

CGA C 5.3—2013

**STANDARD FOR VISUAL
INSPECTION OF LOW PRESSURE
ALUMINUM ALLOY
COMPRESSED GAS CYLINDERS**

THIRD EDITION



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Work Item 10-022
Cylinder Specifications Committee

NOTE—Technical changes from the previous edition are underlined.

FOREWORD

Aluminum has been used for many years in the chemical industry, petrochemical industry, more recently in the aerospace program, cryogenic pressure vessels, liquefied gas cylinders, and most recently as a cylinder for containment of compressed gas.

The fabrication of aluminum alloy cylinders, following the U.S. Department of Transportation and Transport Canada specifications, special permits (exemptions) and exceptions, has put a great number of aluminum alloy cylinders into the gas transportation service. Aluminum alloy cylinders must be periodically inspected and requalified to verify their fitness for continued service.

The small volume of low pressure aluminum alloy cylinders in service versus their equivalent low pressure steel cylinders has not created a great amount of historical data on which to base their limitations of acceptability. The data contained in this publication is based on the most current information available on cylinders with service pressures of 500 psig (3450 kPa) and less and represents a consensus opinion of manufacturers and users. It may be necessary in some specific cases to contact the manufacturer for the latest information available.

Inspection of all compressed gas cylinders requires judgment and knowledge of the prior use of the cylinder and its intended service.

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Contents	Page
1 Introduction.....	1
2 Definitions.....	1
3 Preparation for inspection and testing.....	2
3.1 Aluminum alloy cylinder identification.....	2
3.2 Venting.....	2
3.3 Cleaning cylinders.....	2
4 Inspection equipment.....	3
4.1 Depth gauges, scales.....	3
4.2 Inspection light.....	3
4.3 Penetrant inspection.....	3
4.4 Other devices.....	3
5 Inspection criteria.....	3
5.1 Corrosion limits.....	3
5.2 Cuts, digs, gouges, and dents.....	4
5.3 Arc burn (arc strike).....	6
5.4 Bulges.....	6
5.5 Fire/heat exposure damage.....	7
5.6 Neck defects.....	7
5.7 Rebuilding.....	7
5.8 Threads and valving.....	7
6 Requalification methods.....	8
6.1 Hydrostatic testing requalification.....	8
6.2 Modified hydrostatic requalification.....	8
6.3 Visual inspection requalification.....	8
7 References.....	9
Figures	
Figure 1—Cylinder exhibiting cuts, digs, and gouges.....	4
Figure 2—Cylinder exhibiting dent in bottom end wall.....	5
Figure 3—Cylinder exhibiting a dent on the neck radius.....	5
Figure 4—Cylinder exhibiting dents in the weld and cylinder sidewall.....	6
Figure 5—Bulged cylinder.....	6
Figure 6—Fire damaged cylinder exhibiting bulging and melting.....	7

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1 Introduction

Title 49 of the U.S. *Code of Federal Regulations* (49 CFR), Parts 100-180, Hazardous Materials Regulations of the Department of Transportation (DOT) as well as the *Transportation of Dangerous Goods Regulations* of Transport Canada (TC) and Canadian national standard CSA B339 require that a cylinder be condemned when it leaks or when internal or external corrosion, denting, bulging, or evidence of rough usage exists to the extent that the cylinder is likely to be weakened appreciably [1, 2, 3].¹ In addition, these regulations and standards identify the periodic inspection and hydrostatic test requirements for cylinders used in transportation. Cylinders identified with ICC stampings are also covered by DOT regulations in the United States. In Canada, cylinders approved by previous agencies are identified by CTC, BTC, and CRC markings and are currently subject to TC regulations.

This publication has been prepared as a guide for the periodic inspection of aluminum alloy compressed gas cylinders with service pressures of 500 psi (3450 kPa) or less.² This publication is general in nature and will not cover all circumstances for each individual cylinder type or lading. Inspection agencies may find it necessary to amplify these requirements to fit their condition of service if the service is more severe than encountered in transportation. Other publications offered by the Compressed Gas Association (CGA) that discuss visual inspection of cylinders are C-1, *Methods for Pressure Testing Compressed Gas Cylinders*; C-6, *Standards for Visual Inspection of Steel Compressed Gas Cylinders*; C-6.1, *Standards for Visual Inspection of High Pressure Aluminum Compressed Gas Cylinders*; C-6.2, *Guidelines for Visual Inspection and Requalification of Fiber Reinforced High Pressure Cylinders*; and P-22, *The Responsible Management and Disposition of Compressed Gases and Their Containers* [5, 6, 7, 8, 9].

Experience in the inspection of cylinders is an important factor in determining the acceptability of a given cylinder for continued service. Users who lack this experience and have questionable cylinders shall return them to a manufacturer of the same type of cylinders or to a competent requalification agency for reinspection.

2 Definitions

For the purpose of this publication, the following definitions apply.

2.1 Bulges

Abnormal outward protrusion of any portion of the cylinder.

NOTE—Most cylinders are manufactured with a substantially symmetrical shape. Bulges most commonly occur due to overpressurization or prolonged exposure to heat.

2.2 Condemned

Cylinder no longer fit for service and to which rework is not allowed.

2.3 Corrosion

Loss of thickness caused by corrosive media.

NOTE—It usually shows as general corrosion or pitting corrosion. Corrosion of aluminum will appear as a roughened and discolored area.

2.3.1 General corrosion

Indicates a somewhat uniform loss of wall thickness in a relatively large area.

NOTE—General corrosion can be difficult to detect unless it is severe.

2.3.2 Line corrosion

Series of closely spaced pits that appear to be “in line.”

NOTE—This condition is more serious than isolated pitting.

¹ References are shown by bracketed numbers and are listed in order of appearance in the reference section.

² kPa shall indicate gauge pressure unless otherwise noted as (kPa, abs) for absolute pressure and (kPa, differential) for differential pressure. All kPa values are rounded off per CGA P-11, *Metric Practice Guide for the Compressed Gas Industry* [4].