

## DOT Cylinder Maintenance, Retest and Certification Requirements

### Visual Inspection and Hydrostatic Testing of Cylinders

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### Qualification, maintenance and use of cylinders.

(a) General qualification for use of cylinders. (See §§173.1 through 173.30 for requirements applying to all shipments.)

(1) No person may charge or fill a cylinder unless it is as specified in this part and part 178 of this subchapter. A cylinder that leaks, is bulged, has defective valves or safety devices, bears evidence of physical abuse, fire or heat damage, or detrimental rusting or corrosion, must not be used unless it is properly repaired and requalified as prescribed in these regulations.

(2) When cylinders with a marked pressure limit are prescribed, other cylinders made under the same specification but with a higher marked service pressure limit are authorized. For example, cylinders marked DOT-4B500 may be used where DOT-4B300 is specified.

(b) Grandfather clause. A cylinder in domestic use previous to the date upon which the specification therefor was first made effective in these regulations may be used if the cylinder has been properly tested and otherwise complies with the requirements applicable for the gas with which it is charged.

(c) Cylinder marking. Each required marking on a cylinder must be maintained so that it is legible. Retest markings and original markings which are becoming illegible may be reproduced by stamping on a metal plate which must be permanently secured to the cylinder.

(1) Additional information not affecting the markings prescribed in the applicable cylinder specification may be placed on the cylinder. No indentation may be made in the sidewall of the cylinder unless specifically permitted in the applicable specification.

(2) When the space originally provided for dates of subsequent retests becomes filled, the stamping of additional test dates into the external surface of the footing of a cylinder is authorized.

(3) Except for marked service pressure, markings required on cylinders may not be altered or removed. The marked service pressure may be changed only upon application to the Associate Administrator for Hazardous Materials Safety and receipt of written instructions as to the procedure to be followed. A service pressure change is not authorized for a cylinder which fails to pass the prescribed periodic hydrostatic retest, unless it is reheat treated and requalified in accordance with this section.

(d) Pressure relief device systems. No person may offer a cylinder charged with a compressed gas for transportation in commerce unless the cylinder is equipped with one or more pressure relief devices sized and selected as to type, location, and quantity and tested in accordance with CGA Pamphlet S-1.1 (compliance with paragraph 9.1.1.1 of CGA Pamphlet S-1.1 is not required). The pressure relief device system must be capable of preventing rupture of the normally charged cylinder when subjected to a fire test conducted in accordance with CGA Pamphlet C-14, or in the case of an acetylene cylinder, CGA Pamphlet C-12. Cylinders shall not be shipped with leaking safety relief devices. Safety relief devices

must be tested for leaks before the charged cylinder is shipped from the cylinder filling plant; it is expressly forbidden to repair leaking fuse plug devices, where leak is through the fusible metal or between the fusible metal and the opening in the plug

body, (except by removal of the device and replacement of the fusible metal.) Exceptions are as follows:

(1) Except as provided in paragraphs (d)(1) (i) through (iii) of this section, a pressure relief device is not required on a cylinder 12 inches or less in length, exclusive of neck, and 4 1/2 inches or less in outside diameter.

(i) A pressure relief device is required on a specification 9, 39 (§178.65 of this subchapter), 40, or 41 cylinder. A metal pressure relief valve is required on a specification 39 cylinder used for a liquefied flammable gas. A fusible pressure relief device is not authorized on a specification 39 cylinder containing a liquefied compressed gas.

(ii) A pressure relief device is required on a cylinder charged with a liquefied gas for which this part requires a service pressure of 1800 psi or higher.

(iii) A pressure relief device is required on a cylinder charged with a nonliquefied gas to a pressure of 1,800 psi or higher at 70 °F.

(2) Except for a specification 39 cylinder and a cylinder used for [acetylene](#) in solution, a pressure relief device is not required on a cylinder charged with a nonliquefied gas under pressure of 300 psi or less at 70 °F.

(3) A pressure relief device is prohibited on a cylinder charged with a Division 2.3 or Division 6.1 material in Hazard Zone A.

(4) A pressure relief device is prohibited on a cylinder charged with fluorine.

(5) A pressure relief device is not required on a cylinder charged with methyl mercaptan; with mono-, di-, or trimethylamine, anhydrous; with not over 10 pounds of nitrosyl chloride; or with less than 165 pounds of anhydrous [ammonia](#).

(6) Pressure relief devices, if used, must be in the vapor space of cylinders containing pyroforic liquids, inorganic or organic, n.o.s., covered by §173.124.

(e) Periodic qualification and marking of cylinders. Each cylinder that becomes due for periodic retest as specified in the following table must be retested and marked in conformance with the requirements of this paragraph (e):

**Retest and Inspection of Cylinders Table**

DOT Specification 2	Minimum retest pressure (p.s.i.) 3	Retest period (years)
DOT-3	3,000 p.s.i.	5
DOT-3A, 3AA	5/3 times service pressure, except non-corrosive service (173.34(e)(13))	5, 10, or 12 (173.34(e)(14)(12)(16) and (19))
DOT-3AX, 3AAX	5/3 times service pressure	5
3B, 3BN	2 times service pressure	5 or 10 (see (e)(12))
3C	Retest not required	-
3D	5/3 times service pressure	5
3E	Retest not required	-
3HT	5/3 times service pressure	3 (see (e)(15))
3T	5/3 times service pressure	5
4	700 p.s.i.	10
4A	5/3 times service pressure	5 or 10 (see (e)(12))

4AA480	2 times service pressure	5 or 10 (e)(14)
4B, 4BA, 4BW, 4B-240ET	2 times service pressure, except for non-corrosive service (173.34(e)(13))	5, 10, or 12 (173.34(e)(12) and (19))
4C	Retest not required	-
4D, 4DA, 4DS	2 times service pressure	5
DOT-4E	2 times service pressure, except for non-corrosive service (173.34(e)(13))	5
4L	Retest not required	-
8, 8AL		10 or 20 (173.34 (e)(18))
DOT-9	400 p.s.i. (max. 600 p.s.i.)	5
25	500 p.s.i.	5
26 FILLING OVER 450 psi	5/3 times service pressure	5
26 FILLING AT 450 psi or less	2 times service pressure, except for non-corrosive service (173.34(e)(13))	5 or 10 (173.34(e)(11))
33	800 p.s.i.	5
38	500 p.s.i.	5

1 Any cylinder not exceeding two inches outside diameter and less than two feet in length is excepted from hydrostatic retest.

2 A cylinder in chlorine or sulfur dioxide service made before April 20, 1915, must be retested at 500 psi.

3 For cylinders not marked with a service pressure, see 173.301(e)(1).

#### **(1) General requirements.**

(i) Each cylinder bearing a DOT specification marking (including a cylinder remarked in conformance with §173.23) must be inspected, retested and marked in conformance with this section, at the frequency specified in the Retest and Inspection of Cylinders Table in this paragraph (e). Each cylinder bearing a DOT exemption number must be inspected, retested and marked in conformance with this section and the terms of the applicable exemption, at the frequency specified in the exemption.

(ii) No cylinder required to be retested by paragraph (e)(1)(i) of this section may be charged or filled with a hazardous material and transported in commerce unless that cylinder has been inspected and retested in accordance with this section and the retester has marked the cylinder by stamping the date of retest, the cylinder retester identification number unless excepted under this section, and any other marking required by this section. No person may mark a test date or a retester identification number on a DOT specification or exemption cylinder unless all applicable requirements of this section have been met.

#### **(2) Retester authorization.**

(i) No person may mark a cylinder with a test date or retester identification number, or otherwise represent that a DOT specification or exemption cylinder has been retested under this section, unless that person holds a current retester identification number issued by the Associate Administrator for Hazardous Material Safety and operates in compliance with the terms of the retester identification number issuance letter. With the exception of visual inspections, all functions under this section must be performed or supervised by an individual named as qualified in the retester identification number application or a notification pursuant to paragraph (e)(2)(iv) of this section. A person is not required to obtain a retester identification number, if the person only performs visual inspections on DOT specification or exemption cylinders.

(ii) Any person seeking approval as a cylinder retester shall arrange for an independent inspection agency, approved by the Associate Administrator for

Hazardous Material Safety pursuant to §173.300a, to inspect its retest facility. The person seeking approval shall bear the cost of the inspection. Independent inspection agencies are not RSPA agents or representatives. A list of approved independent inspection agencies is available from the Associate Administrator for Hazardous Materials Safety, Office of Hazardous Materials Exemptions and Approvals (DHM-32), Research and Special Programs Administration, U.S. Department of Transportation, Washington, DC 20590-0001. Assistance in obtaining an approval may be requested from the same address.

(A) After the inspection, the person seeking approval must submit a letter of recommendation and inspection report from the independent inspection agency and a completed request for approval to the Associate Administrator for Hazardous Materials Safety at the address listed in this paragraph (e)(2)(ii). An applicant must include the following information:

company name; facility location;

mailing address (if different from location of facility); business telephone number; name of facility manager; the DOT specification/exemption cylinders that will be tested at the facility; a certification that the facility will operate in compliance with the applicable requirements of this subchapter, the date and an authorized signature.

(B) The Associate Administrator for Hazardous Materials Safety reviews the application, the name, address, ownership, testing equipment, or management or personnel performing any function under this section, to the Associate Administrator for Hazardous Materials Safety (DHM-32) within 20 days of the change. A retester identification number remains valid only if the retester's facility and qualifications are maintained at or above the level observed at the time of inspection by the independent inspection agency.

(v) A retester shall maintain, at each location at which it inspects, retests or marks cylinders under this section:

(A) Current copies of those portions of this subchapter that apply to its cylinder inspection, retesting and marking activities at that location.

(B) Current copies of all exemptions governing exemption cylinders inspected, retested or marked by the retester at that location.

(C) Copies of each CGA pamphlet incorporated by reference in §171.7 of this subchapter that applies to the retester's cylinder inspection, retesting and marking activities at that location. The publication maintained must be the edition incorporated by reference in §171.7 of this subchapter.

### **(3) Visual inspection.**

Except as otherwise provided in this section, each time a cylinder is retested, it must be visually inspected, internally and externally, in accordance with CGA Pamphlets C-6, C-6.1, C-6.2, or C-6.3, as applicable. The cylinder must be approved, rejected or condemned according to the criteria in the applicable CGA pamphlet. Internal inspection may be omitted for cylinders of the type and in the service described under paragraph (e)(13) of this section. DOT 3BN cylinders must be inspected in accordance with CGA Pamphlet C-6.

### **(4) Pressure retest.**

(i) Unless otherwise provided, each cylinder required to be retested under this section must be retested by means suitable for measuring the expansion of the cylinder under pressure. Bands and other removable attachments must be loosened or removed before testing so that the cylinder is free to expand in all directions.

(ii) The pressure-indicating device of the testing apparatus must permit reading of pressures to within 1% of the minimum prescribed test pressure of each cylinder tested, except that for an analog device, interpolation to  $\frac{1}{2}$  of the marked gauge divisions is acceptable. The expansion-indicating device of the testing apparatus must also permit incremental reading of the cylinder expansion to 1% of the total

expansion of each cylinder tested or 0.1 cubic centimeter, whichever is larger. Midpoint visual interpolation is permitted.

(iii) Each day before retesting, the retester shall confirm, by using a calibrated cylinder or other method authorized in writing by the Associate Administrator for Hazardous Materials Safety that:

(A) The pressure-indicating device, as part of the retest apparatus, is accurate within  $\pm 1.0\%$  of the prescribed test pressure of any cylinder tested that day. The pressure indicating device, itself, must be certified as having an accuracy of  $\pm 0.5\%$ , or better, of its full range, and must permit readings of pressure from 90%-110% of the minimum prescribed test pressure of the cylinder to be tested.

The accuracy of the pressure indicating device within the test system can be demonstrated at any point within 500 psi of the actual test pressure for test pressures at or above 3000 psi, or 10% of the actual test pressure for test pressures below 3000 psi; and

(B) The expansion-indicating device, as part of the retest apparatus, gives a stable reading of expansion and is accurate to  $\pm 1.0\%$  of the total expansion of any cylinder tested or 0.1 cubic centimeter, whichever is larger. The expansion-indicating device itself must have an accuracy of  $\pm 0.5\%$ , or better, of its full scale.

(iv) The test equipment must be verified to be accurate within  $\pm 1.0\%$  of the calibrated cylinder's pressure and corresponding expansion values. This may be accomplished by bringing the pressure to a value shown on the calibration certificate for the calibrated cylinder used and verifying that the resulting total expansion is within  $\pm 1.0\%$  of the total expansion shown on the calibration certificate. Alternatively, calibration may be demonstrated by bringing the total expansion to a known value on the calibration certificate for the calibrated cylinder used and verifying that the resulting pressure is within  $\pm 1.0\%$  of the pressure shown on the calibration certificate. The calibrated cylinder must show no permanent expansion. The retester shall demonstrate calibration in conformance with this paragraph (e)(4) to an authorized inspector on any day that it retests cylinders. A retester shall maintain calibrated cylinder certificates in conformance with paragraph (e)(8)(iii) of this section.

(v) Minimum test pressure must be maintained for at least 30 seconds, and as long as necessary for complete expansion of the cylinder. A system check may be performed at or below 90% of test pressure prior to the retest. In the case of a malfunction of the test equipment, the test may be repeated at a pressure increased by 10 percent or 100 psi, whichever is less. This paragraph (e)(4) does not authorize retest of a cylinder otherwise required to be condemned under paragraph (e)(6) of this section.

#### **(5) Cylinder rejection.**

(i) A retester shall reject a cylinder when on visual inspection, it meets a rejection standard in CGA Pamphlets C-6, C-6.1, C-6.2, or C-6.3, as applicable.

(ii) Except as provided in paragraph (e)(5)(iv) of this section, a cylinder that is rejected may not be marked as meeting the requirements of this section.

(iii) When a cylinder is rejected, the retester shall notify the cylinder owner, in writing, that the cylinder has been rejected and, unless requalified as provided in paragraph (e)(5)(iv) of this section, may not be filled with a hazardous material for transportation in commerce where use of a specification packaging is required.

(iv) A rejected cylinder with a service pressure of less than 900 psig may be requalified and marked if the cylinder is repaired or rebuilt and subsequently reinspected and retested in conformance with-

(A) CGA Pamphlets C-6, C-6.1, C-6.2, or C-6.3, as applicable;

- (B) Parts 173 and 178 of this subchapter;
- (C) Any exemption specific to that cylinder; and
- (D) Any approval required under paragraphs (i) and (l) of this section.

**(6) Cylinder condemnation.**

(i) A cylinder must be condemned when-

- (A) On inspection, it meets a condition for condemnation in CGA Pamphlets C-6, C-6.1, C-6.2, or C-6.3, as applicable;
- (B) The cylinder leaks through its wall;
- (C) Evidence of cracking exists to the extent that the cylinder is likely to be weakened appreciably;
- (D) For a DOT specification cylinder other than a DOT 4E aluminum cylinder, permanent expansion exceeds 10 percent of total expansion;
- (E) For a DOT 4E aluminum cylinder, permanent expansion exceeds 12 percent of total expansion;
- (F) For a DOT exemption cylinder, permanent expansion exceeds the limit in the applicable exemption, or the cylinder meets another criterion for condemnation in the applicable exemption; or
- (G) For a DOT specification 3HT cylinder, elastic expansion exceeds the marked rejection elastic expansion.

(ii) When a cylinder is required to be condemned, the retester shall stamp a series of X's over the DOT specification number and the marked service pressure or stamp "CONDEMNED" on the shoulder, top head, or neck using a steel stamp. Alternatively, at the direction of the owner, the retester may render the cylinder incapable of holding pressure.

(iii) When a cylinder is required to be condemned, the retester shall notify the cylinder owner, in writing, that the cylinder is condemned and may not be filled with hazardous material for transportation in commerce where use of a specification packaging is required.

(iv) A cylinder that is condemned may not be filled with hazardous material for transportation in commerce where use of a specification packaging is required and may not be marked as meeting the requirements of this section or any DOT exemption. No person may remove or obliterate the "CONDEMNED" marking.

**(7) Retester markings.**

(i) Each cylinder passing retest must be marked with the retester's identification number set in a square pattern, between the month and year of the retest date, in characters not less than  $\frac{1}{8}$ -inch high. The first character of the retester identification number must appear in the upper left corner of the square pattern; the second in the upper right; the third in the lower right, and the fourth in the lower left. Example: A cylinder retested in May 1994, and approved by a person who has been issued retester identification number "A123", would be marked plainly and permanently into the metal of the cylinder in accordance with location requirements of the cylinder specification or on a metal plate permanently secured to the cylinder in accordance with paragraph (c) of this section:

(ii) Markings of previous tests may not be obliterated. A cylinder that is subject to the requirements of paragraph (e) (10), (11) (modified hydrostatic test only), (13) or (14) of this section is not required to be marked with a retester identification number. A cylinder requalified by the modified hydrostatic test method or external inspection must be marked after a retest or an inspection by stamping the date of retest or reinspection on the cylinder followed by the symbol "E" (external inspection) or "S" (modified hydrostatic test method) as appropriate. However, a cylinder subject to the requirements of §173.301(j) may not be marked with a retester identification number. Variation from the marking requirement may be approved on written request to the Associate Administrator for Hazardous Materials Safety.

## **(8) Recordkeeping.**

A retester shall maintain the following records at the retesting location, on paper or in a form from which a paper copy can be produced on request.

(i) Records of authority to inspect, retest and mark must be maintained, as follows:

(A) Current retester identification number issuance letter;

(B) If the retester identification number has expired and renewal is pending, a copy of the renewal request; and

(C) Copies of notifications to Associate Administrator for Hazardous Materials Safety required under paragraph (e)(2)(iv) of this section.

(ii) Daily records of visual inspection and hydrostatic retest must be maintained until either the expiration of the retest period or until the cylinder is again reinspected or retested, whichever occurs first. A single date may be used for each retest sheet, provided each retest on the sheet was conducted on that date. Ditto marks or a solid vertical line may be used to indicate repetition of the preceding entry for the following entries: date; actual dimensions or a symbol; if present, manufacturer's name or symbol; if present, owner's name or symbol and retest operator. Blank spaces may not be used to indicate repetition of a prior entry. Records must include-

(A) For each test to demonstrate calibration, the date; serial number of the calibrated cylinder; calibration test pressure; total, elastic and permanent expansions; and legible identification of retest operator. The retest operator must be able to demonstrate that the results of the daily calibration verification correspond to the hydrostatic retests that were performed on that day. The daily verification of calibration(s) may be recorded on the same sheets as, and with, retest records for that date;

(B) For each cylinder retested or visually inspected, records containing the date; serial number; ICC/DOT specification or exemption number; service pressure; actual dimensions or a symbol; if present, manufacturer's name or symbol; if present, owner's name or symbol; result of visual inspection; actual test pressure; total, elastic and permanent expansions; percent permanent expansion; disposition, with reason for any repeated retest, rejection or condemnation; and legible identification of test operator. For each cylinder marked pursuant to §173.302(c)(5), the retest sheet must indicate the method by which any average or maximum wall stress was computed. Records must be kept for all completed retests, as well as unsuccessful retests under paragraph (e)(4)(v) of this section. The entry for a later retest under paragraph (e)(4)(v) of this section after a failure to hold test pressure, or retest of a cylinder requalified after rejection, must indicate the date of the earlier inspection or retest; and

(C) Calculations of average and maximum wall stress pursuant to §173.302(c)(3), if performed.

(iii) The most recent certificate of calibration must be maintained for each calibrated cylinder used by the retester.

#### **(9) DOT 4-series cylinders.**

A DOT 4-series cylinder, except 4L cylinders, that at any time shows evidence of a leak or of internal or external corrosion, denting, bulging or rough usage to the extent that it is likely to be weakened appreciably; or that has lost five percent or more of its official tare weight must be retested before being recharged and shipped. (Refer to CGA Pamphlet C-6 or C-6.3, as applicable, regarding cylinder weakening.) After retest, the actual tare weight must be recorded as the new tare weight.

#### **(10) Cylinders 12 pounds or less with service pressures of 300 psi or less.**

A cylinder of 12 pounds or less water capacity authorized for service pressure of 300 psi or less must be given a complete external visual inspection at the time periodic retest becomes due. External visual inspection must be in accordance with CGA Pamphlet C-6 or C-6.3. The cylinder may be hydrostatically retested without a water jacket and without determining total and permanent expansions. The retest is successful if the cylinder, when examined under test pressure, does not display a defect described in paragraph (e)(6)(i) (B) or (C) of this section.

#### **(11) Modified hydrostatic retest.**

A cylinder made in compliance with specification DOT 4B, DOT 4BA, DOT 4BW, DOT 4E or ICC-26-3002 (§§178.50, 178.51, 178.61, 178.68 of this subchapter) that is used exclusively for anhydrous dimethylamine; anhydrous methylamine; anhydrous trimethylamine; methyl chloride; liquefied petroleum gas; methylacetylene-propadiene stabilized; or dichlorodifluoromethane, difluoroethane, difluorochloroethane, chlorodifluoromethane, chlorotetrafluoroethane, trifluorochloroethylene, or mixture thereof, or mixtures of one or more with trichlorofluoromethane; and that is commercially free from corroding components and protected externally by a suitable corrosion-resistant coating (such as galvanizing or painting) may be given a hydrostatic retest every 12 years instead of every five years. Alternatively, the cylinder may be subjected to internal hydrostatic pressure of at least two times the marked service pressure without determination of expansions, but this latter type of test must be repeated every seven years after expiration of the first 12-year period. When subjected to the latter test, the cylinder must be carefully examined under test pressure and removed from service if a leak or other harmful defect exists. A cylinder requalified by the modified hydrostatic test method must be marked after a retest or an inspection by stamping the date of retest or reinspection on the cylinder followed by a "S".

#### **(12) A cylinder made in conformance with specification**

DOT-3A, DOT-3AA, DOT-3B, DOT-4BA or DOT-4BW (§§178.36, 178.37, 178.38, 178.51, 178.61 of this subchapter) having a service pressure of 300 psi or less that is used exclusively for methyl bromide, liquid; mixtures of methyl bromide and ethylene dibromide, liquid; mixtures of methyl bromide and chlorpicrin, liquid; mixtures of methyl bromide and petroleum solvents, liquid; or methyl bromide and nonflammable, nonliquefied compressed gas mixtures, liquid; that is commercially free of corroding components, and that is protected externally by a suitable corrosion resistant coating (such as galvanizing or painting) and internally by a suitable corrosion resistant lining (such as galvanizing) may be tested every 10 years instead of every five years, provided that a visual internal and external examination of the cylinder is conducted every five years in accordance with CGA Pamphlet C-6. The cylinder must be examined at each filling, and rejected if a dent, corroded area, leak or other condition indicates possible weakness.

#### **(13) A cylinder made in conformance with a specification - exceptions**

listed in the table in this paragraph (e)(13) and used exclusively in the service indicated may, instead of a periodic hydrostatic retest, be given a complete external visual inspection at the time periodic retest becomes due. External visual inspection must be in accordance with CGA Pamphlet C-6 or C-6.3. When this inspection is used instead of hydrostatic retesting, subsequent inspections are required at five-year intervals after the first inspection. Inspections must be made only by competent persons and the results recorded and maintained in accordance with paragraph (e)(8) of this section. Records shall include: date of inspection (month and year); DOT specification number; cylinder identification (registered symbol and serial number, date of manufacture, and owner); type of cylinder protective coating (including statement as to need of refinishing or recoating); conditions checked (e.g., leakage, corrosion, gouges,



dents or digs in shell or heads, broken or damaged footing or protective ring or fire damage); disposition of cylinder (returned to service, returned to cylinder manufacturer for repairs or scrapped). A cylinder that passes inspection shall be marked with the date in accordance with paragraph (e)(7) of this section. An "E" after the date indicates requalification by the external inspection method. Specification cylinders must be in exclusive service as follows:

Cylinders made in compliance Used exclusively for-- with--

Modified Retest / Exclusive Use Table

Cylinders made in compliance with —	Used exclusively for —
DOT-4, DOT-3A, DOT-3AA, DOT3A480X, DOT-4A, DOT-4AA480	Anhydrous ammonia of at least 99.95% purity.
DOT-3A, DOT-3AA, DOT-3A480X, DOT-3B, DOT-4B, DOT-4BA, DOT-4BW, ICC-26-2401, ICC-26-3001	Butadiene, inhibited, which is commercially free from corroding components.
DOT-3A, DOT-3A480X, DOT-3AA, DOT-3B, DOT-4A, DOT-4AA480, DOT-4B, DOT-4BA, DOT-4BW	Cyclopropane which is commercially free from corroding components.
DOT-3A, DOT-3AA, DOT-3A480X, DOT-4B, DOT-4BA, DOT-4BW, DOT- 4E commercially free from corroding components.	Fluorinated hydrocarbons and mixtures thereof which are commercially free from corroding components.
DOT-3A, DOT-3AA, DOT-3A480X, DOT-3B, DOT-4B, DOT-4BA, DOT- 4BW, DOT-4E, ICC-26-240, ICC-26-3001	Liquefied hydrocarbon gas which is commercially free from corroding components.
DOT-3A, DOT-3AA, DOT-3A480X, DOT-3B, DOT-4B, DOT-4BA, DOT- 4BW, DOT-4E, ICC-26-2401, ICC-26-3001	Liquefied petroleum gas which is commercially free from corroding components.
DOT-3A, DOT-3AA, DOT-3B, DOT- 4B, DOT-4BA, DOT-4BW, DOT-4E	Methylacetylene-propadiene, stabilized, which is commercially free from corroding components.
DOT-3A, DOT-3AA, DOT-3B, DOT- 4B, DOT-4BA, DOT-4BW	Anhydrous mono, di, trimethylamines which are commercially free from corroding components.
DOT-4B240, DOT-4BW240	Ethyleneimine, inhibited.

1 Use of existing cylinders authorized; new construction not authorized.

#### **(14) Cylinders containing anhydrous ammonia.**

A cylinder made in compliance with specification DOT-3A, DOT-3A 480X, or DOT-4AA480 used exclusively for anhydrous ammonia, commercially free from corroding components, and protected externally by a suitable corrosion-resistant coating (such as painting) may be retested every 10 years instead of every five years.

#### **(15) 3HT cylinders.**

(i) In addition to the other requirements of this section, a cylinder marked DOT-3HT must be requalified in accordance with CGA Pamphlet C-8.

(ii) The cylinder must be condemned:

(A) If elastic expansion exceeds the marked rejection elastic expansion. A cylinder made before January 17, 1978, and not marked with a rejection elastic expansion in cubic centimeters near the marked original elastic expansion must be so

marked before the next retest date. The rejection elastic expansion for a cylinder is 1.05 times its original elastic expansion.

(B) If there is evidence of denting or bulging.

(C) Twenty-four years after the date of the original test or after 4,380 pressurizations, whichever occurs first. If a cylinder is recharged, on average, more than once every other day, an accurate record of the number of rechargings must be maintained by the cylinder owner or his/her agent.

(iii) The retest date and retester identification number must be applied by low-stress steel stamp to a depth no greater than that of the marking at the time of manufacture. Stamping on the sidewall is not authorized.

#### **(16) DOT-3A or 3AA cylinders.**

(i) A cylinder made in conformance with specification DOT-3A or 3AA with a water capacity of 125 pounds or less that is removed from any cluster, bank, group, rack or vehicle each time it is filled, may be retested every ten years instead of every five years, provided the cylinder complies with all of the following-

(A) The cylinder was manufactured after December 31, 1945;

(B) The cylinder is used exclusively for [air](#), [argon](#), cyclopropane, [ethylene](#), [helium](#), [hydrogen](#), [krypton](#), [neon](#), nitrogen, [nitrous oxide](#), [oxygen](#), [sulfur hexafluoride](#), [xenon](#), permitted mixtures of these gases (see §173.301(a)) and permitted mixtures of these gases with up to 30 percent by volume of [carbon dioxide](#), provided that the gas has a dew point at or below minus 52° F at 1 atmosphere;

(C) Before each refill, the cylinder passes the hammer test specified in CGA Pamphlet C-6;

(D) The cylinder is dried immediately after hydrostatic testing to remove all traces of free water;

(E) The cylinder is not used for underwater breathing; and

(F) Each cylinder is stamped with a five-point star at least one-fourth of an inch high immediately following the test date.

(ii) If, since the last required hydrostatic retest, a cylinder has not been used exclusively as specified in paragraph (e)(16)(i)(B) of this section, but currently conforms with all other provisions of paragraph (e)(16)(i) of this section, it may be retested every 10 years instead of every five years, provided it is first retested and examined as prescribed by §173.302(c)(2), (3) and (4).

(iii) Except as specified in paragraph (e)(16)(ii) of this section, if a cylinder marked with a star is charged with a compressed gas other than as specified in this paragraph (e)(16), the star following the most recent test date must be obliterated. The cylinder must be retested five years from the marked retest date, or prior to the first charging with a compressed gas, if the required five-year retest period has passed.

#### **(17) Cylinders containing corrosive materials.**

(i) A cylinder that previously contained a Class 8 (corrosive) material may not be used to transport a compressed gas in commerce unless the following requirements are met-

(A) The cylinder is visually inspected, internally and externally, in accordance with CGA Pamphlet C-6;

(B) Regardless of the date of previous retest, the cylinder is subjected to and passes inspection and hydrostatic retest in accordance with this section; and

(C) The record prescribed in paragraph (e)(8) of this section includes: the month and year of inspection and test; the cylinder identification (including ICC or DOT specification number, registered symbol, serial number, date of manufacture and owner); the conditions checked (e.g., leakage, corrosion, gouges, dents, or digs in shell or heads, broken or damaged footings, fire damage) and the disposition of the cylinder (returned to service, returned to the manufacturer for repairs, or scrapped).

(ii) A cylinder requalified for compressed gas service in accordance with this paragraph (e)(17) may have its next retest and inspection scheduled from the date of the inspection and retest prescribed in this paragraph (e). If decontamination cannot remove all significant residue or impregnation by the Class 8 material, the cylinder may not be used to transport compressed gas in commerce.

#### **(18) DOT 8 and 8AL cylinders.**

(i) Each owner of a DOT 8 or 8AL cylinder used to transport acetylene must have the cylinder shell and the porous filler requalified in accordance with CGA Pamphlet C-13. Requalification must be performed in accordance with the following schedule:

Date of cylinder manufacture	Shell (visual inspection)requalification	Porous filler requalification
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Initial	Subsequent	Initial	Subsequent
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Before January 1, 1991	Before January 1, 2011	10 yrs	Before January 1, 2001	Not required.
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On or after January 1, 1991	10 yrs <sup>1</sup>	10 yrs	3 to 30 yrs <sup>2</sup>	Not required.
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1 Years from date of cylinder manufacture.

2 For a cylinder manufactured on or after January 1, 1991, requalification of the porous filler must be performed no sooner than 3 years, and no later than 20 years, from the date of manufacture.

(ii) Unless requalified and marked in accordance with CGA Pamphlet C-13 before October 1, 1994, an acetylene cylinder must be requalified by a person who holds a valid retester identification number. Each cylinder successfully passing a shell or filler requalification must be marked with the retester's identification number in accordance with paragraph (e)(7) of this section. In addition, the cylinder must be marked to identify the type of requalification performed in accordance with paragraph 5.6 of CGA Pamphlet C-13. For example, the letter "S" must be used for a shell requalification and the letter "F" for a porous filler requalification.

(iii) If a cylinder valve is replaced, a cylinder valve of the same weight must be used or the tare weight of the cylinder must be adjusted to compensate for valve weight differential.

## **(19) Cylinders used as fire extinguishers.**

Only DOT specification cylinders used as fire extinguishers and meeting Special Provision 18 in §172.102(c)(1) of this subchapter may be retested in accordance with this paragraph (e)(19).

(i) A DOT specification 4B, 4BA, 4B240ET or 4BW (§§178.50, 178.51, 178.55 and 178.61 of this subchapter) cylinder may be retested as follows:

(A) For a cylinder with a water capacity of 12 pounds or less by hydrostatic test using the water jacket method or by hydrostatic test without determination of expansion (modified hydrostatic test method). A retest must be performed 12 years after the original test date and at 12-year intervals thereafter.

(B) For a cylinder having a water capacity over 12 pounds-

(1) By hydrostatic test without determination of expansion (modified hydrostatic test method). A retest must be performed 12 years after the original test date and at 7-year intervals; or

(2) By hydrostatic test using the water jacket method. A retest must be performed 12 years after the original test date and at 12-year intervals thereafter.

(ii) A DOT specification 3A, 3AA, or 3AL (§§178.36, 178.37 and 178.46 of this subchapter) cylinder may be retested by hydrostatic test using the water jacket method. A retest must be performed 12 years after the original test date and at 12-year intervals thereafter.

(f) Cylinders subjected to the action of fire. A cylinder which has been subjected to the action of fire must not again be placed in service until it has been properly reconditioned as follows:

(1) A cylinder made of plain carbon steel with not over 0.25 percent carbon nor over 0.90 manganese need not be reheat-treated but must pass the periodic retest requirements as specified in paragraph (e) of this section.

(2) DOT 8 and 8AL cylinders made entirely of carbon steel with 0.25 percent or less carbon and with 0.90 percent or less manganese, must be reinspected to determine the condition of the cylinder and the porous filler, as prescribed in CGA Pamphlet C-13. If the cylinder has been damaged, the porous filler must be removed and the cylinder must be heat treated and retested. The porous filler must be replaced in accordance with the specification to which the cylinder was made. A cylinder may be returned to service without reheat treatment or retest if the cylinder has no fire or mechanical damage and the porous filler is unchanged and intact.

(3) The inner cylinders made under specification DOT-4L (§178.57 of this chapter) may be used after again passing the original hydrostatic test.

(4) DOT 3AL and DOT 4E aluminum cylinders may not be reheat treated and must be removed from service.

(5) Other cylinders must be reheat treated and reconditioned as specified in paragraph (g) of this section.

(g) Reheat treatment.

(1) Previous to the reheat treatment procedure hereinafter prescribed, each cylinder must be subjected to a careful internal and external inspection.

(2) Cylinders must be segregated for reheat treatment in lots of 100 or less cylinders of the same general size having practically the same chemical composition.

- (3) The reheat treatment operation must be carried out, supervised, and reported as prescribed for the heat treatment in the specification covering the manufacture of the cylinder in question. Data from the original reports of manufacture of the cylinders must be available.
- (4) The reheat treatment must be followed by hydrostatic retest, such retest to be carried out, supervised, and reported as prescribed for the hydrostatic tests in the specification covering the manufacture of the cylinder in question. The results of the retest must meet either of the following conditions:
- (i) The permanent expansion shall be from zero to 10 percent of the total expansion in the hydrostatic retest and one cylinder from each lot shall pass the requirements of the flattening and physical tests prescribed. Failure to pass the flattening or physical tests will reject the lot or;
- (ii) The permanent expansion shall not be less than 3 percent nor more than 10 percent of the total expansion in the hydrostatic retest, in which case the flattening and physical tests are not required. For this alternative method the hydrostatic retest pressure may not exceed 115 percent of the minimum prescribed test pressure.
- (h) Repair by welding or brazing of specifications DOT-3A, 3AA, 3B, 3C cylinders. Repair of specifications DOT-3A, 3AA, 3B or 3C (§§178.36(e), 178.37(e), 178.38(e), and 178.40(e) of this subchapter) cylinders by welding or brazing authorized, but only for the removal and replacement of neckrings and footrings attached to cylinders originally manufactured to conform to §§178.36-9(a), 178.37-9(a), 178.38-9(a), and 178.40-9(a) of this subchapter. Removal and replacement must be done by a regular manufacturer of this type of cylinder. After removal and before replacement of such parts, cylinders must be inspected, and defective ones rejected. Cylinders, neckrings, footrings, and method of replacement must conform to §178.36(e), 178.37(e), 178.38(e), or 178.40(e) of this subchapter whichever applies. Replacement must be followed by reheat treating, testing, inspection, and supervised and reported as prescribed by the specification covering their original manufacture. Inspector's reports must conform with that required by the specification covering original manufacture with the word "repaired" substituted for "manufactured." Show original markings and the new additional markings added, and statement: "Cylinders were carefully inspected for defects after removal of neckrings and footrings and after replacement, which replacement was made by process of ----- (Welding-brazing)."
- (i) Repair by welding or brazing of DOT-4 series and DOT-8, welded or brazed cylinders. Repairs on DOT-4 series and DOT-8 series welded or brazed cylinders are authorized to be made by welding or brazing. Such repairs must be made by a manufacturer of these types of DOT cylinders or by a repair facility approved by the Associate Administrator for Hazardous Materials Safety and by a process similar to that used in its manufacture and under the following specific requirements:
- (1) Cylinders with injurious defects in welded joints in or on pressure parts must be repaired by completely removing the defect prior to rewelding.
- (2) Cylinders with injurious defects in brazed joints in or on pressure parts must be repaired by rebrazing.
- (3) Cylinders during welding must be free of materials in contact with the welded joint that may impair the serviceability of the metal in or adjacent to the weld. (Precautions must be taken to prevent acetylene cylinder steels from picking up carbon during repair.)
- (4) Neckrings, footrings, or other nonpressure attachments authorized by the specification may be replaced or repaired. Repair or replacement of footrings, neckrings, or other nonpressure attachments authorized by the specification for DOT-4BA and 8AL (§§178.51 and 178.60 of this subchapter) cylinders may be made without conforming to the requirements of paragraph (i)(6) of this section provided the following requirements are met:
- (i) Must be done by a manufacturer of these types of DOT cylinders or by a repair facility approved by the Associate Administrator for Hazardous Materials Safety.

(ii) The welder shall have available to him information as to the procedure equipment, and rod used during manufacture and shall use a similar method for repair.

(iii) Repairs must be by metal arc welding only. Welds shall be 3 inches maximum length and spaced at least 3 inches apart.

(iv) Welds shall not be made on or near a brazed joint (to prevent the possibility of copper penetration).

(v) After repair the welds are to be inspected visually for weld quality.

(vi) After repair the weld area is to be leak tested at the service pressure of the cylinder.

(5) After removal, and before replacement of attachments, cylinders must be inspected and defective ones rejected, repaired or rebuilt.

(6) After repair, cylinders must be reheat-treated, tested, inspected and reported when and as prescribed by the specification covering their original manufacture when welding or brazing seams in a pressure part of a cylinder; or when welding or brazing on pressure parts of cylinders of plain carbon steels with carbon over 0.25 percent or manganese over 1.00 percent or of alloy steels except as provided in §173.34(i)(7).

Note 1: Heat-treatment is not required after welding or brazing weldable low carbon parts to attachments of similar material which has been previously welded or brazed to the top or bottom of cylinders and properly heat-treated, provided such subsequent welding or brazing does not produce a temperature in excess of 400° F. in any part of the top or bottom material.

(7) Repair of cylinders must be followed by a proof pressure leakage test at prescribed test pressure and visual examination for weld quality when welding on pressure parts of cylinders of plain carbon 0.25 percent or less and manganese 1.00 percent or less, or when repairing steel types 1315, NAX and GLX by the following procedure:

(i) Leakage through the welding metal may be repaired without subsequent reheat treatment of the cylinder.

(ii) Repair permitted only by either the metal arc or tungsten inert gas shielded arc process. E7015, 7016, or 7018 electrodes not larger than  $\frac{1}{8}$  inch diameter shall be used for the metal arc process.

(iii) Weld defects must be removed by grinding or chipping before repair by the metal arc process. The tungsten inert gas shielded arc process may be used for repair only when such repair can be made by puddling. Repair weld shall not exceed 1 inch in length nor be closer than 3 inches to the next repair area.

(iv) Repair of weld defects which have any cracking is not permitted.

(j) Repair of non-pressure attachments. Repair of non-pressure attachments by welding or brazing without affecting a pressure part of the cylinder must be followed by visual examination for weld quality.

(k) Prohibited repairs. Walls, heads or bottoms of cylinders with injurious defects or leaks in base metal shall not be repaired, but may be replaced as provided for in paragraph (l) of this section.

(l) Rebuilding of DOT-4 series and DOT-8, welded or brazed cylinders. Rebuilding of DOT-4 series and DOT-8 series, welded or brazed cylinders is authorized. Such rebuilding must be done by a manufacturer of these types of DOT cylinders or by a repair facility approved by the Associate Administrator for Hazardous Materials Safety and by a process similar to that used in its original manufacture and under the following specific requirements:

(1) The replacement of a pressure part such as wall, heads, or bottoms of cylinders or the replacement of the porous filling material, shall be considered as rebuilding.

(2) Rebuilt cylinders shall be considered as new cylinders and shall conform to all the requirements of the specifications applying, including verification of material, examination, inspection, etc., and the rendering of the proper reports to the purchaser, cylinder rebuilder, and the Associate Administrator for Hazardous Materials Safety. Report must show that cylinders were rebuilt.

(3) Information in sufficient detail regarding previous serial numbers and identification symbols must be filed with the Associate Administrator for Hazardous Materials Safety.

#### **173.40**

##### **General packaging requirements for poisonous materials required to be packaged in cylinders.**

When this section is referenced in the packaging section for a hazardous material elsewhere in this part, the following requirements are applicable to cylinders used for that material:

(a) Authorized cylinders. A cylinder must conform to one of the specifications for cylinders in subpart C of part 178 of this subchapter, except that Specification 8, 8AL and 39 cylinders are not authorized.

(b) Outage and pressure requirements. The pressure of the hazardous material at 55 °C (131 °F) must not exceed the service pressure of the cylinder. Sufficient outage shall be provided so that the cylinder will not be liquid full at 55 °C (131 °F).

(c) Closures. Each cylinder must be closed with a plug or valve conforming to the following:

(1) Each plug or valve must have a taper-threaded connection directly to the cylinder and be capable of withstanding the test pressure of the cylinder;

(2) Each valve must be of the packless type with non-perforated diaphragm, except that for corrosive materials, a valve may be of the packed type provided the assembly is made gas-tight by means of a seal cap with gasketed joint attached to the valve body or the cylinder to prevent loss of material through or past the packing;

(3) Each valve outlet must be sealed by a threaded cap or threaded solid plug, and

(4) Cylinder, valves, plugs, outlet caps, luting and gaskets must be compatible with each other and with the lading.

(d) Additional protection. Additional protection requirements for thin-walled cylinders and for cylinders equipped with valves are as follows:

(1) Each cylinder which has a wall thickness at any point of less than 2.03 mm (0.080 inch) and each cylinder which does not have fitted valve protection must be overpacked in a 4C1, 4D, 4F, 4G, 4H1 or 4H2 box. The box must conform to overpack provisions in §173.25. Box and valve protection must be of sufficient strength to protect all parts of the cylinder and valve, if any, from deformation and breakage resulting from a drop of 2.0 m (7 ft) or more onto a concrete floor, impacting at an orientation most likely to cause damage.

(2) Each cylinder equipped with a valve, if not overpacked in a box in accordance with paragraph (d)(1) of this section, must be equipped with a protective cap or other means of valve protection sufficient to protect the valve from deformation and breakage resulting from a drop of 2.0 m (7 ft) or more onto a concrete floor, impacting at an orientation most likely to cause damage.

(e) Interconnection. Cylinders may not be interconnected.