

| Specification marking | Service Pressure psig |
|-----------------------|-----------------------|
| 3E | 1800 |
| 8 | 250 |

(c) *Cylinder pressure at 21 °C (70 °F).* The pressure in a cylinder at 21 °C (70 °F) may not exceed the service pressure for which the cylinder is marked or designated, except as provided in §173.302a(b). For certain liquefied gases, the pressure at 21 °C (70 °F) must be lower than the marked service pressure to avoid having a pressure at a temperature of 55 °C (131 °F) that is greater than permitted.

(d) *Cylinder pressure at 55 °C (131 °F).* The pressure in a cylinder at 55 °C (131 °F) may not exceed 5/4 times the service pressure, except:

(1) For a cylinder filled with acetylene, liquefied nitrous oxide, or carbon dioxide.

(2) For a cylinder filled in accordance with §173.302a(b), the pressure in the cylinder at 55 °C (131 °F) may not exceed 5/4 times the filling pressure.

(3) After May 30, 2003, for toxic materials the pressure in the cylinder at 55 °C (131 °F) may not exceed the service pressure of the cylinder.

(e) *Grandfather clause.* A cylinder in domestic use prior to the date on which the specification for the cylinder was first made effective may be used if the cylinder has been properly tested and otherwise conforms to the requirements applicable to the gas with which it is charged.

[67 FR 51645, Aug. 8, 2002, as amended at 67 FR 61289, Sept. 30, 2002]

§ 173.301b [Reserved]

§ 173.302 **Filling of cylinders with non-liquefied (permanent) compressed gases.**

(a) *General requirements.* A cylinder filled with a nonliquefied compressed gas (except gas in solution) must be offered for transportation in accordance with the requirements of this section and §§173.301, 173.301a, 173.302a, and 173.305, as applicable. Where more than one section applies to a cylinder, the most restrictive requirements must be followed.

(b) *Aluminum cylinders in oxygen service.* Each aluminum cylinder filled with

oxygen must meet all of the following conditions:

(1) Metallic portions of a valve that may come into contact with the oxygen in the cylinder must be constructed of brass or stainless steel.

(2) Each cylinder opening must be configured with straight threads only.

(3) Each cylinder must be cleaned in accordance with the requirements of Federal Specification RR-C-901C, paragraphs 3.3.1 and 3.3.2 (incorporated by reference; see §171.7 of this subchapter). Cleaning agents equivalent to those specified in RR-C-901C may be used provided they do not react with oxygen. One cylinder selected at random from a group of 200 or fewer and cleaned at the same time must be tested for oil contamination in accordance with Specification RR-C-901C, paragraph 4.4.2.2 (incorporated by reference; see §171.7 of this subchapter), and meet the specified standard of cleanliness.

(4) The pressure in each cylinder may not exceed 3000 psig at 21 °C (70 °F).

(c) Notwithstanding the provisions of §173.24(b)(1), an authorized cylinder containing oxygen continuously fed to tanks containing live fish may be offered for transportation and transported.

(d) Shipment of Division 2.1 materials in aluminum cylinders is authorized for transportation only by motor vehicle, rail car, or cargo-only aircraft.

[67 FR 51646, Aug. 8, 2002, as amended at 67 FR 61289, Sept. 30, 2002]

§ 173.302a **Additional requirements for shipment of nonliquefied (permanent) compressed gases in specification cylinders.**

(a) *Detailed filling requirements.* Nonliquefied compressed gases (except gas in solution) for which filling requirements are not specifically prescribed in §173.304a must be shipped subject to the requirements in this section and §§173.301, 173.301a, 173.302, and 173.305 in specification cylinders, as follows:

(1) DOT 3, 3A, 3AA, 3AL, 3B, 3E, 4B, 4BA and 4BW cylinders.

(2) DOT 3HT cylinders. These cylinders are authorized for aircraft use only and only for nonflammable gases. They have a maximum service life of 24 years from the date of manufacture. The cylinders must be equipped with

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frangible disc type pressure relief devices that meet the requirements of §173.301(f). Each frangible disc must have a rated bursting pressure not exceeding 90 percent of the minimum required test pressure of the cylinder. Discs with fusible metal backing are not permitted. Specification 3HT cylinders may be offered for transportation only when packed in strong outer packagings conforming to the requirements of §173.25.

(3) For a DOT 39 cylinder filled with a Division 2.1 material, the internal volume of the cylinder may not exceed 1.23 L (75 in³).

(4) DOT 3AX, 3AAX, and 3T cylinders are authorized for Division 2.1 and 2.2 materials and for carbon monoxide. DOT 3T cylinders are not authorized for hydrogen. When used in methane service, the methane must be a non-liquefied gas with a minimum purity of 98.0 percent methane and commercially free of corroding components.

(5) Aluminum cylinders manufactured in conformance with specifications DOT 39 and 3AL are authorized for oxygen only under the conditions specified in §173.302(b).

(b) *Special filling limits for DOT 3A, 3AX, 3AA, 3AAX, and 3T cylinders.* A DOT 3A, 3AX, 3AA, 3AAX, and 3T cylinder may be filled with a compressed gas, other than a liquefied, dissolved, Division 2.1, or Division 2.3 gas, to a pressure 10 percent in excess of its marked service pressure, provided:

(1) The cylinder is equipped with a frangible disc pressure relief device (without fusible metal backing) having a bursting pressure not exceeding the minimum prescribed test pressure.

(2) The cylinder's elastic expansion was determined at the time of the last test or retest by the water jacket method.

(3) Either the average wall stress or the maximum wall stress does not exceed the wall stress limitation shown in the following table:

| Type of steel | Average wall stress limitation | Maximum wall stress limitation |
|--|--------------------------------|--------------------------------|
| I. Plain carbon steels over 0.35 carbon and medium manganese steels | 53,000 | 58,000 |
| II. Steels of analysis and heat treatment specified in spec. 3AA | 67,000 | 73,000 |
| III. Steels of analysis and heat treatment specified in spec. DOT-3T | 87,000 | 94,000 |
| IV. Plain carbon steels less than 0.35 carbon made prior to 1920 | 45,000 | 48,000 |

(i)(A) The average wall stress must be computed from the elastic expansion data using the following formula:

$$S = 1.7EE / KV - 0.4P$$

Where:

S = wall stress, pounds per square inch;
 EE = elastic expansion (total less permanent) in cubic centimeters;

K = factor $\times 10^{-7}$ experimentally determined for the particular type of cylinder being tested or derived in accordance with CGA Pamphlet C-5;

V = internal volume in cubic centimeter (1 cubic inch = 16.387 cubic centimeters);

P = test pressure, pounds per square inch.

(B) The formula in paragraph (b)(3)(i)(A) of this section is derived from the formula in paragraph (b)(3)(ii) of this section and the following:

$$EE = (PKVD^2) / (D^2-d^2)$$

(ii) The maximum wall stress must be computed from the formula:

$$S = (P(1.3D^2 + 0.4d^2)) / (D^2-d^2)$$

Where:

S = wall stress, pounds per square inch;
 P = test pressure, pounds per square inch;

D = outside diameter, inches;

d = D-2t, where t=minimum wall thickness determined by a suitable method.

(iii) Compliance with average wall stress limitation may be determined by computing the elastic expansion rejection limit in accordance with CGA Pamphlet C-5 (incorporated by reference; see §171.7 of this subchapter), by reference to data tabulated in CGA Pamphlet C-5, or by the manufacturer's marked elastic expansion rejection limit (REE) on the cylinder.

(4) An external and internal visual examination made at the time of test or retest shows the cylinder to be free from excessive corrosion, pitting, or dangerous defects.

(5) A plus sign (+) is added following the test date marking on the cylinder to indicate compliance with paragraphs (b) (2), (b)(3), and (b)(4) of this section.

(c) *Carbon monoxide.* Carbon monoxide must be offered in a DOT 3, 3A, 3AX, 3AA, 3AAX, 3AL, 3E, or 3T cylinder having a minimum service pressure of 1800 psig. The pressure in a steel cylinder may not exceed 1000 psig at 21 °C (70 °F), except that if the gas is dry and sulfur free, the cylinder may be filled to 5/6 of the cylinder's service pressure or 2000 psig, whichever is less. A DOT 3AL cylinder may be filled to its marked service pressure. A DOT 3AL cylinder is authorized only when transported by motor vehicle, rail car, or cargo-only aircraft.

(d) *Diborane and diborane mixtures.* Diborane and diborane mixed with compatible compressed gas must be offered in a DOT 3AA1800 cylinder. The maximum filling density of the diborane may not exceed 7 percent. Diborane mixed with compatible compressed gas may not have a pressure exceeding the service pressure of the cylinder if complete decomposition of the diborane occurs. Cylinder valve assemblies must be protected in accordance with §173.301(h).

[67 FR 51646, Aug. 8, 2002]

173.302b [Reserved]

§ 173.303 Charging of cylinders with compressed gas in solution (acetylene).

(a) *Cylinder, filler and solvent requirements.* (Refer to applicable parts of Specification 8 and 8AL). Acetylene gas must be shipped in Specification 8 or 8AL (§178.59 or §178.60 of this subchapter) cylinders. The cylinders shall consist of metal shells filled with a porous material, and this material must be charged with a suitable solvent. The cylinders containing the porous material and solvent, shall be tested with satisfactory results in accordance with CGA Pamphlet C-12. Representative samples of cylinders charged with

acetylene shall be tested with satisfactory results in accordance with CGA Pamphlet C-12.

(1) The specific gravity of acetone solvent in acetylene cylinders must be 0.796 or over at 15.5 °C. (59.9 °F.).

(2) The amount of solvent added in the refilling operation must not cause the tare weight of the cylinder to exceed its marked tare weight. The tare weight includes the weight of the cylinder shell, porous filling, valve, safety relief devices and solvent, but without removable cap.

(b) *Filling limits.* The pressure in cylinders containing acetylene gas must not exceed 250 psig at 70 °F., and in case the cylinders are marked for a lower allowable charging pressure, at 70 °F., then that pressure must not be exceeded.

(c) *Data requirements on filler and solvent.* Cylinders containing acetylene gas must not be shipped unless they were charged by or with the consent of the owner, and by a person, firm, or company having possession of complete information as to the nature of the porous filling, the kind and quantity of solvent in the cylinders, and the meaning of such markings on the cylinders as are prescribed by the Department's regulations and specifications applying to containers for the transportation of acetylene gas.

(d) *Verification of container pressure.* (1) Each day, the pressure in a container representative of that day's compression must be checked by the charging plant after the container has cooled to a settled temperature and a record of this test kept for at least 30 days.

(e) *Prefill requirements.* Before each filling of an acetylene cylinder, the person filling the cylinder must visually inspect the outside of the cylinder in accordance with the prefill requirements contained in CGA Pamphlet C-13, Section 3.

[29 FR 18743, Dec. 29, 1964. Redesignated at 32 FR 5606, Apr. 5, 1967]

EDITORIAL NOTE: For FEDERAL REGISTER citations affecting §173.303, see the List of CFR Sections Affected which appears in the Finding Aids section of the printed volume and on GPO Access.