

CGA C-6.1—2019

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

SEVENTH EDITION

CGA

Compressed Gas Association

The Standard For Safety Since 1913

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Work Item 18-006
Cylinder Specifications Committee

NOTE—Technical changes from the previous edition are underlined.

NOTE—Appendices A, B, and C (Informative) are for information only.

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Contents	Page
1 Introduction.....	1
2 Scope	2
3 Definitions.....	3
4 Preparation for inspection	7
4.1 Inspection equipment	7
4.2 Valve removal and venting	8
4.3 Aluminum alloy cylinder identification.....	8
4.4 Cleaning	8
5 Inspection criteria	9
5.1 Ultrasonic examination visual inspections	9
5.2 Markings	9
5.3 Corrosion limits.....	10
5.4 Cuts, digs, and gouges.....	10
5.5 Wall loss	11
5.6 Dents	11
5.7 Leaks and holes	11
5.8 Bulges.....	11
5.9 Fire and thermal damage	11
5.10 Neck defects.....	13
5.11 Threads and valving	15
5.12 Bow.....	15
6 Condemning a cylinder.....	15
7 References	16
8 Additional references.....	16
 Figures	
Figure 1—Exemption marked cylinder	2
Figure 2—3AL marked exemption cylinder	2
Figure 3—Cylinder with pitting corrosion	4
Figure 4—Gouged cylinder	4
Figure 5—Dented cylinder	5
Figure 6—Fold	5
Figure 7—Cylinder characteristics	6
Figure 8—Valley.....	6
Figure 9—Light and mirror used to inspect threads and crown	7
Figure 10a—Neck crack.....	13
Figure 10b—Neck crack.....	14
Figure 11—Tool stop mark.....	14
 Appendices	
Appendix A—Eddy current devices (Informative)	17
Appendix B—Sustained load cracking (SLC) (Informative)	18
Appendix C—Heat exposure and condemning aluminum alloy cylinders (Informative).....	20

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1 Introduction

Unless otherwise provided for by special permit, equivalency certificate (formerly called permit of equivalent level of safety), or regulations, U.S. Department of Transportation (DOT) and Transport Canada (TC) require that cylinders used for the transportation of compressed gases are requalified periodically by visual inspection followed by hydrostatic testing if they are to remain in service (see CGA C-1, *Methods for Pressure Testing Compressed Gas Cylinders*) [1].¹ However, a cylinder that was charged or filled before the requalification becomes due may remain in service until it has been emptied. U.S. regulations in Part 180 Subpart C of Title 49 of the *Code of Federal Regulations* (49 CFR) and equivalent Canadian regulations in Clause 24 of Canadian Standards Association (CSA) B339, *Cylinders, spheres, and tubes for the transportation of dangerous goods*, identify the inspection and hydrostatic testing requirements for most cylinders [2, 3]. Cylinders fabricated in accordance with DOT, TC, or the former Canadian Transport Commission (CTC) permits, equivalency certificate/permit of equivalent level of safety, or exemptions/special permits shall be requalified as specified in the exemption/special permit, equivalency certificate/permit, or CTC permit. These documents can be obtained from DOT, TC, or the manufacturer.

The approval of the 3AL specification in 49 CFR 178.46 (July 2, 1982) consolidated the majority of the exemptions and special permits for aluminum alloy cylinders into one manufacturing regulation [2]. Canadian specification TC-3ALM also consolidates specification CTC-3AL and permits for aluminum alloy cylinders into regulations [3, 4].

Both DOT and TC have provisions in their regulations for introduction of new cylinder designs, materials, and fabrication techniques. Before implementation of CTC/DOT specification 3AL and TC specification 3ALM, aluminum alloy cylinders were manufactured under special permits and/or exemptions E 6498, E 7042, E 8107, E 8364, E 8422, CTC SP 890, or CTC SP 922. Permit or exemption numbers are stamped on the shoulder of the cylinder. These cylinders may be continued in use in Canada. In the United States, these cylinders (with the exception of CTC SP 922) may be continued in use but shall be remarked in compliance with 49 CFR 173.23 at the time of the first retest following July 2, 1982 [2]. Such remarking is not authorized for all permitted cylinders.

In the United States, DOT exemptions E 6498, E 7042, E 8107, E 8364, and E 8422 were previously issued, which identified the manufacturing, usage, and inspection requirements of these cylinders. These exemptions have been superseded by DOT specification 3AL and copies of the exemptions are no longer required. Cylinders marked with "S.P." preceding the previously noted exemption numbers, designating special permits, are also covered by DOT specification 3AL. Some cylinders with the previously noted markings may be preceded by "CTC" indicating compliance with the CTC requirements, for example, CTC/DOT E 6498-1800. Exemption and special permit cylinders shall be remarked at the time of the first hydrostatic testing occurring after July 2, 1982. Requirements for remarking can be found in 49 CFR 173.23(c), which states that after July 2, 1982, a seamless aluminum alloy cylinder manufactured in conformance with and for use under DOT exemption E 6498, E 7042, E 8107, E 8364, or E 8422 may be continued in use if marked before or at the time of the next retest with the specification identification 3AL immediately above the exemption number, or if the DOT mark (i.e., DOT-3AL 1800) is added in proximity to the exemption marking [2]. See Figures 1 and 2 for examples of exemption marked cylinders.

Experience in the inspection of cylinders is an important factor in determining the acceptability of a given cylinder for continued service. Inspectors evaluating cylinders shall consult the manufacturer or other knowledgeable sources.

Existing regulatory markings shall remain intact.

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

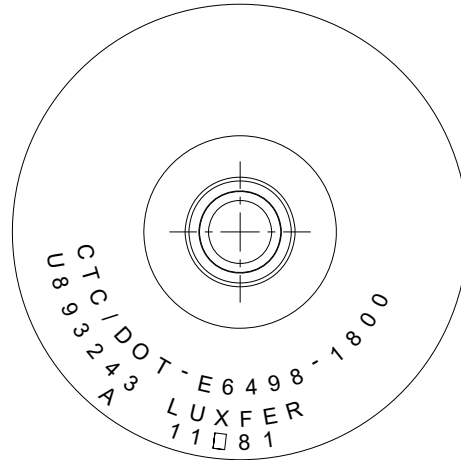


Figure 1—Exemption marked cylinder

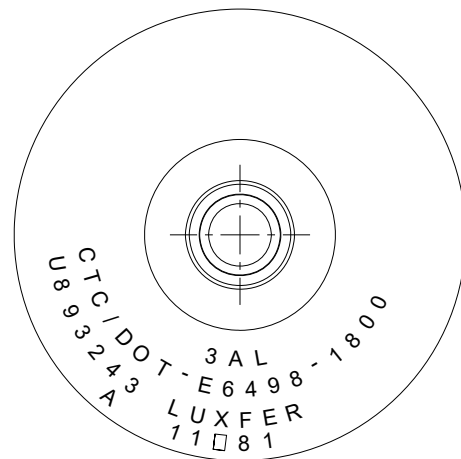


Figure 2—3AL marked exemption cylinder

2 Scope

This standard has been prepared for the visual inspection of aluminum alloy compressed gas cylinders with service pressures of 1800 psi (12 410 kPa) or greater.² This standard does not address all cylinder manufacture defects. Cylinders authorized by regulation may require testing by ultrasonic examination (UE) or pressure testing. This standard does not include testing that may be required by regulation. UE of aluminum alloy cylinders shall meet the requirements of CGA C-20, *Requalification Standard for Metallic, DOT and TC 3-Series Gas Cylinders and Tubes Using Ultrasonic Examination* [6]. Pressure testing shall meet regulatory requirements. CGA C-6.3, *Standard for Visual Inspection of Low Pressure Aluminum Alloy Compressed Gas Cylinders* shall be followed for cylinders with lower service pressures [7].

Additional publications and standards prepared by the Compressed Gas Association, Inc. (CGA) that can be helpful include:

- CGA C-1 [1];
- CGA C-6, *Standard for Visual Inspection of Steel Compressed Gas Cylinders* [8];

² kPa shall indicate gauge pressure unless otherwise noted as (kPa, abs) for absolute pressure or (kPa, differential) for differential pressure. All kPa values are rounded off per CGA P-11, *Guideline for Metric Practice in the Compressed Gas Industry* [5].