(FRP) ALUMINIUM ALLOY GAS
CYLINDERS—
HOOP OVERWRAPPED

AS 2337.3—1987

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PREFACE

This standard was prepared by the Association's Committee on Gas Cylinders. It is based on draft procedures provided to the committee by The Commonwealth Industrial Gases Limited.

It is expected that certain SAA approved gas cylinder test stations will be able to extend their existing approval to cater for cylinders now entering service.

This standard provides only for hoop overwrapped gas cylinders with seamless aluminium alloy liners. Other types, such as totally overwrapped gas cylinders, and those with steel liners, have not been provided for in the absence of any proposals. For such proposals to be considered it would be necessary for the committee to receive comprehensive information on which to base appropriate requirements.

The interval of testing, and service life, are specified in AS 2030.1, SAA Gas Cylinders Code, Part 1—Cylinders for Compressed Gases Other than Acetylene.

Fibre reinforced plastics (FRP) gas cylinders are a high technology approach to the design of lightweight gas cylinders, and are highly stressed. The proper inspection and testing of these cylinders is essential to continued safe performance.

Each element of the FRP gas cylinder is important. The liner is a leak-tight membrane and provides some structural strength. The reinforcing fibres provide the major proportion of the structural strength. The resin protects the reinforcing fibres, and facilitates transfer of forces between fibres. A protective sleeve or exterior coating of paint may have been used for further protection from the environment or for cosmetic purposes.

CONTENTS

	<i>Page</i>
1 SCOPE	3
2 REFERENCED DOCUMENTS	3
3 DEFINITIONS	3
4 PREPARATION OF CYLINDER	3
5 INSPECTION AND TEST	3
6 REPAIR	4
7 CONDEMNING	4
8 STAMPING	4
APPENDIX A. BACKGROUND INFORMATION ON FRP GAS CYLINDERS	13

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STANDARDS ASSOCIATION OF AUSTRALIA

Australian Standard
for

GAS CYLINDER TEST STATIONS

PART 3—INSPECTION AND TESTING OF FIBRE REINFORCED PLASTICS (FRP)
ALUMINIUM ALLOY GAS CYLINDERS—HOOP OVERWRAPPED

1 SCOPE. This standard specifies inspection and test requirements additional to those given in AS 2337.1 for application to hoop overwrapped fibre reinforced plastics (FRP) seamless aluminium gas cylinders by specifically approved (by SAA) gas cylinder test stations.

This standard does not apply to gas cylinders manufactured outside Australia.

NOTES:

1. Provisions for other FRP gas cylinders may be added in due course.
2. Appendix A gives information on the development of FRP gas cylinders.
3. AS 2764 specifies requirements for FRP hoop overwrapped gas cylinders.

2 REFERENCED DOCUMENTS. The following standards are referred to in this standard:

- AS 2030.1 SAA Gas Cylinders Code, Part 1—Cylinders for Compressed Gases Other than Acetylene
- AS 2337.1 Gas Cylinder Test Stations, Part 1—General Requirements, Inspections and Tests—Gas Cylinders
- AS 2764 Fibre Reinforced Plastics (FRP) Aluminium Alloy Gas Cylinders—Hoop Overwrapped

3 DEFINITIONS. For the purposes of this standard, the definitions given in AS 2030.1 apply.

4 PREPARATION OF CYLINDER. In addition to the cylinder preparation requirements of AS 2337.1, the following shall apply:

- (a) Any dirt, attachments, or labels (other than the cylinder manufacturer's label) that would interfere with visual inspection shall be removed.
- (b) Removal of paint is not recommended, but where paint removal is necessary for inspection or other reasons, the following apply:
 - (i) Abrasive and harsh mechanical means, including shot blasting and wire brushing, shall not be used.
 - (ii) The means of removal of paint shall be confirmed as appropriate by the cylinder manufacturer.

NOTE: Some chemical paint removers will damage the overwrap.

- (c) Removal of any protective sleeve. Any protective sleeve that would interfere with visual inspection shall be removed. The means of removal shall not cause damage to the overwrap.

5 INSPECTION AND TEST.

5.1 General. The cylinder shall be inspected and tested in accordance with Clauses 5.2, 5.3, and 5.4. The assessment criteria and action taken shall be in accordance with Table 1.

NOTES:

1. Photographs and drawings are provided (see Figs 1 to 13) for guidance.
2. The criteria are new and experience will be necessary before they can be applied with certainty. Where doubt exists, the assessor is advised to be conservative and to quarantine marginal subjects until further guidance is obtained from the cylinder manufacturer.

5.2 External examination.

5.2.1 Exposed metal portions. The visual external examination requirements of AS 2337.1, as appropriate, shall apply.

5.2.2 Overwrap portion. The overwrap portion shall be inspected for defects listed in Table 1, and assessed in accordance with Table 1.

5.3 Internal inspection. In addition to the internal examination requirements of AS 2337.1, the following shall apply:

- (a) Any dent or structural damage visible on the internal surface shall be cause for the cylinder to be condemned.
- (b) Particular attention shall be given to the O-ring groove to confirm that it is clean and free from damage.
- (c) Particular attention shall be given to the internal shoulder and neck areas to confirm that no cracks exist.

5.4 Hydrostatic pressure test. In addition to the hydrostatic pressure testing requirements of AS 2337.1, the following shall apply:

- (a) When the cylinder is tested by one of the following methods, permanent expansion exceeding the specified percentage shall be cause for the cylinder to be condemned.
 - (i) Water jacket method... 5 percent of total expansion.
 - (ii) Non-water jacket method... $0.0006 \times$ the original internal volume.
- (b) For the water jacket method, the following equipment and procedural requirements apply:
 - (i) Verify the accuracy of the apparatus over the required range by use of calibrated cylinders.