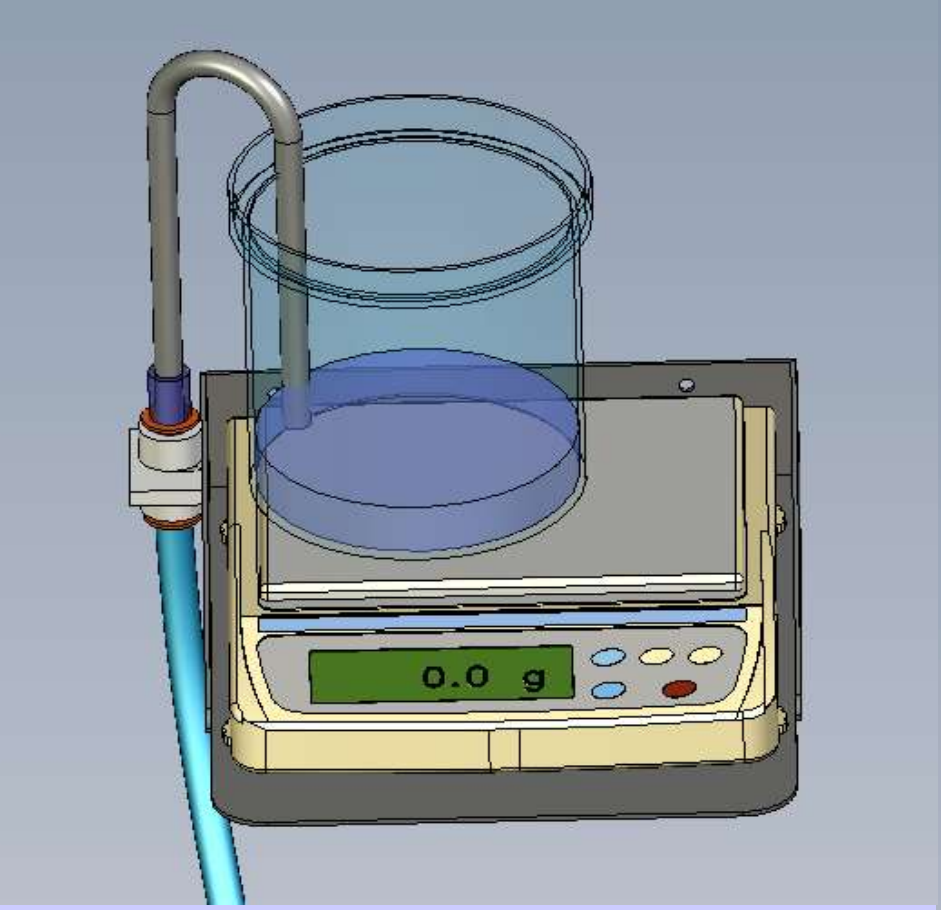
GALISO Incorporated

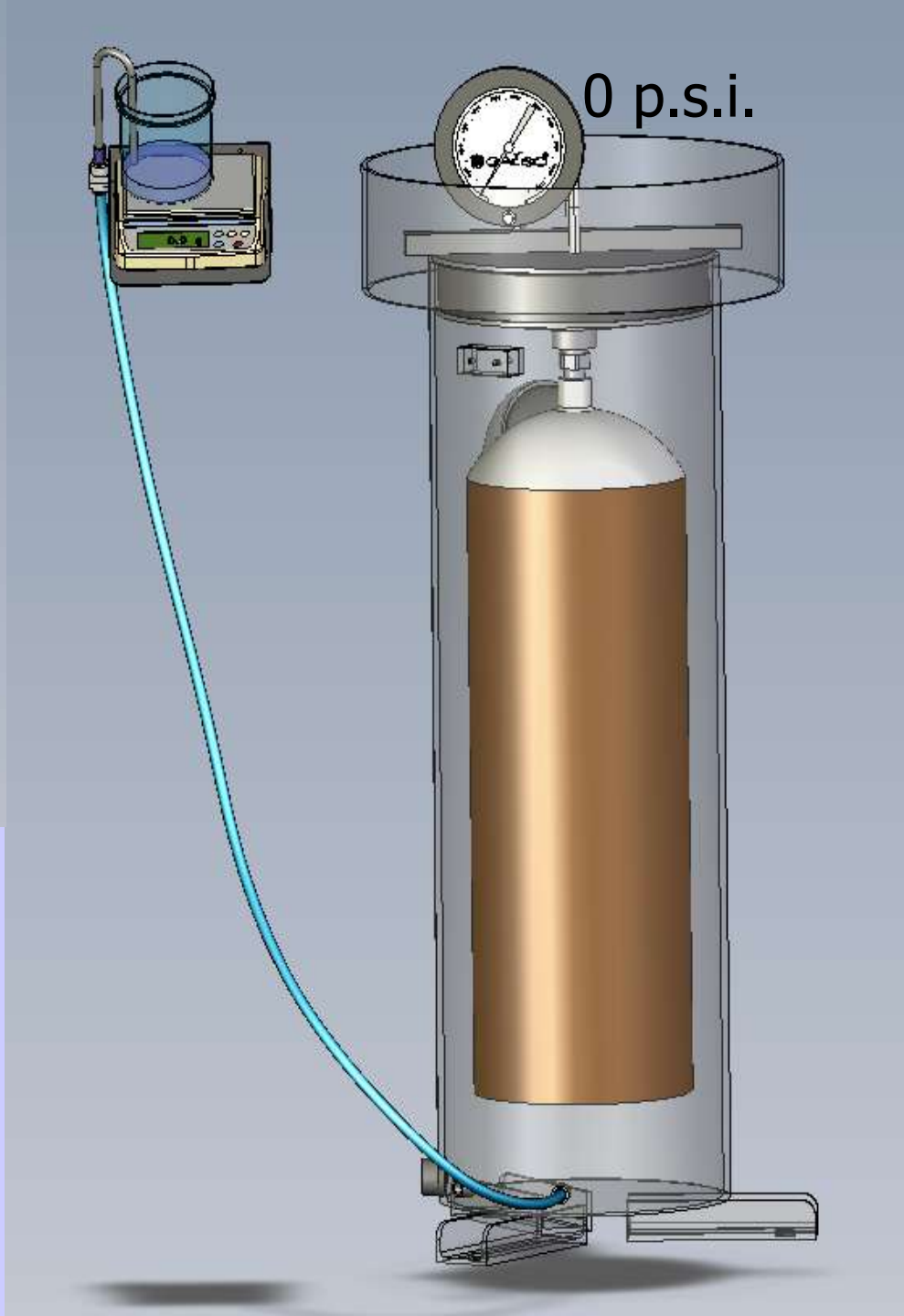
Presents

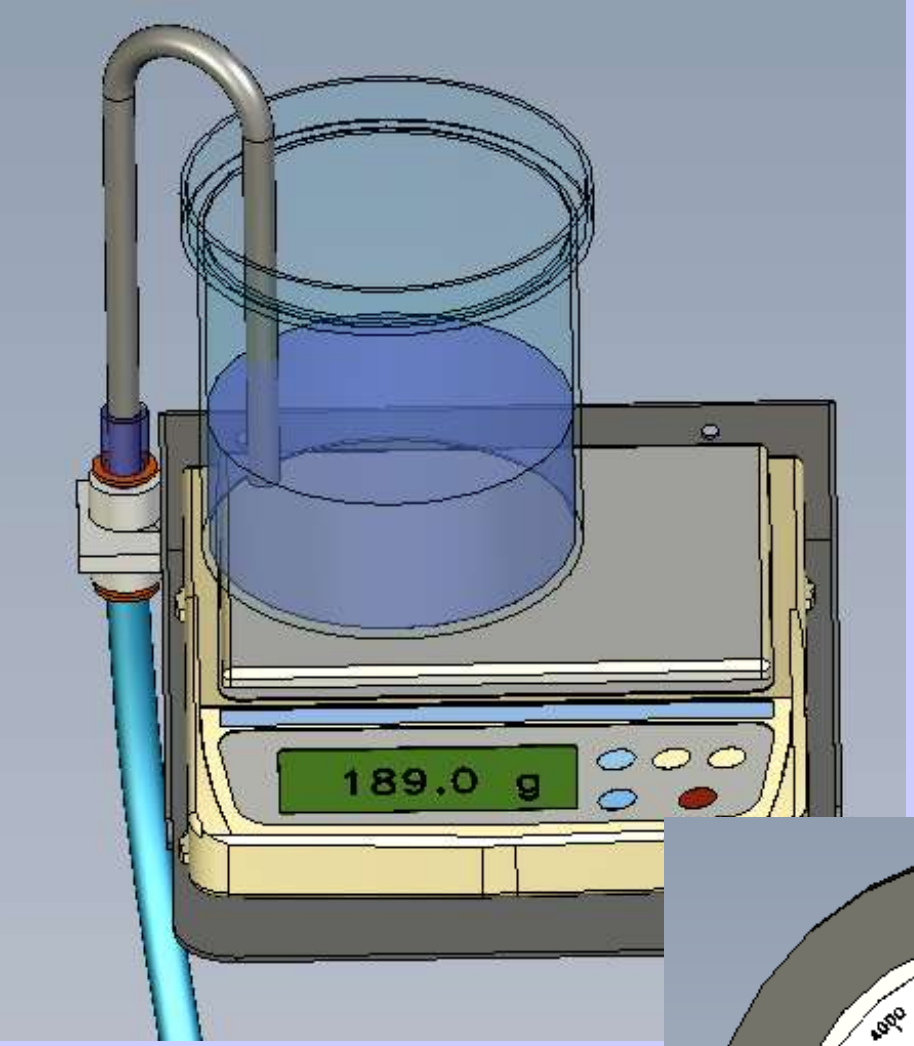
Cylinder Re-Qualification Hazmat Training

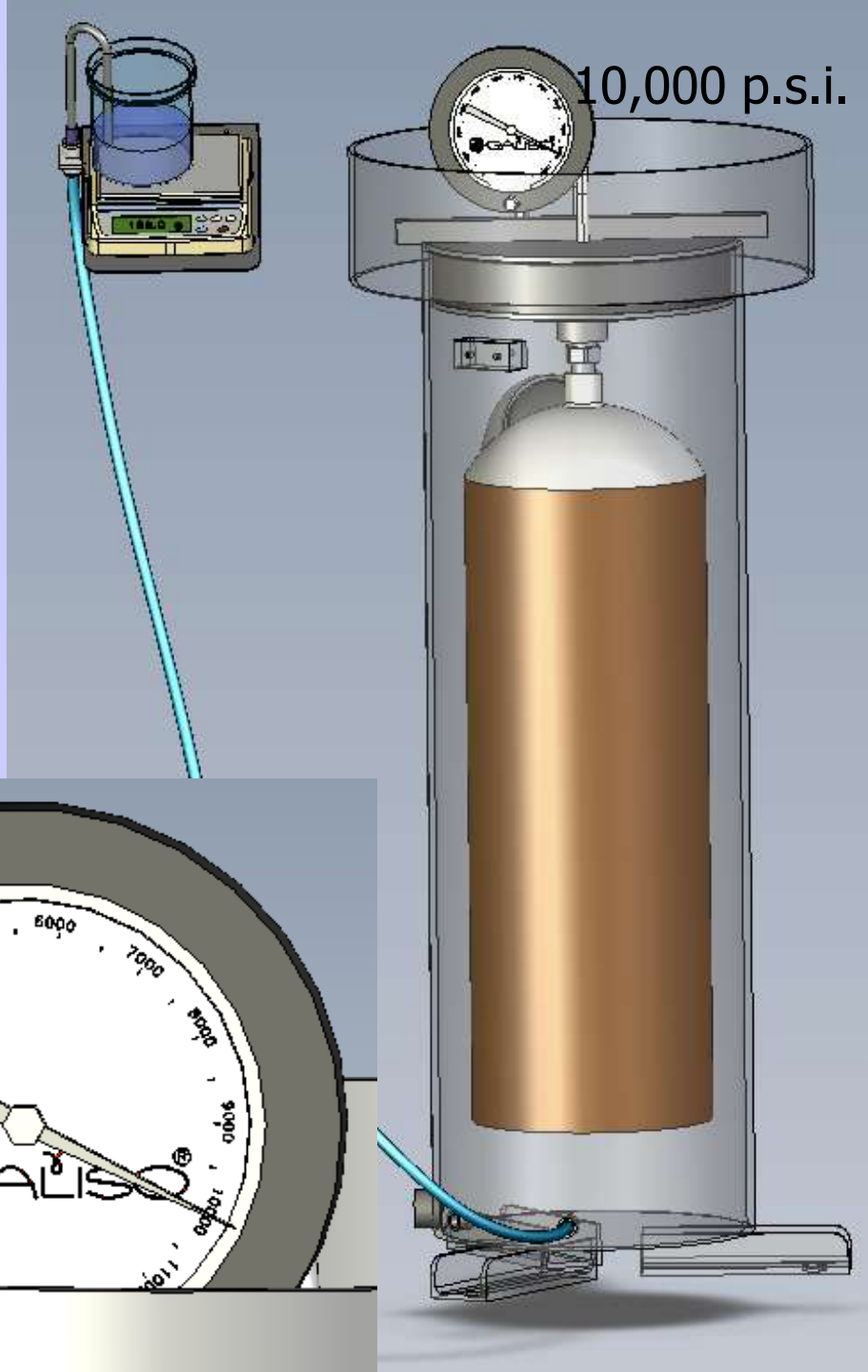
First, let’s give meaning to a few terms…



Zero Point







Total Expansion
189 c.c. at
10,000 p.s.i.

Permanent expansion means a permanent increase in a cylinder's volume after the test pressure is released.

Proof pressure test means a pressure test by interior pressurization without the determination of a cylinder's expansion.

Rebuild means the replacement of a pressure part (e.g. a wall, head, or pressure fitting) by welding.

Rejected cylinder means a cylinder that cannot be used for the transportation of a hazardous material in commerce without repair, rebuilding, and requalification.

Repair means a procedure for correction of a rejected cylinder that may involve welding.

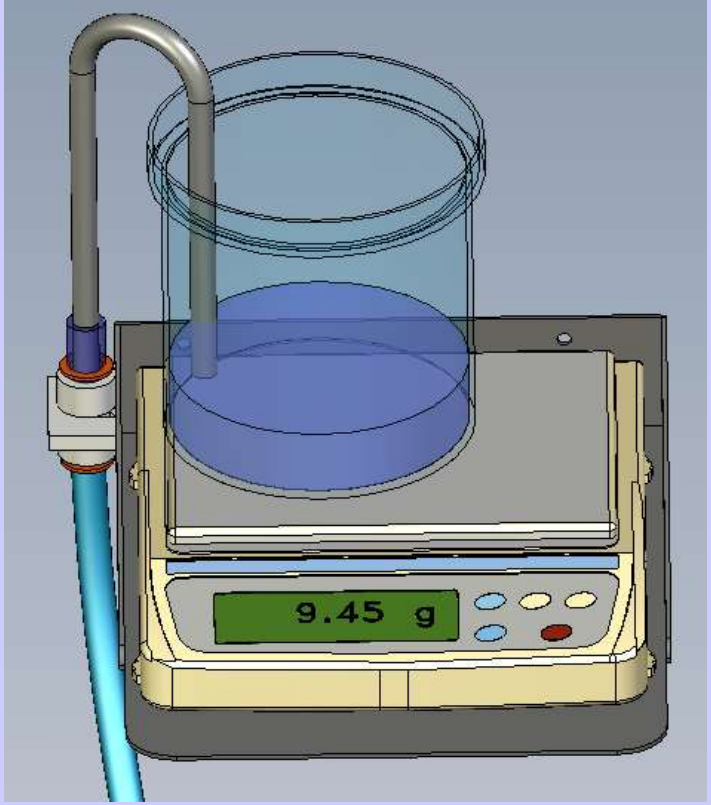
Requalification means the completion

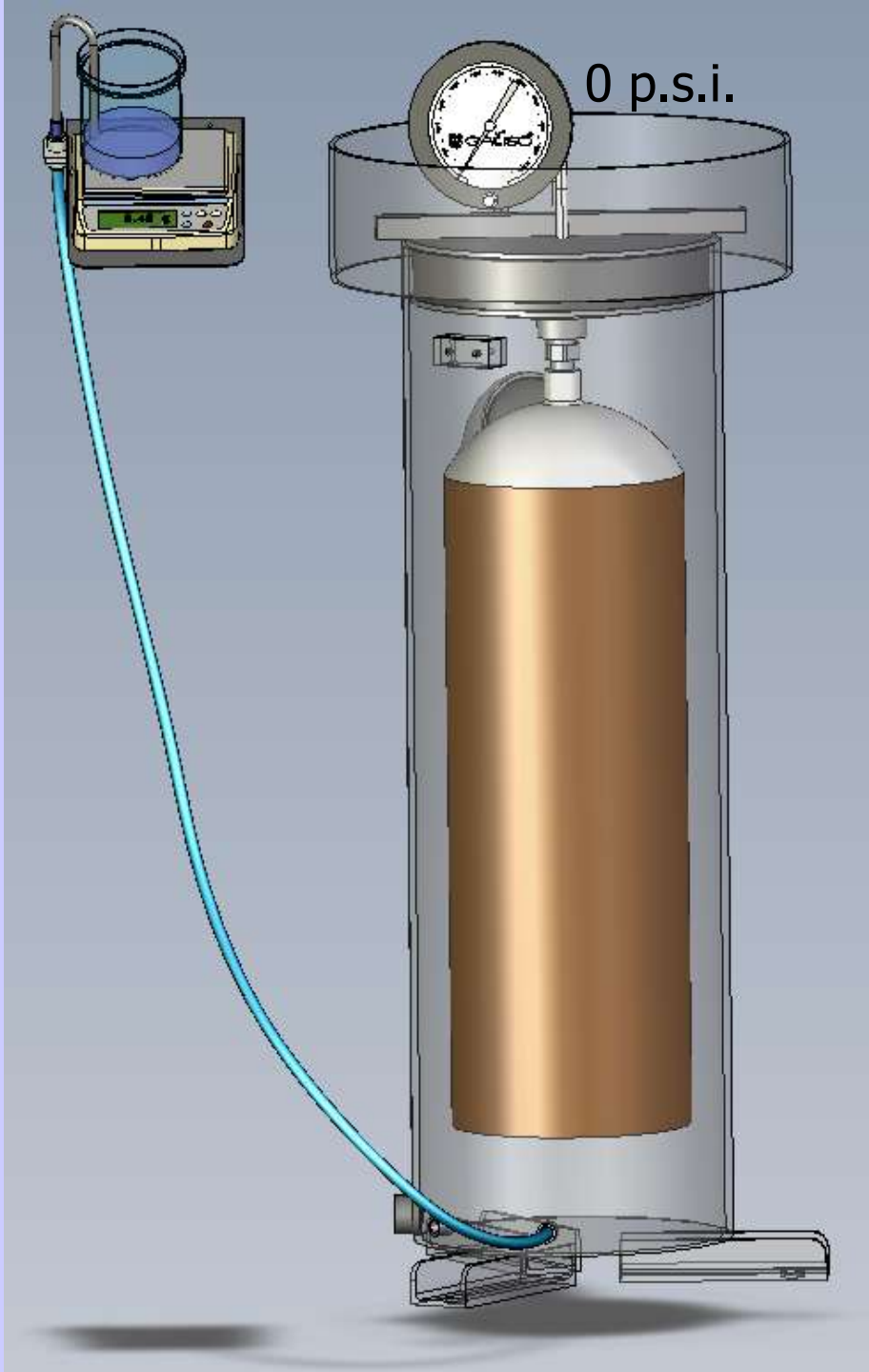
ibility of water, as a means of determining the expansion.

§ 180.205 General requirements for requalification of cylinders.

(a) *General.* Each cylinder used for the transportation of hazardous materials must be an authorized packaging. To qualify as an authorized packaging, each cylinder must conform to this subpart, the applicable requirements specified in part 173 of this subchapter, and the applicable requirements of subpart C of part 178 of this subchapter.

(b) *Persons performing requalification functions.* No person may represent that a repair or requalification of a cylinder has been performed in accordance with the requirements in this subchapter unless that person holds a cur-





Permanent Expansion = 9.45 c.c.

$$\frac{\text{Perm. Exp.}}{\text{Total Exp.}} \times 100 = \text{Percent Permanent Exp.}$$

$$\frac{9.45}{189} \times 100 = 5\ \%\ \text{Permanent Expansion}$$

tended to be used for the transportation of a hazardous material, unless it is marked, maintained, reconditioned, repaired, or retested, as appropriate, in accordance with this part, an approval issued thereunder, or an exemption issued under subchapter A of this chapter.

(b) The representations, markings, and certifications subject to the prohibitions of paragraph (a) of this section include:

(1) Identifications that include the letters "DOT", "MC", "ICC", or "UN";

(2) Exemption, approval, and registration numbers that include the letters "DOT";

(3) Test dates displayed in association with specification, registration, approval, or exemption markings indicating conformance to a test or retest requirement of this subchapter, an approval issued thereunder, or an exemption issued under subchapter A of this chapter;

(4) Documents indicating conformance to the testing, inspection, maintenance or other continuing qualification requirements of this part; and

§ 180.203 Definitions.

In addition to the definitions contained in §171.8 of this subchapter, the following definitions apply to this subpart:

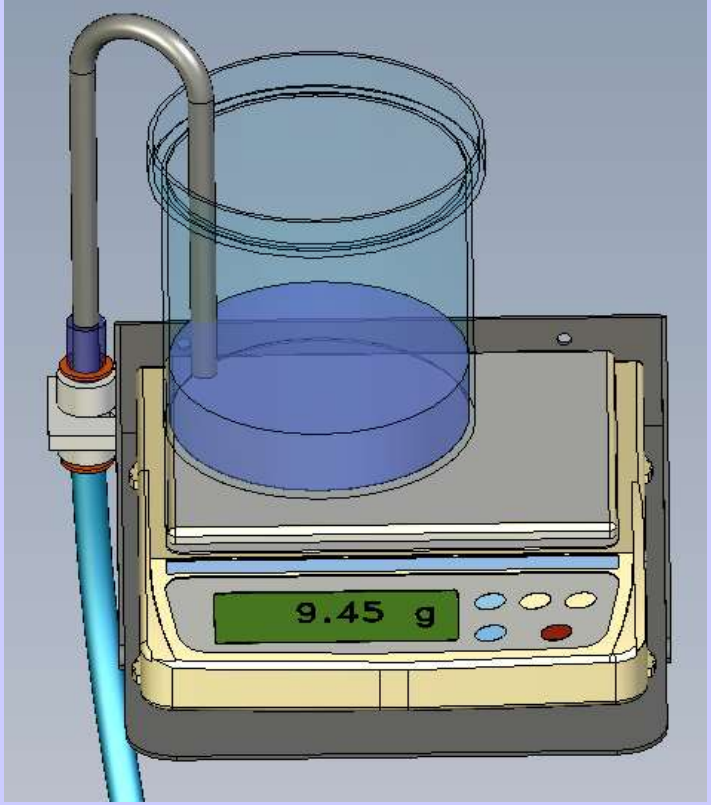
Commercially free of corrosive components means a hazardous material having a dew point at or below minus 46.7 °C (minus 52 °F) at 101kPa (1 atmosphere) and free of components that will adversely react with the cylinder (e.g. chemical stress corrosion).

Condemn means a determination that a cylinder is unserviceable for the continued transportation of hazardous materials in commerce and that the cylinder may not be restored by repair, rebuilding, requalification, or any other procedure.

Defect means an imperfection requiring removal of a cylinder from service.

Elastic expansion means a temporary increase in a cylinder's volume, due to application of pressure, that is lost when pressure is released (elastic expansion = total expansion minus permanent expansion).

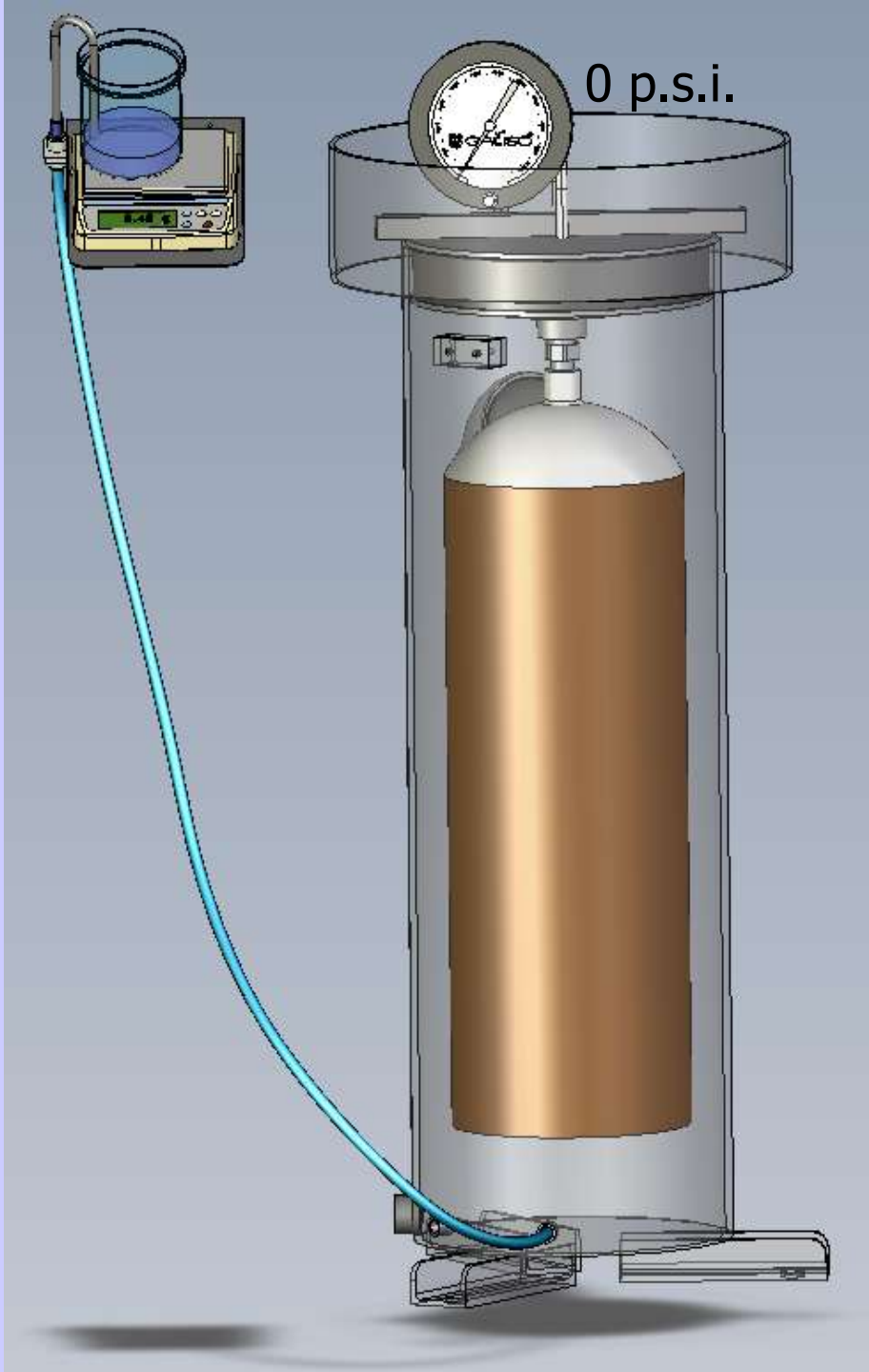
Filled or *charged* means an introduction or presence of a hazardous material in a cylinder.



Total Exp. – Perm. Exp. = Elastic Expansion

189 c.c. – 9.45 c.c. = 179.55 c.c.

Elastic Expansion = 179.55 c.c.



Why do we train?

- First of all – It’s the law!

Battery powered equipment
Battery powered vehicle
Carbon dioxide, solid
Castor bean
Castor flake
Castor meal
Castor pomace
Consumer commodity
Dry ice
Engines, internal combustion
Fish meal, stabilized
Fish scrap, stabilized
Refrigerating machine
Vehicle, flammable gas powered
Vehicle, flammable liquid powered
Wheelchair, electric

[Amdt. 172–116, 54 FR 27145, June 27, 1989, as amended at 55 FR 33713, Aug. 17, 1990; Amdt. 172–127, 59 FR 49133, Sept. 26, 1994; Amdt. 172–149, 61 FR 27173, May 30, 1996; 65 FR 50460, Aug. 18, 2000; 65 FR 58628, Sept. 29, 2000; 66 FR 45182, Aug. 28, 2001; 69 FR 64473, Nov. 4, 2004]

§ 172.606 Carrier information contact.

(a) Each carrier who transports or accepts for transportation a hazardous material for which a shipping paper is required shall instruct the operator of a motor vehicle, train, aircraft, or vessel to contact the carrier (e.g., by telephone or mobile radio) in the event of an incident involving the hazardous material.

(b) For transportation by highway, if square-on-point configuration with the identification number of each hazardous material loaded therein, and the marking or placard is visible on the outside of the motor vehicle.

[Amdt. 172–151, 62 FR 1234, Jan. 8, 1997, as amended at 62 FR 39398 and 39409, July 22, 1997; 63 FR 16076, Apr. 1, 1998]

Subpart H—Training

SOURCE: Amdt. 172–126, 57 FR 20952, May 15, 1992, unless otherwise noted.

§ 172.700 Purpose and scope.

(a) *Purpose.* This subpart prescribes requirements for training hazmat employees.

(b) *Scope.* Training as used in this subpart means a systematic program that ensures a hazmat employee has familiarity with the general provisions of this subchapter, is able to recognize and identify hazardous materials, has knowledge of specific requirements of this subchapter applicable to functions performed by the employee, and has knowledge of emergency response information, self-protection measures and accident prevention methods and procedures (see § 172.704).

and parked at a location other than a facility operated by the consignor or consignee or a facility (e.g., a carrier's terminal or a marine terminal) subject to the provisions of §172.602(c)(2), the carrier shall—

(1) Mark the transport vehicle with the telephone number of the motor carrier on the front exterior near the brake hose and electrical connections or on a label, tag, or sign attached to the vehicle at the brake hose or electrical connection; or

(2) Have the shipping paper and emergency response information readily available on the transport vehicle.

(c) The requirements specified in paragraph (b) of this section do not apply to an unattended motor vehicle separated from its motive power when the motor vehicle is marked on an orange panel, a placard, or a plain white

§172.701 Federal-State relationship.

This subpart and the parts referenced in §172.700(c) prescribe minimum training requirements for the transportation of hazardous materials. For motor vehicle drivers, however, a State may impose more stringent training requirements only if those requirements—

(a) Do not conflict with the training requirements in this subpart and in part 177 of this subchapter; and

(b) Apply only to drivers domiciled in that State.

§172.702 Applicability and responsibility for training and testing.

(a) A hazmat employer shall ensure that each of its hazmat employees is trained in accordance with the requirements prescribed in this subpart.

(b) Except as provided in §172.704(c)(1), a hazmat employee who performs any function subject to the requirements of this subchapter may not perform that function unless instructed in the requirements of this subchapter that apply to that function. It is the duty of each hazmat employer to comply with the applicable requirements of this subchapter and to thoroughly instruct each hazmat employee in relation thereto.

(c) Training may be provided by the hazmat employer or other public or private sources.

(d) A hazmat employer shall ensure that each of its hazmat employees is tested by appropriate means on the training subjects covered in §172.704.

[Amdt. 172–126, 57 FR 20952, May 15, 1992; 57 FR 22182, May 27, 1992, as amended by Amdt. 172–149, 61 FR 27173, May 30, 1996]

§ 172.704 Training requirements.

(ii) Measures to protect the employee from the hazards associated with hazardous materials to which they may be exposed in the work place, including specific measures the hazmat employer has implemented to protect employees from exposure; and

(iii) Methods and procedures for avoiding accidents, such as the proper procedures for handling packages containing hazardous materials.

(4) *Security awareness training.* No later than the date of the first scheduled recurrent training after March 25, 2003, and in no case later than March 24, 2006, each hazmat employee must receive training that provides an awareness of security risks associated with hazardous materials transportation and methods designed to enhance transportation security. This training must also include a component covering how to recognize and respond to possible security threats.

Another reason to train?

- Well… how about safety!?

  Handling a pressurized cylinder is like handling a “loaded gun”.

  Think about it…A pressurized cylinder contains a lot of energy. Your safety and the safety of others depends on correct training.

  And…Yes.. The law requires safety training…

Question…

- Volume 49 of the Code of Federal Regulations, Section 172.704 (49 CFR 172.704) stipulates that Hazmat employee training must include:

  A. General awareness familiarization training.

  B. Function specific training

  C. Safety training

  D. Security awareness training

  E. All of the above.

172-149, 61 FR 27173, May 30, 1996]

§ 172.704 Training requirements.

(a) Hazmat employee training must include the following:

(1) *General awareness/familiarization training.* Each hazmat employee shall be provided general awareness/familiarization training designed to provide familiarity with the requirements of this subchapter, and to enable the employee to recognize and identify hazardous materials consistent with the hazard communication standards of this subchapter.

(2) *Function-specific training.* (i) Each hazmat employee shall be provided function-specific training concerning requirements of this subchapter, or exemptions issued under subchapter A of this chapter, which are specifically applicable to the functions the employee performs.

(ii) As an alternative to function-specific training on the requirements of this subchapter, training relating to the requirements of the ICAO Technical Instructions and the IMDG Code may be provided to the extent such training addresses functions authorized by §§ 171.11 and 171.12 of this subchapter.

(3) *Safety training.* Each hazmat employee shall receive safety training concerning—

(i) Emergency response information required by subpart G of part 172;

training must also include a component covering how to recognize and respond to possible security threats. After March 25, 2003, new hazmat employees must receive the security awareness training required by this paragraph within 90 days after employment.

(5) *In-depth security training.* By December 22, 2003, each hazmat employee of a person required to have a security plan in accordance with subpart I of this part must be trained concerning the security plan and its implementation. Security training must include company security objectives, specific security procedures, employee responsibilities, actions to take in the event of a security breach, and the organizational security structure.

(b) *OSHA, EPA, and other training.* Training conducted by employers to comply with the hazard communication programs required by the Occupational Safety and Health Administration of the Department of Labor (29 CFR 1910.120 or 1910.1200) or the Environmental Protection Agency (40 CFR 311.1), or training conducted by employers to comply with security training programs required by other Federal or international agencies, may be used to satisfy the training requirements in paragraph (a) of this section to the extent that such training addresses the training components specified in paragraph (a) of this section.

Answer…

- Volume 49 of the Code of Federal Regulations, Section 172.704 (49 CFR 172.704) stipulates that Hazmat employee training must include:

  A. General awareness familiarization training.

  B. Function specific training

  C. Safety training

  D. Security awareness training

  E. All of the above.

Question…

- The Code of Federal Regulations (CFR) requires that a Hazmat employee receive training at least once every three years.

  A. True?

  B. False?

(c) *Initial and recurrent training*—(1) *Initial training.* A new hazmat employee, or a hazmat employee who changes job functions may perform those functions prior to the completion of training provided—

(i) The employee performs those functions under the direct supervision of a properly trained and knowledgeable hazmat employee; and

(ii) The training is completed within 90 days after employment or a change in job function.

(2) *Recurrent training.* A hazmat employee shall receive the training required by this subpart at least once every three years.

(3) *Relevant Training.* Relevant training received from a previous employer or other source may be used to satisfy the requirements of this subpart provided a current record of training is obtained from hazmat employees' previous employer.

(4) *Compliance.* Each hazmat employer is responsible for compliance with the requirements of this subchapter regardless of whether the training required by this subpart has been completed.

to the safety training requirement of paragraph (a)(3) of this section.

[Amdt. 172–126, 57 FR 20952, May 15, 1992, as amended by Amdt. 172–126, 58 FR 5851, Jan. 22, 1993; Amdt. 172–145, 60 FR 49110, Sept. 21, 1995; Amdt. 172–149, 61 FR 27173, May 30, 1996; 65 FR 50460, Aug. 18, 2000; 68 FR 14521, Mar. 25, 2003]

Subpart I—Security Plans

SOURCE: 68 FR 14521, Mar. 25, 2003, unless otherwise noted.

§ 172.800 Purpose and applicability.

(a) *Purpose.* This subpart prescribes requirements for development and implementation of plans to address security risks related to the transportation of hazardous materials in commerce.

(b) *Applicability.* By September 25, 2003, each person who offers for transportation in commerce or transports in commerce one or more of the following hazardous materials must develop and adhere to a security plan for hazardous materials that conforms to the requirements of this subpart:

(1) A highway route-controlled quan-

Answer…

- The Code of Federal Regulations (CFR) requires that a Hazmat employee receive training at least once every three years.

  True – 49 CFR 172.704

Question…

- CFR Title 49 180.205 (c), 173.301 (a) (6) stipulates that no cylinder may be filled and transported unless it has been successfully and periodically re-qualified.

  A. True?

  B. False?

after the test pressure is released.

Proof pressure test means a pressure test by interior pressurization without the determination of a cylinder's expansion.

Rebuild means the replacement of a pressure part (e.g. a wall, head, or pressure fitting) by welding.

Rejected cylinder means a cylinder that cannot be used for the transportation of a hazardous material in commerce without repair, rebuilding, and requalification.

Repair means a procedure for correction of a rejected cylinder that may involve welding.

Requalification means the completion of a visual inspection and/or the test(s) required to be performed on a cylinder to determine its suitability for continued service.

Requalification identification number or RIN means a code assigned by DOT to uniquely identify a cylinder requalification, repair, or rebuilding facility.

Test pressure means the pressure used for the requalification of a cylinder.

Total expansion means the total increase in a cylinder's volume due to application of the test pressure.

Visual inspection means an internal or external visual examination, or both, performed as part of the cylinder requalification process.

Volumetric expansion test means a pressure test to determine the total and permanent expansion of a cylinder at a given pressure. The *volumetric expansion test* is conducted using the water jacket or direct expansion methods:

(1) *Water jacket method* means a volumetric expansion test to determine a cylinder's total and permanent expan-

§ 180.205 General requirements for requalification of cylinders.

(a) *General.* Each cylinder used for the transportation of hazardous materials must be an authorized packaging. To qualify as an authorized packaging, each cylinder must conform to this subpart, the applicable requirements specified in part 173 of this subchapter, and the applicable requirements of subpart C of part 178 of this subchapter.

(b) *Persons performing requalification functions.* No person may represent that a repair or requalification of a cylinder has been performed in accordance with the requirements in this subchapter unless that person holds a current approval issued under the procedural requirements prescribed in subpart I of part 107 of this chapter. No person may mark a cylinder with a RIN and a requalification date or otherwise represent that a DOT specification or exemption cylinder has been requalified unless all applicable requirements of this subpart have been met. A person who requalifies cylinders must maintain the records prescribed in §180.215 at each location at which it inspects, tests, or marks cylinders.

(c) *Periodic requalification of cylinders.* Each cylinder bearing a DOT specification marking must be requalified and marked as specified in the Requalification Table in this subpart. Each cylinder bearing a DOT exemption number must be requalified and marked in conformance with this section and the terms of the applicable exemption. No cylinder may be filled with a hazardous material and offered for transportation in commerce unless that cylinder has been successfully requalified and marked in accordance with this sub-

Answer…

- CFR Title 49 180.205 (c), 173.301 (a) (6) stipulates that no cylinder may be filled and transported unless it has been successfully and periodically re-qualified.

  True – CFR 49 180.205 (c); 173.301(a)(6)

Question…

- Except as otherwise provided by the CFR, each time a cylinder is pressure tested, it must be given both an internal and external _____ inspection.

specified in this section must be marked in accordance with §180.213.

(2) Each cylinder that fails requalification must be:

(i) Rejected and may be repaired or rebuilt in accordance with §180.211 or §180.212, as appropriate; or

(ii) Condemned in accordance with paragraph (i) of this section.

(3) For DOT specification cylinders, the marked service pressure may be changed upon approval of the Associate Administrator and in accordance with written procedures specified in the approval.

(4) For a specification 3, 3A, 3AA, 3AL, 3AX, 3AXX, 3B, 3BN, or 3T cylinder filled with gases in other than Division 2.2, from the first requalification due on or after December 31, 2003, the burst pressure of a CG–1, CG–4, or CG–5 pressure relief device must be at test pressure with a tolerance of plus zero to minus 10%. An additional 5% tolerance is allowed when a combined rupture disc is placed inside a holder. This requirement does not apply if a CG–2, CG–3 or CG–9 thermally activated relief device or a CG–7 reclosing pressure valve is used on the cylinder.

tion is recorded as prescribed in §180.215;

(2) Requalified in accordance with this section, regardless of the date of the previous requalification;

(3) Marked in accordance with §180.213; and

(4) Decontaminated to remove all significant residue or impregnation of the Class 8 material.

(f) *Visual inspection.* Except as otherwise provided in this subpart, each time a cylinder is pressure tested, it must be given an internal and external visual inspection.

(1) The visual inspection must be performed in accordance with the following CGA Pamphlets: C–6 for steel and nickel cylinders (IBR, see §171.7 of this subchapter); C–6.1 for seamless aluminum cylinders (IBR, see §171.7 of this subchapter); C–6.2 for fiber reinforced composite exemption cylinders (IBR, see §171.7 of this subchapter); C–6.3 for low pressure aluminum cylinders (IBR, see §171.7 of this subchapter); C–8 for DOT 3HT cylinders (IBR, see §171.7 of this subchapter); and C–13 for DOT 8 series cylinders (IBR, see §171.7 of this subchapter).

Answer…

- Except as otherwise provided by the CFR, each time a cylinder is pressure tested, it must be given both an internal and external **visual** inspection.

Question…

- The visual inspection must be performed in accordance with the following CGA pamphlets:
  A. C-6
  B. C-8 and C-13
  C. All of the above
  D. None of the above

(3) For DOT specification cylinders, the marked service pressure may be changed upon approval of the Associate Administrator and in accordance with written procedures specified in the approval.

(4) For a specification 3, 3A, 3AA, 3AL, 3AX, 3AXX, 3B, 3BN, or 3T cylinder filled with gases in other than Division 2.2, from the first requalification due on or after December 31, 2003, the burst pressure of a CG–1, CG–4, or CG–5 pressure relief device must be at test pressure with a tolerance of plus zero to minus 10%. An additional 5% tolerance is allowed when a combined rupture disc is placed inside a holder. This requirement does not apply if a CG–2, CG–3 or CG–9 thermally activated relief device or a CG–7 reclosing pressure valve is used on the cylinder.

(d) *Conditions requiring test and inspection of cylinders.* Without regard to any other periodic requalification requirements, a cylinder must be tested and inspected in accordance with this sec-

Class 8 material.

(f) *Visual inspection.* Except as otherwise provided in this subpart, each time a cylinder is pressure tested, it must be given an internal and external visual inspection.

(1) The visual inspection must be performed in accordance with the following CGA Pamphlets: C–6 for steel and nickel cylinders (IBR, see §171.7 of this subchapter); C–6.1 for seamless aluminum cylinders (IBR, see §171.7 of this subchapter); C–6.2 for fiber reinforced composite exemption cylinders (IBR, see §171.7 of this subchapter); C–6.3 for low pressure aluminum cylinders (IBR, see §171.7 of this subchapter); C–8 for DOT 3HT cylinders (IBR, see §171.7 of this subchapter); and C–13 for DOT 8 series cylinders (IBR, see §171.7 of this subchapter).

(2) For each cylinder with a coating or attachments that would inhibit inspection of the cylinder, the coating or attachments must be removed before performing the visual inspection.

Source and name of material	49 CFR reference
Chlorine Institute Emergency Kit "A" for 100-lb. & 150 lb. Chlorine Cylinders (with the exception of repair method using Device 8 for side leaks), Edition 10, June 2003.	173.3
Chlorine Institute Emergency Kit "B" for Chlorine Ton Containers (with the exception of repair method using Device 9 for side leaks), Edition 9, June 2003.	173.3
Type 1½ JQ 225, Dwg., H51970, Revision D, April 5, 1989; or Type 1½ JQ 225, Dwg. H50155, Revision F, April 4, 1989.	173.315.
Section 3, Pamphlet 57, Emergency Shut-Off Systems for Bulk Transfer of Chlorine, 3rd Edition, October 1997.	177.840.
Standard Chlorine Angle Valve Assembly, Dwg. 104–8, July 1993	178.337–9.
Excess Flow Valve with Removable Seat, Dwg. 101–7, July 1993	178.337–8.
Excess Flow Valve with Removable Basket, Dwg. 106–6, July 1993	178.337–8.
Standards for Housing and Manway Covers for Steel Cargo Tanks, Dwgs. 137–1 and 137–2, September 1, 1982.	178.337–10.
Compressed Gas Association, Inc., 4221 Walney Road, 5th Floor, Chantilly, Virginia 20151:	
CGA Pamphlet C–3, Standards for Welding on Thin-Walled Steel Cylinders, 1994	178.47; 178.50; 178.51; 178.53; 178.55; 178.56; 178.57; 178.58; 178.59; 178.60; 178.61; 178.65; 178.68; 180.211.
CGA Pamphlet C–5, Cylinder Service Life—Seamless Steel High Pressure Cylinders, 1991	173.302a.
CGA Pamphlet C–6, Standards for Visual Inspection of Steel Compressed Gas Cylinders, 1993	173.3, 173.198, 180.205, 180.209, 180.211, 180.411, 180.519.
CGA Pamphlet C–6.1, Standards for Visual Inspection of High Pressure Aluminum Compressed Gas Cylinders, 2002, Fourth Edition.	180.205; 180.209
CGA Pamphlet C–6.2, Guidelines for Visual Inspection and Requalification of Fiber Reinforced High Pressure Cylinders, 1996, Third Edition.	180.205.
CGA Pamphlet C–6.3, Guidelines for Visual Inspection and Requalification of Low Pressure Aluminum Compressed Gas Cylinders, 1991.	180.205; 180.209.
CGA Pamphlet C–7, A Guide for the Preparation of Precautionary Markings for Compressed Gas Containers, appendix A, issued 1992 (6th Edition).	172.400a.
CGA Pamphlet C–8, Standard for Requalification of DOT-3HT Cylinder Design, 1985	180.205; 180.209.
CGA Pamphlet C–11, Recommended Practices for Inspection of Compressed Gas Cylinders at Time of Manufacture, 2001, Third Edition.	178.35.
CGA Pamphlet C–12, Qualification Procedure for Acetylene Cylinder Design, 1994	173.301; 173.303; 178.59; 178.60.
CGA Pamphlet C–13, Guidelines for Periodic Visual Inspection and Requalification of Acetylene Cylinders, 2000, Fourth Edition.	173.303; 180.205; 180.209.
CGA Pamphlet C–14, Procedures for Fire Testing of DOT Cylinder Pressure Relief Device Systems, 1979.	173.301, 173.323.

Answer…

- The visual inspection must be performed in accordance with the following CGA pamphlets:

  A. C-6

  B. C-8 and C-13

  C. All of the above

  D. None of the above

Question…

- The volumetric expansion test is conducted using only the direct expansion method and never the water jacket method.

  A. True?

  B. False?

Visual inspection means an internal or external visual examination, or both, performed as part of the cylinder requalification process.

Volumetric expansion test means a pressure test to determine the total and permanent expansion of a cylinder at a given pressure. The *volumetric expansion test* is conducted using the water jacket or direct expansion methods:

(1) *Water jacket method* means a volumetric expansion test to determine a cylinder's total and permanent expansion by measuring the difference between the volume of water the cylinder externally displaces at test pressure and the volume of water the cylinder externally displaces at ambient pressure.

(2) *Direct expansion method* means a volumetric expansion test to calculate a cylinder's total and permanent expansion by measuring the amount of water forced into a cylinder at test pressure, adjusted for the compress-

specs, tests, or marks cylinders.

(c) *Periodic requalification of cylinders.* Each cylinder bearing a DOT specification marking must be requalified and marked as specified in the Requalification Table in this subpart. Each cylinder bearing a DOT exemption number must be requalified and marked in conformance with this section and the terms of the applicable exemption. No cylinder may be filled with a hazardous material and offered for transportation in commerce unless that cylinder has been successfully requalified and marked in accordance with this subpart. A cylinder may be requalified at any time during or before the month and year that the requalification is due. However, a cylinder filled before the requalification becomes due may remain in service until it is emptied. A cylinder with a specified service life may not be refilled and offered for transportation after its authorized service life has expired.

(1) Each cylinder that is requalified in accordance with the requirements

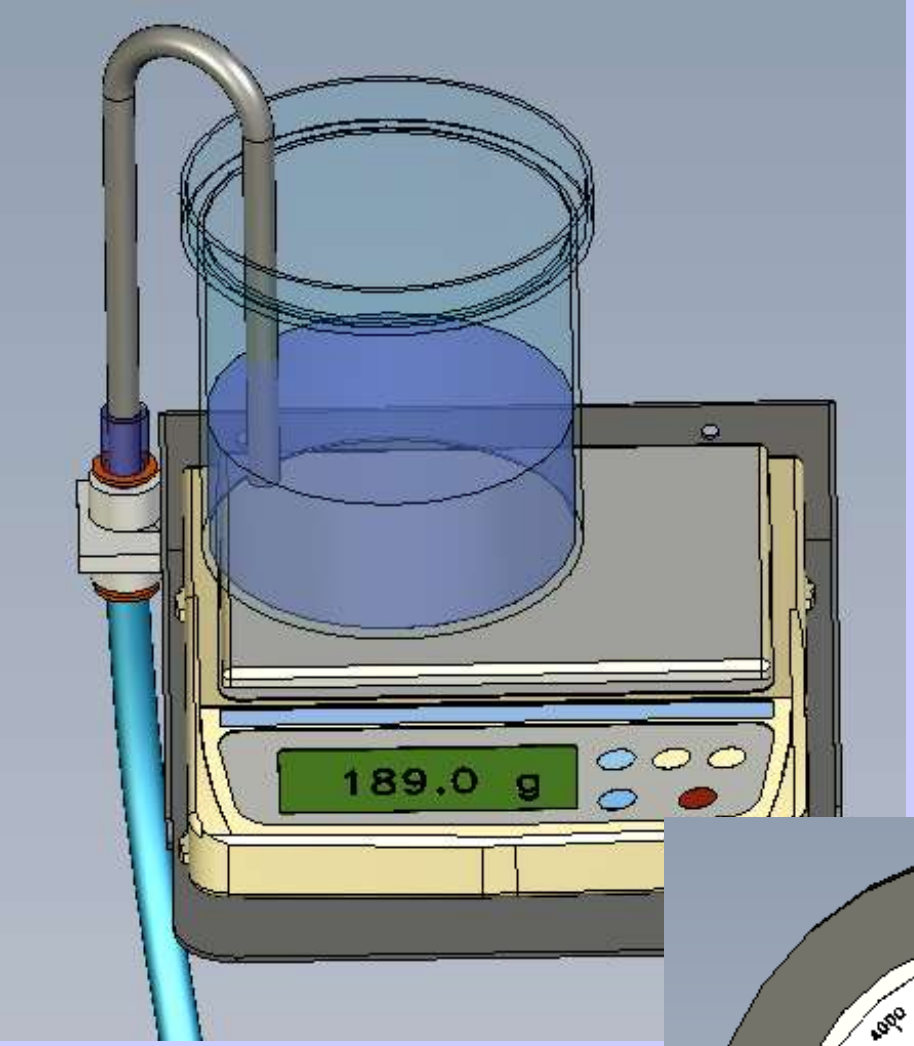
Answer…

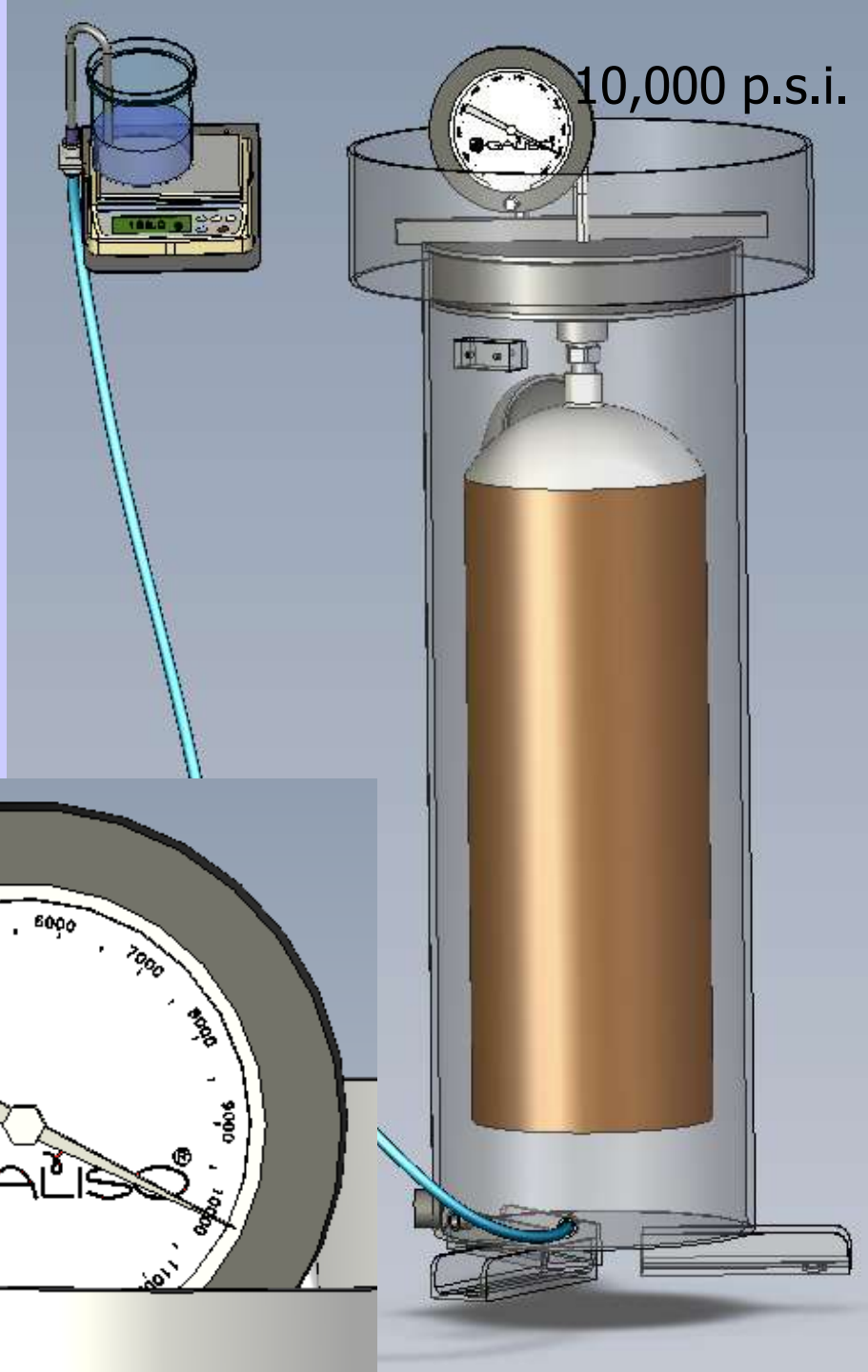
- The volumetric expansion test is conducted using only the direct expansion method and never the water jacket method.

False

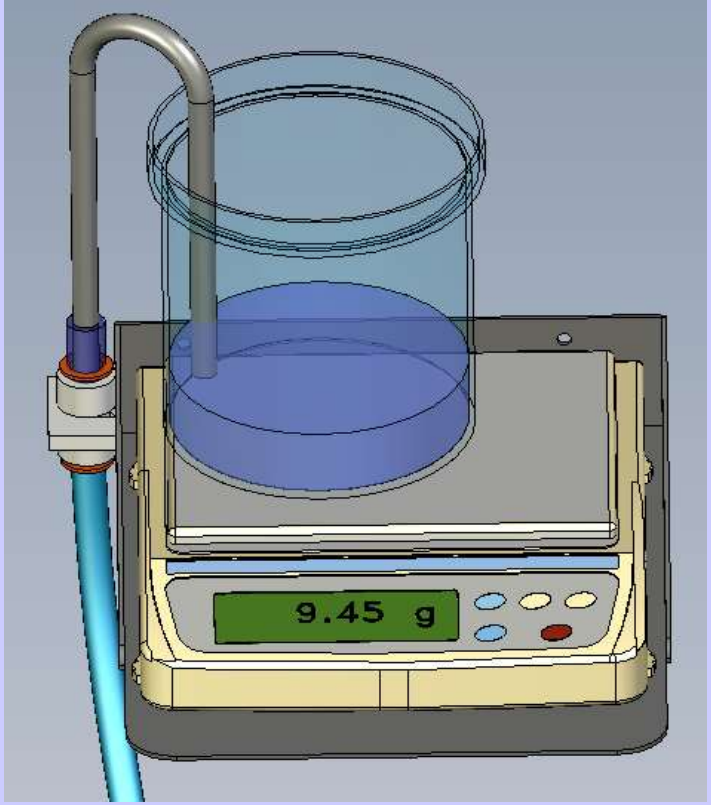
Remember these terms?

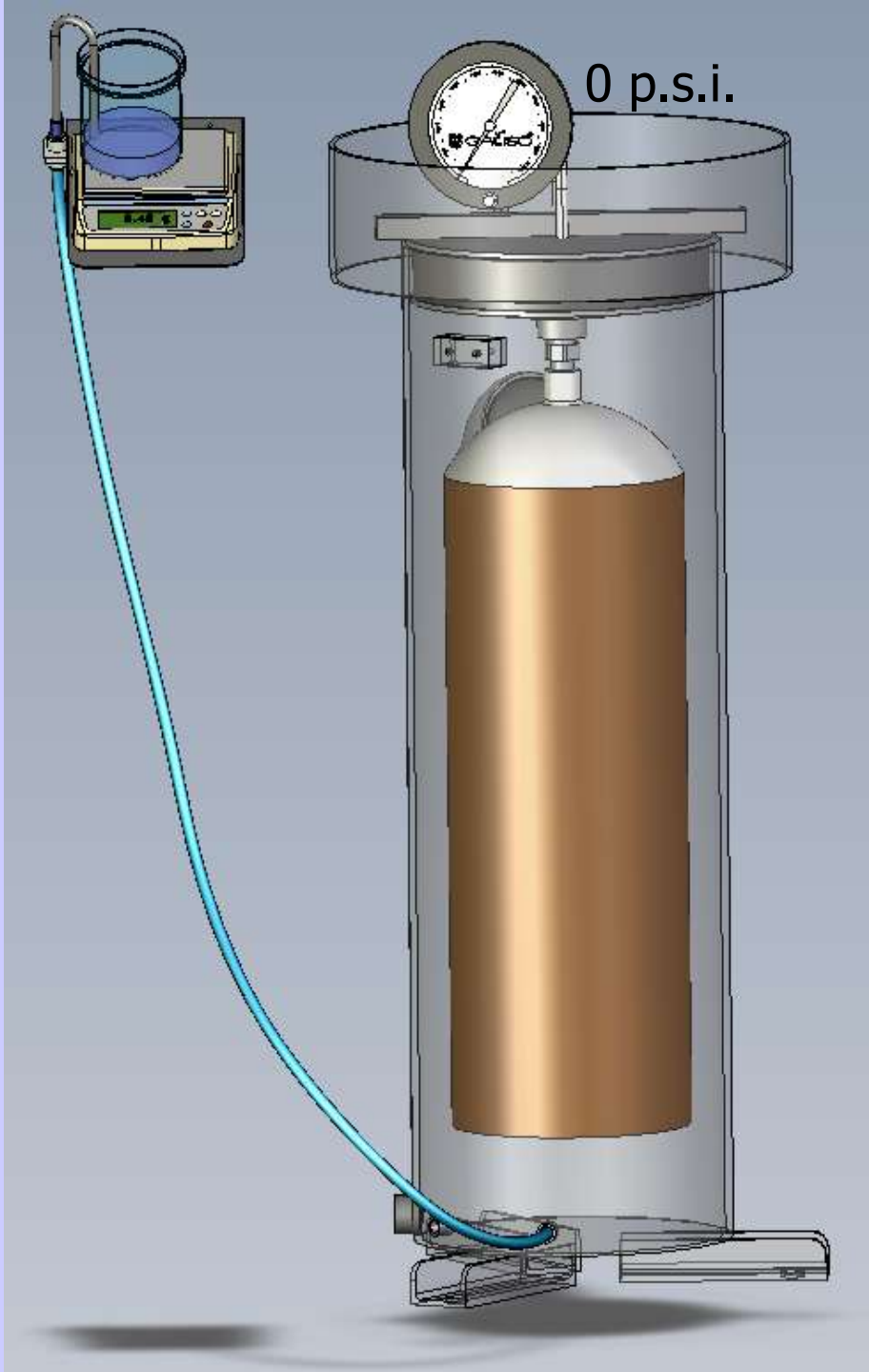
Next slide please…





Total Expansion
189 c.c. at
10,000 p.s.i.





Permanent Expansion = 9.45 c.c.

$$\frac{\text{Perm. Exp.}}{\text{Total Exp.}} \times 100 = \text{Percent Permanent Exp.}$$

$$\frac{9.45}{189} \times 100 = 5\ \%\ \text{Permanent Expansion}$$

Question…

- The water jacket method:
  A. Is a volumetric expansion test.
  B. Determines a cylinder's total expansion.
  C. Determines a cylinder's permanent expansion.
  D. Measures a difference in water volume displacement.
  E. All of the above.

Total expansion means the total increase in a cylinder's volume due to application of the test pressure.

Visual inspection means an internal or external visual examination, or both, performed as part of the cylinder requalification process.

Volumetric expansion test means a pressure test to determine the total and permanent expansion of a cylinder at a given pressure. The *volumetric expansion test* is conducted using the water jacket or direct expansion methods:

(1) *Water jacket method* means a volumetric expansion test to determine a cylinder's total and permanent expansion by measuring the difference between the volume of water the cylinder externally displaces at test pressure and the volume of water the cylinder externally displaces at ambient pressure.

(2) *Direct expansion method* means a volumetric expansion test to calculate a cylinder's total and permanent expansion by measuring the amount of

maintain the records prescribed in §180.215 at each location at which it inspects, tests, or marks cylinders.

(c) *Periodic requalification of cylinders.* Each cylinder bearing a DOT specification marking must be requalified and marked as specified in the Requalification Table in this subpart. Each cylinder bearing a DOT exemption number must be requalified and marked in conformance with this section and the terms of the applicable exemption. No cylinder may be filled with a hazardous material and offered for transportation in commerce unless that cylinder has been successfully requalified and marked in accordance with this subpart. A cylinder may be requalified at any time during or before the month and year that the requalification is due. However, a cylinder filled before the requalification becomes due may remain in service until it is emptied. A cylinder with a specified service life may not be refilled and offered for transportation after its authorized service life has expired.

Answer…

- The water jacket method:

  A. Is a volumetric expansion test.

  B. Determines a cylinder's total expansion.

  C. Determines a cylinder's permanent expansion.

  D. Measures a difference in water volume displacement.

  E. All of the above.

Question…

- The direct expansion method calculates a cylinder's total and _____ expansion.

Visual inspection means an internal or external visual examination, or both, performed as part of the cylinder requalification process.

Volumetric expansion test means a pressure test to determine the total and permanent expansion of a cylinder at a given pressure. The *volumetric expansion test* is conducted using the water jacket or direct expansion methods:

(1) *Water jacket method* means a volumetric expansion test to determine a cylinder's total and permanent expansion by measuring the difference between the volume of water the cylinder externally displaces at test pressure and the volume of water the cylinder externally displaces at ambient pressure.

(2) *Direct expansion method* means a volumetric expansion test to calculate a cylinder's total and permanent expansion by measuring the amount of water forced into a cylinder at test pressure, adjusted for the compress-

specks, lesus, or marks cylinders.

(c) *Periodic requalification of cylinders.* Each cylinder bearing a DOT specification marking must be requalified and marked as specified in the Requalification Table in this subpart. Each cylinder bearing a DOT exemption number must be requalified and marked in conformance with this section and the terms of the applicable exemption. No cylinder may be filled with a hazardous material and offered for transportation in commerce unless that cylinder has been successfully requalified and marked in accordance with this subpart. A cylinder may be requalified at any time during or before the month and year that the requalification is due. However, a cylinder filled before the requalification becomes due may remain in service until it is emptied. A cylinder with a specified service life may not be refilled and offered for transportation after its authorized service life has expired.

(1) Each cylinder that is requalified in accordance with the requirements

Question…

- The direct expansion method calculates a cylinder's total and **permanent** expansion.

Question…

- A proof pressure test does not determine a cylinder's _____.

Permanent expansion means a permanent increase in a cylinder's volume after the test pressure is released.

Proof pressure test means a pressure test by interior pressurization without the determination of a cylinder's expansion.

Rebuild means the replacement of a pressure part (e.g. a wall, head, or pressure fitting) by welding.

Rejected cylinder means a cylinder that cannot be used for the transportation of a hazardous material in commerce without repair, rebuilding, and requalification.

Repair means a procedure for correction of a rejected cylinder that may involve welding.

Requalification means the completion of a visual inspection and/or the test(s) required to be performed on a cylinder to determine its suitability for continued service.

Requalification identification number or RIN means a code assigned by DOT to

ibility of water, as a means of determining the expansion.

§ 180.205 General requirements for requalification of cylinders.

(a) *General.* Each cylinder used for the transportation of hazardous materials must be an authorized packaging. To qualify as an authorized packaging, each cylinder must conform to this subpart, the applicable requirements specified in part 173 of this subchapter, and the applicable requirements of subpart C of part 178 of this subchapter.

(b) *Persons performing requalification functions.* No person may represent that a repair or requalification of a cylinder has been performed in accordance with the requirements in this subchapter unless that person holds a current approval issued under the procedural requirements prescribed in subpart I of part 107 of this chapter. No person may mark a cylinder with a RIN and a requalification date or otherwise represent that a DOT specifica-

Answer…

- A proof pressure test does not determine a cylinder's **expansion**.

Question…

- The expansion-indicating device, as part of a water-jacket retesting system, must be stable and have an accuracy of ± 0.5%, or better, of its full scale.

  A. True?

  B. False?

of each cylinder tested, except that for an analog device, interpolation to ½ 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 cc, whichever is larger. Midpoint visual interpolation is permitted.

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

(i) The pressure-indicating device, as part of the retest apparatus, is accurate within ±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 ±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 psig of the actual test pressure for test pressures at or above 3000 psig, or 10% of the actual test pressure for test pressures below 3000 psig.

(ii) The expansion-indicating device, [illegible]

The calibrated cylinder must show no permanent expansion. The retester must demonstrate calibration in conformance with this paragraph (g) to an authorized inspector on any day that it retests cylinders. A retester must maintain calibrated cylinder certificates in conformance with § 180.215(b)(4).

(5) 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% or 100 psig, whichever is less. This paragraph (g) does not authorize retest of a cylinder otherwise required to be condemned under paragraph (i) of this section.

(h) *Cylinder rejection.* A cylinder must be rejected when, after a visual inspection, it meets a condition for rejection under the visual inspection requirements of paragraph (f) of this section.

(1) Except as provided in paragraphs (h)(3) and (h)(4) of this section, a cylinder that is rejected may not be marked as meeting the requirements of this section.

(2) The requalifier must notify the cylinder owner, in writing, that the

Answer…

- The expansion-indicating device, as part of a water-jacket retesting system, must be stable and have an accuracy of ± 0.5%, or better, of its full scale.

  True

Question…

- In a water jacket test, minimum test pressure must be maintained for at least one minute.

  A. True?

  B. False?

of each cylinder tested, except that for an analog device, interpolation to ½ 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 cc, whichever is larger. Midpoint visual interpolation is permitted.

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

(i) The pressure-indicating device, as part of the retest apparatus, is accurate within ±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 ±0.5%, or better, of its full range, and must permit readings of

The calibrated cylinder must show no permanent expansion. The retester must demonstrate calibration in conformance with this paragraph (g) to an authorized inspector on any day that it retests cylinders. A retester must maintain calibrated cylinder certificates in conformance with § 180.215(b)(4).

(5) 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% or 100 psig, whichever is less. This paragraph (g) does not authorize retest of a cylinder otherwise required to be condemned under paragraph (i) of this section.

(h) *Cylinder rejection*. A cylinder must

Answer…

- In a water jacket test, minimum test pressure must be maintained for at least one minute.

False

Question…

- A system check may be performed at or below 90% of test pressure, prior to the retest.

  A. True?

  B. False?

of each cylinder tested, except that for an analog device, interpolation to ½ 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 cc, whichever is larger. Midpoint visual interpolation is permitted.

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

(i) The pressure-indicating device, as part of the retest apparatus, is accurate within ±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 ±0.5%, or better, of its full range, and must permit readings of pressure from 90%-110% of the minimum test pressure. The calibrated cylinder must show no permanent expansion. The retester must demonstrate calibration in conformance with this paragraph (g) to an authorized inspector on any day that it retests cylinders. A retester must maintain calibrated cylinder certificates in conformance with §180.215(b)(4).

(5) 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% or 100 psig, whichever is less. This paragraph (g) does not authorize retest of a cylinder otherwise required to be condemned under paragraph (i) of this section.

(h) *Cylinder rejection.* A cylinder must be rejected when, after a visual inspec-

Answer…

- A system check may be performed at or below 90% of test pressure, prior to the retest.

  True

Question…

- In the event of equipment malfunction, the test may be repeated at a pressure increased by 10% or 100 psig., whichever is ____.

of each cylinder tested, except that for an analog device, interpolation to ½ 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 cc, whichever is larger. Midpoint visual interpolation is permitted.

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

(i) The pressure-indicating device, as part of the retest apparatus, is accurate within ±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 ±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

The calibrated cylinder must show no permanent expansion. The retester must demonstrate calibration in conformance with this paragraph (g) to an authorized inspector on any day that it retests cylinders. A retester must maintain calibrated cylinder certificates in conformance with § 180.215(b)(4).

(5) 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% or 100 psig, whichever is less. This paragraph (g) does not authorize retest of a cylinder otherwise required to be condemned under paragraph (i) of this section.

(h) *Cylinder rejection.* A cylinder must be rejected when, after a visual inspection, it meets a condition for rejection

Answer…

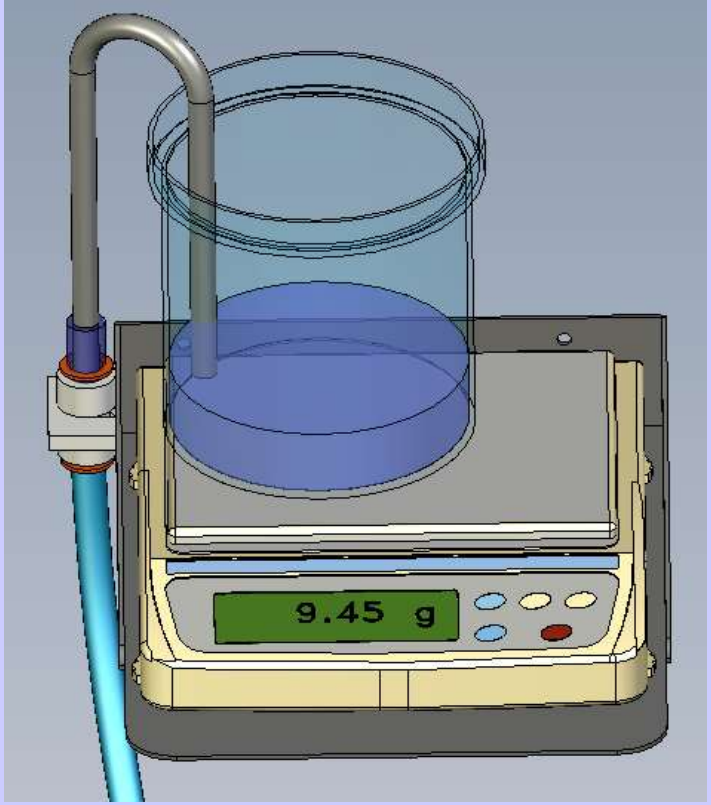
- In the event of equipment malfunction, the test may be repeated at a pressure increased by 10% or 100 psig., whichever is **less**.

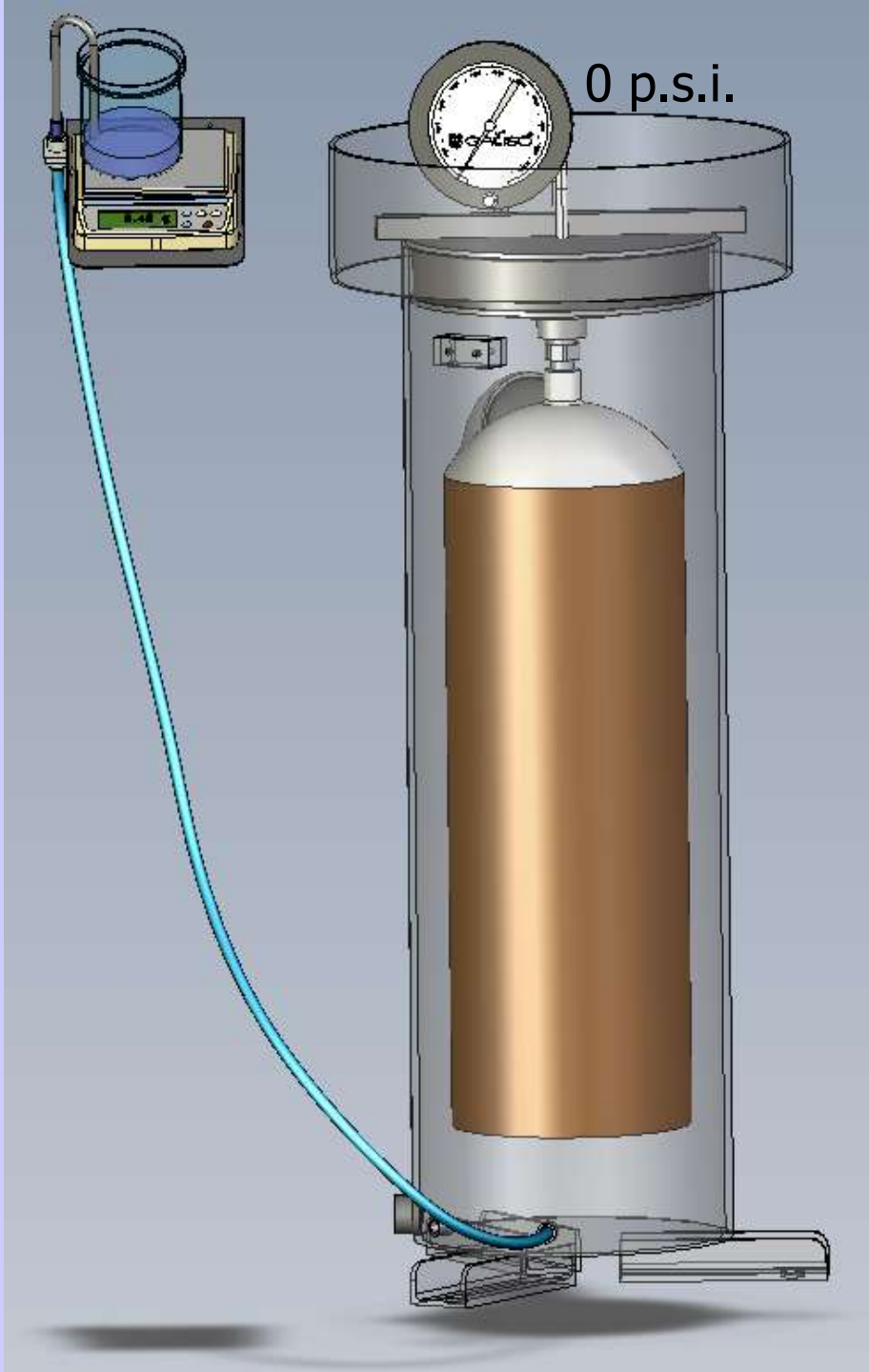
Question…

- Percent permanent expansion is a function of total expansion divided by permanent expansion times 100.

  A. True?

  B. False?





Permanent Expansion = 9.45 c.c.

$$\frac{\text{Perm. Exp.}}{\text{Total Exp.}} \times 100 = \text{Percent Permanent Exp.}$$

$$\frac{9.45}{189} \times 100 = 5\ \%\ \text{Permanent Expansion}$$

Answer…

- Percent permanent expansion is a function of total expansion divided by permanent expansion times 100.

False

Question…

- Total expansion minus permanent expansion equals _____ expansion.

tended to be used for the transportation of a hazardous material, unless it is marked, maintained, reconditioned, repaired, or retested, as appropriate, in accordance with this part, an approval issued thereunder, or an exemption issued under subchapter A of this chapter.

(b) The representations, markings, and certifications subject to the prohibitions of paragraph (a) of this section include:

(1) Identifications that include the letters "DOT", "MC", "ICC", or "UN";

(2) Exemption, approval, and registration numbers that include the letters "DOT";

(3) Test dates displayed in association with specification, registration, approval, or exemption markings indicating conformance to a test or retest requirement of this subchapter, an approval issued thereunder, or an exemption issued under subchapter A of this chapter;

(4) Documents indicating conformance to the testing, inspection, maintenance or other continuing qualification

§ 180.203 Definitions.

In addition to the definitions contained in § 171.8 of this subchapter, the following definitions apply to this subpart:

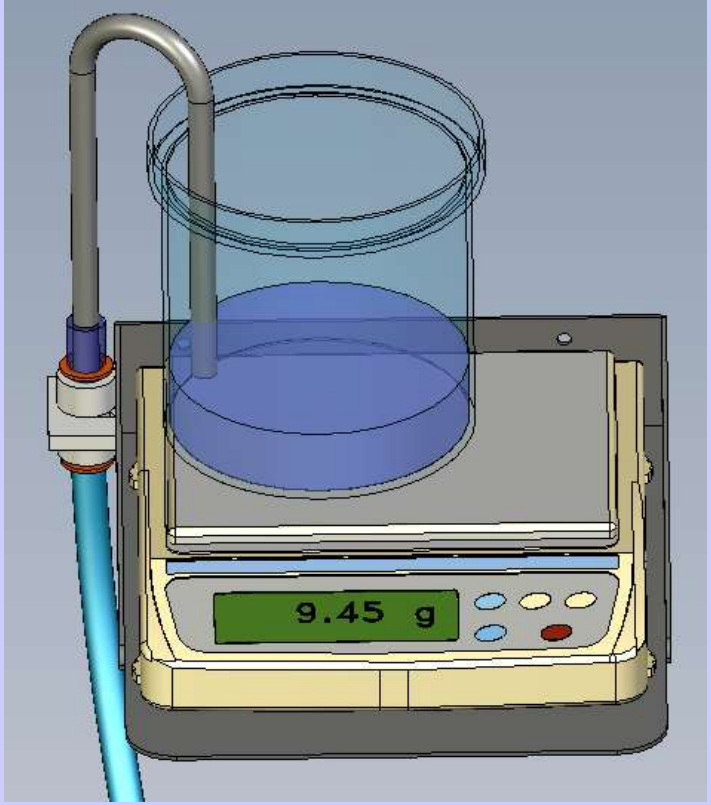
Commercially free of corrosive components means a hazardous material having a dew point at or below minus 46.7 °C (minus 52 °F) at 101kPa (1 atmosphere) and free of components that will adversely react with the cylinder (e.g. chemical stress corrosion).

Condemn means a determination that a cylinder is unserviceable for the continued transportation of hazardous materials in commerce and that the cylinder may not be restored by repair, rebuilding, requalification, or any other procedure.

Defect means an imperfection requiring removal of a cylinder from service.

Elastic expansion means a temporary increase in a cylinder's volume, due to application of pressure, that is lost when pressure is released (elastic expansion = total expansion minus permanent expansion).

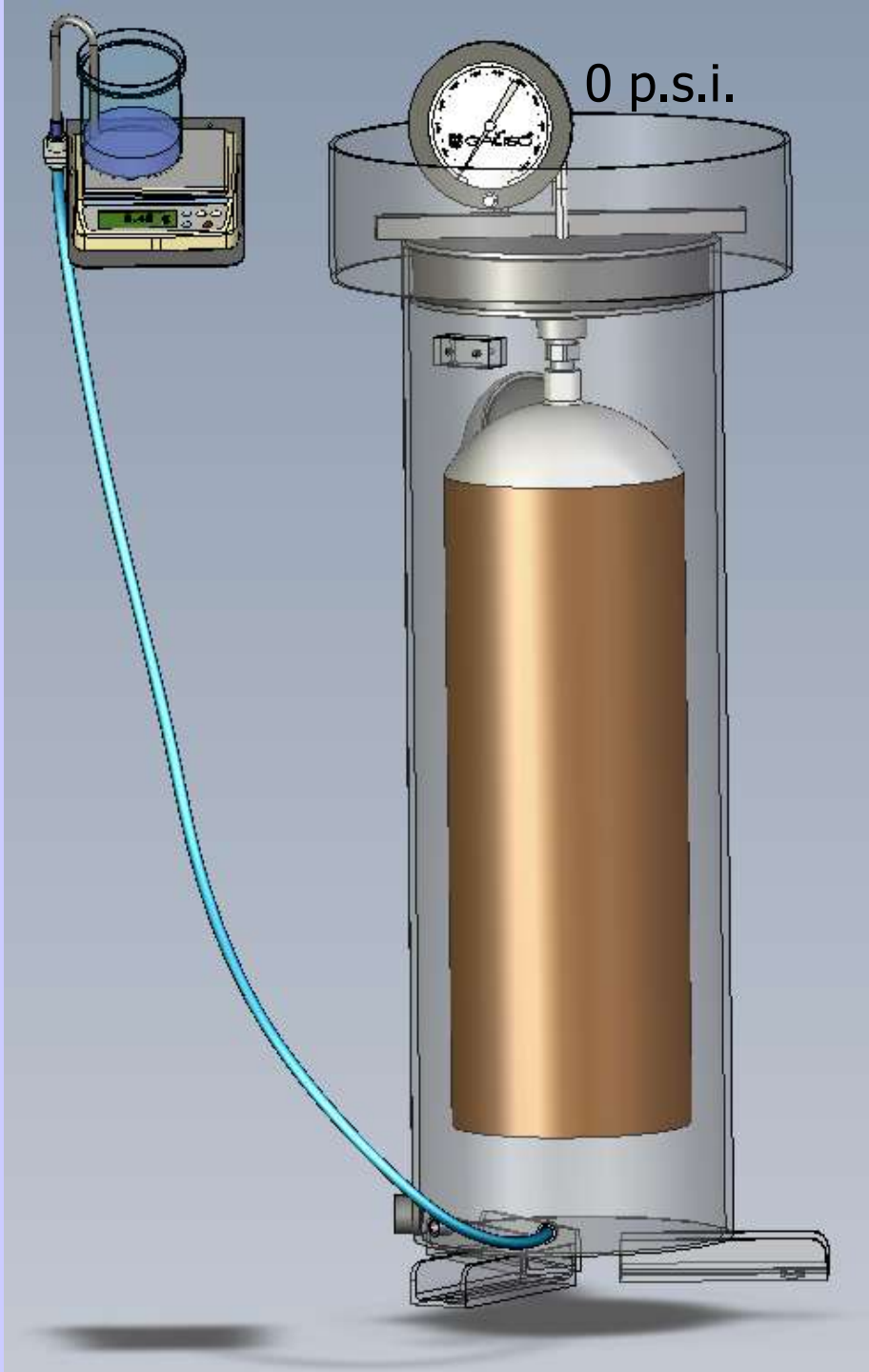
Filled or *charged* means an introduction or presence of a hazardous mate-



Total Exp. – Perm. Exp. = Elastic Expansion

189 c.c. – 9.45 c.c. = 179.55 c.c.

Elastic Expansion = 179.55 c.c.



Answer…

- Total expansion minus permanent expansion equals **elastic** expansion.

Question…

- A D.O.T. specification cylinder must be condemned when permanent expansion exceeds 10 percent of _____ expansion.

(i) The cylinder meets a condition for condemnation under the visual inspection requirements of paragraph (f) of this section.

(ii) The cylinder leaks through its wall.

(iii) Evidence of cracking exists to the extent that the cylinder is likely to be weakened appreciably.

(iv) For a DOT specification cylinder, other than a DOT 4E aluminum cylinder or an exemption cylinder, permanent expansion exceeds 10 percent of total expansion.

(v) For a DOT 3HT cylinder—

(A) The pressure test yields an elastic expansion exceeding the marked rejection elastic expansion (REE) value.

(B) The cylinder shows evidence of denting or bulging.

(C) The cylinder bears a manufacture or an original test date older than twenty-four years or after 4380 pressurizations, whichever occurs first. If a

(2) When a cylinder must be condemned, the requalifier must—

(i) Stamp a series of X's over the DOT specification number and the marked pressure or stamp "CONDEMNED" on the shoulder, top head, or neck using a steel stamp;

(ii) For composite cylinders, securely affix to the cylinder a label with the word "CONDEMNED" overcoated with epoxy near, but not obscuring, the original cylinder manufacturer's label; or

(iii) As an alternative to the stamping or labeling as described in this paragraph (i)(2), at the direction of the owner, the requalifier may render the cylinder incapable of holding pressure.

(3) No person may remove or obliterate the "CONDEMNED" marking. In addition, the requalifier must notify the cylinder owner, in writing, that the cylinder is condemned and may not be filled with hazardous material and offered for transportation in commerce

Answer…

- A D.O.T. specification cylinder must be condemned when permanent expansion exceeds 10 percent of **total** expansion.

Question…

- A cylinder must be condemned when evidence of cracking exists to the extent that the cylinder is likely to be weakened appreciably.

  A. True?

  B. False?

(i) The cylinder meets a condition for condemnation under the visual inspection requirements of paragraph (f) of this section.

(ii) The cylinder leaks through its wall.

(iii) Evidence of cracking exists to the extent that the cylinder is likely to be weakened appreciably.

(iv) For a DOT specification cylinder, other than a DOT 4E aluminum cylinder or an exemption cylinder, permanent expansion exceeds 10 percent of total expansion.

(v) For a DOT 3HT cylinder—

(A) The pressure test yields an elastic expansion exceeding the marked rejection elastic expansion (REE) value.

(B) The cylinder shows evidence of denting or bulging.

(C) The cylinder bears a manufacture

(2) When a cylinder must be condemned, the requalifier must—

(i) Stamp a series of X's over the DOT specification number and the marked pressure or stamp "CONDEMNED" on the shoulder, top head, or neck using a steel stamp;

(ii) For composite cylinders, securely affix to the cylinder a label with the word "CONDEMNED" overcoated with epoxy near, but not obscuring, the original cylinder manufacturer's label; or

(iii) As an alternative to the stamping or labeling as described in this paragraph (i)(2), at the direction of the owner, the requalifier may render the cylinder incapable of holding pressure.

(3) No person may remove or obliterate the "CONDEMNED" marking. In addition, the requalifier must notify

Answer…

- A cylinder must be condemned when evidence of cracking exists to the extent that the cylinder is likely to be weakened appreciably.

  True

Question…

- Re-qualifiers must mark condemned cylinders in the following manner:

  A. Stamp a series of Xs over the DOT specification number and the marked pressure.

  B. Stamp "CONDEMNED" on the shoulder, top head, or neck using a steel stamp.

  C. Both A and B.

  D. Either A or B.

  E. None of the above.

(i) The cylinder meets a condition for condemnation under the visual inspection requirements of paragraph (f) of this section.

(ii) The cylinder leaks through its wall.

(iii) Evidence of cracking exists to the extent that the cylinder is likely to be weakened appreciably.

(iv) For a DOT specification cylinder, other than a DOT 4E aluminum cylinder or an exemption cylinder, permanent expansion exceeds 10 percent of total expansion.

(v) For a DOT 3HT cylinder—

(A) The pressure test yields an elastic expansion exceeding the marked rejection elastic expansion (REE) value.

(B) The cylinder shows evidence of denting or bulging.

(2) When a cylinder must be condemned, the requalifier must—

(i) Stamp a series of X's over the DOT specification number and the marked pressure or stamp "CONDEMNED" on the shoulder, top head, or neck using a steel stamp;

(ii) For composite cylinders, securely affix to the cylinder a label with the word "CONDEMNED" overcoated with epoxy near, but not obscuring, the original cylinder manufacturer's label; or

(iii) As an alternative to the stamping or labeling as described in this paragraph (i)(2), at the direction of the owner, the requalifier may render the cylinder incapable of holding pressure.

(3) No person may remove or obliterate the "CONDEMNED" marking. In

Answer…

- Re-qualifiers must mark condemned cylinders in the following manner:

  A. Stamp a series of Xs over the DOT specification number and the marked pressure.

  B. Stamp "CONDEMNED" on the shoulder, top head, or neck using a steel stamp.

  C. Both A and B.

  D. Either A or B.

  E. None of the above.

Question…

- Condemned composite cylinders must have a label with the word "_____" overcoated with epoxy securely affixed.

(i) The cylinder meets a condition for condemnation under the visual inspection requirements of paragraph (f) of this section.

(ii) The cylinder leaks through its wall.

(iii) Evidence of cracking exists to the extent that the cylinder is likely to be weakened appreciably.

(iv) For a DOT specification cylinder, other than a DOT 4E aluminum cylinder or an exemption cylinder, permanent expansion exceeds 10 percent of total expansion.

(v) For a DOT 3HT cylinder—

(A) The pressure test yields an elastic expansion exceeding the marked rejection elastic expansion (REE) value.

(B) The cylinder shows evidence of denting or bulging.

(2) When a cylinder must be condemned, the requalifier must—

(i) Stamp a series of X's over the DOT specification number and the marked pressure or stamp "CONDEMNED" on the shoulder, top head, or neck using a steel stamp;

(ii) For composite cylinders, securely affix to the cylinder a label with the word "CONDEMNED" overcoated with epoxy near, but not obscuring, the original cylinder manufacturer's label; or

(iii) As an alternative to the stamping or labeling as described in this paragraph (i)(2), at the direction of the owner, the requalifier may render the cylinder incapable of holding pressure.

(3) No person may remove or obliterate the "CONDEMNED" marking. In addition, the requalifier must notify

Answer…

- Condemned composite cylinders must have a label with the word "CONDEMNED" overcoated with epoxy securely affixed.

Question…

- As an alternative to stamping or labeling, a re-qualifier may render a cylinder incapable of holding pressure.

  A. True?

  B. False?

(i) The cylinder meets a condition for condemnation under the visual inspection requirements of paragraph (f) of this section.

(ii) The cylinder leaks through its wall.

(iii) Evidence of cracking exists to the extent that the cylinder is likely to be weakened appreciably.

(iv) For a DOT specification cylinder, other than a DOT 4E aluminum cylinder or an exemption cylinder, permanent expansion exceeds 10 percent of total expansion.

(v) For a DOT 3HT cylinder—

(A) The pressure test yields an elastic expansion exceeding the marked rejection elastic expansion (REE) value.

(B) The cylinder shows evidence of denting or bulging.

(C) The cylinder bears a manufacture or an original test date older than twenty-four years or after 4380 pressur-

(2) When a cylinder must be condemned, the requalifier must—

(i) Stamp a series of X's over the DOT specification number and the marked pressure or stamp "CONDEMNED" on the shoulder, top head, or neck using a steel stamp;

(ii) For composite cylinders, securely affix to the cylinder a label with the word "CONDEMNED" overcoated with epoxy near, but not obscuring, the original cylinder manufacturer's label; or

(iii) As an alternative to the stamping or labeling as described in this paragraph (i)(2), at the direction of the owner, the requalifier may render the cylinder incapable of holding pressure.

(3) No person may remove or obliterate the "CONDEMNED" marking. In addition, the requalifier must notify the cylinder owner, in writing, that the cylinder is condemned and may not be filled with hazardous material and of-

Answer…

- As an alternative to stamping or labeling, a re-qualifier may render a cylinder incapable of holding pressure.

  True

Question…

- When condemned, a requalifier must notify the cylinder owner, in writing, that the cylinder is condemned.

  A. True?

  B. False?

(i) The cylinder meets a condition for condemnation under the visual inspection requirements of paragraph (f) of this section.

(ii) The cylinder leaks through its wall.

(iii) Evidence of cracking exists to the extent that the cylinder is likely to be weakened appreciably.

(iv) For a DOT specification cylinder, other than a DOT 4E aluminum cylinder or an exemption cylinder, permanent expansion exceeds 10 percent of total expansion.

(v) For a DOT 3HT cylinder—

(A) The pressure test yields an elastic expansion exceeding the marked rejection elastic expansion (REE) value.

(B) The cylinder shows evidence of denting or bulging.

(C) The cylinder bears a manufacture or an original test date older than twenty-four years or after 4380 pressurizations, whichever occurs first. If a cylinder is refilled, on average, more than once every other day, an accurate record of the number of rechargings

(2) When a cylinder must be condemned, the requalifier must—

(i) Stamp a series of X's over the DOT specification number and the marked pressure or stamp "CONDEMNED" on the shoulder, top head, or neck using a steel stamp;

(ii) For composite cylinders, securely affix to the cylinder a label with the word "CONDEMNED" overcoated with epoxy near, but not obscuring, the original cylinder manufacturer's label; or

(iii) As an alternative to the stamping or labeling as described in this paragraph (i)(2), at the direction of the owner, the requalifier may render the cylinder incapable of holding pressure.

(3) No person may remove or obliterate the "CONDEMNED" marking. In addition, the requalifier must notify the cylinder owner, in writing, that the cylinder is condemned and may not be filled with hazardous material and offered for transportation in commerce where use of a specification packaging is required.

Answer…

- When condemned, a requalifier must notify the cylinder owner, in writing, that the cylinder is condemned.

  True

Question…

- When a cylinder is condemned, the cylinder owner must be further notified in writing that the cylinder may not be filled with hazardous material and offered for transportation in _____.

(i) The cylinder meets a condition for condemnation under the visual inspection requirements of paragraph (f) of this section.

(ii) The cylinder leaks through its wall.

(iii) Evidence of cracking exists to the extent that the cylinder is likely to be weakened appreciably.

(iv) For a DOT specification cylinder, other than a DOT 4E aluminum cylinder or an exemption cylinder, permanent expansion exceeds 10 percent of total expansion.

(v) For a DOT 3HT cylinder—

(A) The pressure test yields an elastic expansion exceeding the marked rejection elastic expansion (REE) value.

(B) The cylinder shows evidence of denting or bulging.

(C) The cylinder bears a manufacture or an original test date older than twenty-four years or after 4380 pressurizations, whichever occurs first. If a cylinder is refilled, on average, more than once every other day, an accurate record of the number of rechargings

(2) When a cylinder must be condemned, the requalifier must—

(i) Stamp a series of X's over the DOT specification number and the marked pressure or stamp "CONDEMNED" on the shoulder, top head, or neck using a steel stamp;

(ii) For composite cylinders, securely affix to the cylinder a label with the word "CONDEMNED" overcoated with epoxy near, but not obscuring, the original cylinder manufacturer's label;

(iii) As an alternative to the stamping or labeling as described in this paragraph (i)(2), at the direction of the owner, the requalifier may render the cylinder incapable of holding pressure.

(3) No person may remove or obliterate the "CONDEMNED" marking. In addition, the requalifier must notify the cylinder owner, in writing, that the cylinder is condemned and may not be filled with hazardous material and offered for transportation in commerce where use of a specification packaging is required.

[67 FR 51660, Aug. 8, 2002, as amended at 68

Answer…

- When a cylinder is condemned, the cylinder owner must be further notified in writing that the cylinder may not be filled with hazardous material and offered for transportation in commerce.

Question…

- _____ expansion means a permanent increase in the cylinder's volume after the test pressure is released.

Permanent expansion means a permanent increase in a cylinder's volume after the test pressure is released.

Proof pressure test means a pressure test by interior pressurization without the determination of a cylinder's expansion.

Rebuild means the replacement of a pressure part (e.g. a wall, head, or pressure fitting) by welding.

Rejected cylinder means a cylinder that cannot be used for the transportation of a hazardous material in commerce without repair, rebuilding, and requalification.

Repair means a procedure for correction of a rejected cylinder that may involve welding.

Requalification means the completion

ibility of water, as a means of determining the expansion.

§ 180.205 General requirements for requalification of cylinders.

(a) *General.* Each cylinder used for the transportation of hazardous materials must be an authorized packaging. To qualify as an authorized packaging, each cylinder must conform to this subpart, the applicable requirements specified in part 173 of this subchapter, and the applicable requirements of subpart C of part 178 of this subchapter.

(b) *Persons performing requalification functions.* No person may represent that a repair or requalification of a cylinder has been performed in accordance with the requirements in this subchapter unless that person holds a cur-

Answer…

- Permanent expansion means a permanent increase in the cylinder's volume after the test pressure is released.

Question…

- The CFR requires that all cylinders be hydrostatically tested.
  A. True?
  B. False?

TABLE 1—REQUALIFICATION OF CYLINDERS [1]—Continued

Specification under which cylinder was made	Minimum test pressure (psig) [2]	Requalification period (years)
4B, 4BA, 4BW, 4B–240ET	2 times service pressure, except non-corrosive service (*see* § 180.209(g)).	5, 10, or 12 (*see* § 180.209(e), (f), and (j))
4D, 4DA, 4DS	2 times service	5
DOT 4E	2 times service pressure, except non-corrosive (*see* § 180.209(g)).	5
4L	Test not required.	
8, 8AL		10 or 20 (*see* § 180.209(i))
Exemption cylinder	See current exemption	*See* current exemption
Foreign cylinder (see § 173.301(j) of this subchapter for restrictions on use)	As marked on cylinder, but not less than 5/3 of any service or working pressure marking.	5 (*see* §§ 180.209(l) and 180.213(d)(2))

[1] Any cylinder not exceeding 2 inches outside diameter and less than 2 feet in length is excepted from volumetric expansion test.

[2] For cylinders not marked with a service pressure, see § 173.301a(b) of this subchapter.

Answer…

- The CFR requires that all cylinders be hydrostatically tested.

  False

Question…

- The CFR allows that any cylinder not exceeding 2 inches outside diameter and less than 2 feet in length is excepted from volumetric expansion testing.

  A. True?

  B. False?

TABLE 1—REQUALIFICATION OF CYLINDERS [1]—Continued

Specification under which cylinder was made	Minimum test pressure (psig) [2]	Requalification period (years)
4B, 4BA, 4BW, 4B–240ET	2 times service pressure, except non-corrosive service (*see* § 180.209(g)).	5, 10, or 12 (*see* § 180.209(e), (f), and (j))
4D, 4DA, 4DS	2 times service	5
DOT 4E	2 times service pressure, except non-corrosive (*see* § 180.209(g)).	5
4L	Test not required.	
8, 8AL		10 or 20 (*see* § 180.209(i))
Exemption cylinder	See current exemption	*See* current exemption
Foreign cylinder (see § 173.301(j) of this subchapter for restrictions on use)	As marked on cylinder, but not less than 5/3 of any service or working pressure marking.	5 (*see* §§ 180.209(l) and 180.213(d)(2))

[1] Any cylinder not exceeding 2 inches outside diameter and less than 2 feet in length is excepted from volumetric expansion test.

[2] For cylinders not marked with a service pressure, see § 173.301a(b) of this subchapter.

Answer…

- The CFR allows that any cylinder not exceeding 2 inches outside diameter and less than 2 feet in length is excepted from volumetric expansion testing.

  True

Question…

Think about expansion definitions… which expansion is being referred to here?

- An increase in _____ expansion indicates a reduction in the average wall thickness.

tended to be used for the transportation of a hazardous material, unless it is marked, maintained, reconditioned, repaired, or retested, as appropriate, in accordance with this part, an approval issued thereunder, or an exemption issued under subchapter A of this chapter.

(b) The representations, markings, and certifications subject to the prohibitions of paragraph (a) of this section include:

(1) Identifications that include the letters "DOT", "MC", "ICC", or "UN";

(2) Exemption, approval, and registration numbers that include the letters "DOT";

(3) Test dates displayed in association with specification, registration, approval, or exemption markings indicating conformance to a test or retest requirement of this subchapter, an approval issued thereunder, or an exemption issued under subchapter A of this chapter;

(4) Documents indicating conformance to the testing, inspection, maintenance or other continuing qualification requirements of this part; and

§ 180.203 Definitions.

In addition to the definitions contained in §171.8 of this subchapter, the following definitions apply to this subpart:

Commercially free of corrosive components means a hazardous material having a dew point at or below minus 46.7 °C (minus 52 °F) at 101kPa (1 atmosphere) and free of components that will adversely react with the cylinder (e.g. chemical stress corrosion).

Condemn means a determination that a cylinder is unserviceable for the continued transportation of hazardous materials in commerce and that the cylinder may not be restored by repair, rebuilding, requalification, or any other procedure.

Defect means an imperfection requiring removal of a cylinder from service.

Elastic expansion means a temporary increase in a cylinder's volume, due to application of pressure, that is lost when pressure is released (elastic expansion = total expansion minus permanent expansion).

Filled or *charged* means an introduction or presence of a hazardous material in a cylinder.

Answer…

An increase in elastic expansion indicates a reduction in the average wall thickness.

Question…

- A cylinder will no longer qualify for service at 110% of rated pressure (i.e. a "+") when:

  A. The elastic expansion exceeds the limit established by the owner.

  B. The wall stress at service pressure exceeds the limits established by the CFR.

  C. Neither A or B.

  D. Either A or B.

of each cylinder tested, except that for an analog device, interpolation to ½ 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 cc, whichever is larger. Midpoint visual interpolation is permitted.

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

(i) The pressure-indicating device, as part of the retest apparatus, is accurate within ±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 ±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 psig of the actual

The calibrated cylinder must show no permanent expansion. The retester must demonstrate calibration in conformance with this paragraph (g) to an authorized inspector on any day that it retests cylinders. A retester must maintain calibrated cylinder certificates in conformance with § 180.215(b)(4).

(5) 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% or 100 psig, whichever is less. This paragraph (g) does not authorize retest of a cylinder otherwise required to be condemned under paragraph (i) of this section.

(h) *Cylinder rejection.* A cylinder must be rejected when, after a visual inspection, it meets a condition for rejection under the visual inspection requirements of paragraph (f) of this section.

(1) Except as provided in paragraphs (h)(2) and (h)(4) of this section, a cyl

Answer…

- A cylinder will no longer qualify for service at 110% of rated pressure (i.e. a "+") when:

  A. The elastic expansion exceeds the limit established by the owner.

  B. The wall stress at service pressure exceeds the limits established by the CFR.

  C. Neither A or B.

  D. Either A or B.

Lets move through the following six questions a bit more quickly…

Question…

- If a test is repeated due to equipment or operator error, the _____ increase shall be limited to no more than 10% of minimum prescribed test pressure.

Answer…

- If a test is repeated due to equipment or operator error, the cumulative increase shall be limited to no more than 10% of minimum prescribed test pressure.

Question…

- Foreign cylinders may be used in the U.S. if:

  A. The cylinder has been re-qualified in accordance with the CFR.

  B. Density, pressure and relief devices are in keeping with the CFR.

  C. Bill of lading or shipping papers identify the cylinder.

  D. The cylinder has been certified as being qualified by DOT for export.

  E. All of the above.

Answer…

- Foreign cylinders may be used in the U.S. if:

  A. The cylinder has been re-qualified in accordance with the CFR.

  B. Density, pressure and relief devices are in keeping with the CFR.

  C. Bill of lading or shipping papers identify the cylinder.

  D. The cylinder has been certified as being qualified by DOT for export.

  E. All of the above.

Question…

- The CFR establishes the minimum test pressure for requalification of foreign cylinders to be:

  A. Only as marked on the cylinder.

  B. As marked, but not less than 5/3 of any service or working pressure marking.

  C. A or B.

  D. Both A and B.

Answer…

- The CFR establishes the minimum test pressure for requalification of foreign cylinders to be:

A. Only as marked on the cylinder.

B. As marked, but not less than 5/3 of any service or working pressure marking.

C. A or B.

D. Both A and B.

Question…

- The Hazardous Material Safety Administration provides that DOT-3HT specification cylinders are authorized for _____ use only.

Answer…

- The Hazardous Material Safety Administration provides that DOT-3HT specification cylinders are authorized for aircraft use only.

Question…

- The Hazardous Material Safety Administration provides that DOT-3HT specification cylinders are authorized for flammable gases.

  A. True?

  B. False?

Answer…

- The Hazardous Material Safety Administration provides that DOT-3HT specification cylinders are authorized for flammable gases.

  False

Question…

- The Hazardous Materials Regulations prescribes the requalification requirements of DOT-3HT cylinders.

  A. True?

  B. False?

Answer…

- The Hazardous Materials Regulations prescribes the requalification requirements of DOT-3HT cylinders.

  True

Question…

- In accordance with the CFR, a cylinder marked DOT-3HT must be requalified in accordance with CGA C-__ pamphlet.

jacket method or by proof pressure test. A requalification must be performed by the end of 12 years after the original test date and at 12-year intervals thereafter.

(ii) For a cylinder having a water capacity over 5.44 kg (12 lb)—

(A) *By proof pressure test.* A requalification must be performed by the end of 12 years after the original test date and at 7-year intervals; or

(B) *By volumetric expansion test using the water jacket method.* A requalification must be performed 12 years after the original test date and at 12-year intervals thereafter.

(2) A DOT 3A, 3AA, or 3AL cylinder must be requalified by volumetric expansion test using the water jacket method. A requalification must be performed 12 years after the original test date and at 12-year intervals thereafter.

(k) *3HT cylinders.* In addition to the other requirements of this section, a cylinder marked DOT-3HT must be requalified in accordance with CGA C–8 (IBR, see §171.7 of this subchapter).

(1) *Requalification of foreign cylinders filled for export.* A cylinder manufac-

§ 180.211 Repair, rebuilding and reheat treatment of DOT-4 series specification cylinders.

(a) *General requirements for repair and rebuilding.* Any repair or rebuilding of a DOT 4-series cylinder must be performed by a person holding an approval as specified in §107.805 of this chapter. A person performing a rebuild function is considered a manufacturer subject to the requirements of §178.2(a)(2) and subpart C of part 178 of this subchapter. The person performing a repair, rebuild, or reheat treatment must record the test results as specified in §180.215. Each cylinder that is successfully repaired or rebuilt must be marked in accordance with §180.213.

(b) *General repair requirements.* Each repair of a DOT 4-series cylinder must be made in accordance with the following conditions:

(1) The repair and the inspection of the work performed must be made in accordance with the requirements of the cylinder specification.

(2) The person performing the repair must use the procedure, equipment, and filler metal or brazing material as authorized by the approval issued under §107.805 of this chapter.

(3) Welding and brazing must be per-

Answer…

- In accordance with the CFR, a cylinder marked DOT-3HT must be re-qualified in accordance with CGA C-8 pamphlet.

Question…

- Canadian cylinders may be used within the U.S. under the following conditions:

  A. The Canadian Transport Commission (CTC) corresponds with a DOT specification.

  B. The cylinder has been requalified under a program authorized by Canadian TDG regulations.

  C. The cylinder has been requalified in accordance with DOT specifications.

  D. All of the above.

they were originally marked with the letters "CTC" in place of "DOT";

(2) The cylinder has been requalified under a program authorized by the Canadian TDG regulations or requalified in accordance with the requirements in §180.205 within the prescribed requalification period provided for the corresponding DOT specification;

(3) When the regulations authorize a cylinder for a specific hazardous material with a specification marking prefix of "DOT", a cylinder marked "CTC" which otherwise bears the same markings that would be required of the specified "DOT" cylinder may be used; and

(4) Transport of the cylinder and the material it contains is in all other respects in conformance with the requirements of this subchapter (*e.g.* valve protection, filling requirements, operational requirements, etc.).

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) The pressure at 55 °C (131 °F) of Hazard Zone A and, after December 31,

Answer…

- Canadian cylinders may be used within the U.S. under the following conditions:

  A. The Canadian Transport Commission (CTC) corresponds with a DOT specification.

  B. The cylinder has been requalified under a program authorized by Canadian TDG regulations.

  C. The cylinder has been requalified in accordance with DOT specifications.

  D. All of the above.

Question…

- Canadian and U.S. cylinders may be exchanged and freely used in commercial transport in both the U.S. and Canada respectively.

  A. True?

  B. False?

Answer…

- Canadian and U.S. cylinders may be exchanged and freely used in commercial transport in both the U.S. and Canada respectively.

  False (as we have just seen)

Question…

- DOT-3HT cylinders must be condemned if the _____ expansion exceeds the Rejection Elastic Expansion (REE) as marked on the cylinder.

(i) The cylinder meets a condition for condemnation under the visual inspection requirements of paragraph (f) of this section.

(ii) The cylinder leaks through its wall.

(iii) Evidence of cracking exists to the extent that the cylinder is likely to be weakened appreciably.

(iv) For a DOT specification cylinder, other than a DOT 4E aluminum cylinder or an exemption cylinder, permanent expansion exceeds 10 percent of total expansion.

(v) For a DOT 3HT cylinder—

(A) The pressure test yields an elastic expansion exceeding the marked rejection elastic expansion (REE) value.

(B) The cylinder shows evidence of denting or bulging.

(C) The cylinder bears a manufacture or an original test date older than twenty-four years or after 4380 pressurizations, whichever occurs first. If a cylinder is refilled, on average, more than once every other day, an accurate

(2) When a cylinder must be condemned, the requalifier must—

(i) Stamp a series of X's over the DOT specification number and the marked pressure or stamp "CONDEMNED" on the shoulder, top head, or neck using a steel stamp;

(ii) For composite cylinders, securely affix to the cylinder a label with the word "CONDEMNED" overcoated with epoxy near, but not obscuring, the original cylinder manufacturer's label; or

(iii) As an alternative to the stamping or labeling as described in this paragraph (i)(2), at the direction of the owner, the requalifier may render the cylinder incapable of holding pressure.

(3) No person may remove or obliterate the "CONDEMNED" marking. In addition, the requalifier must notify the cylinder owner, in writing, that the cylinder is condemned and may not be filled with hazardous material and offered for transportation in commerce where use of a specification packaging is required.

Answer…

- DOT-3HT cylinders must be condemned if the elastic expansion exceeds the Rejection Elastic Expansion (REE) as marked on the cylinder.

Question…

- All aluminum cylinders used for carbon dioxide and fire extinguishers require Eddy Current Examination combined with a visual inspection.

  A. True?

  B. False?

Answer…

- All aluminum cylinders used for carbon dioxide and fire extinguishers require Eddy Current Examination combined with a visual inspection.

  False

Question…

- Aluminum alloy 6351-T6 cylinders used in SCUBA, SCBA or oxygen service must be requalified using an Eddy Current Examination combined with a _____ inspection.

Answer…

- Aluminum alloy 6351-T6 cylinders used in SCUBA, SCBA or oxygen service must be requalified using an Eddy Current Examination combined with a visual inspection.

Question…

- The pressure indicating device of the testing apparatus must permit reading of pressures:

  A. To within 1% of the minimum prescribed test pressure of each cylinder tested OR

  B. Interpolation to ½ of the marked gauge divisions is acceptable for an analog device.

  C. To within 0.5% of the minimum test pressure of each cylinder tested.

  D. Both A and B.

of each cylinder tested, except that for an analog device, interpolation to ½ 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 cc, whichever is larger. Midpoint visual interpolation is permitted.

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

(i) The pressure-indicating device, as part of the retest apparatus, is accurate within ±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 ±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 psig of the actual test pressure for test pressures at or above 3000 psig, or 10% of the actual test pressure for test pressures below 3000 psig.

(ii) The expansion-indicating device, as part of the retest apparatus, gives a

The calibrated cylinder must show no permanent expansion. The retester must demonstrate calibration in conformance with this paragraph (g) to an authorized inspector on any day that it retests cylinders. A retester must maintain calibrated cylinder certificates in conformance with § 180.215(b)(4).

(5) 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% or 100 psig, whichever is less. This paragraph (g) does not authorize retest of a cylinder otherwise required to be condemned under paragraph (i) of this section.

(h) *Cylinder rejection.* A cylinder must be rejected when, after a visual inspection, it meets a condition for rejection under the visual inspection requirements of paragraph (f) of this section.

(1) Except as provided in paragraphs (h)(3) and (h)(4) of this section, a cylinder that is rejected may not be marked as meeting the requirements of this section.

(2) The requalifier must notify the cylinder owner, in writing, that the

Answer…

- The pressure indicating device of the testing apparatus must permit reading of pressures:

  A. To within 1% of the minimum prescribed test pressure of each cylinder tested OR

  B. Interpolation to ½ of the marked gauge divisions is acceptable for an analog device.

  C. To within 0.5% of the minimum test pressure of each cylinder tested.

  D. Both A and B.

Question…

- Requalification marking on a cylinder used as a dry chemical fire extinguisher may be by means of a pressure sensitive label. Other cylinders must use _____ marking (other than stamping a composite).

clearly and legibly with the word "RE-THREAD" on the shoulder, head, or neck. No cylinder may be re-threaded more than one time without approval of the Associate Administrator.

[70 FR 34077, June 13, 2005]

§ 180.213 Requalification markings.

(a) *General.* Each cylinder requalified in accordance with this subpart with acceptable results must be marked as specified in this section. Required specification markings may not be altered or removed.

(b) *Placement of markings.* Each cylinder must be plainly and permanently marked on the metal of the cylinder as permitted by the applicable specification. Unless authorized by the cylinder specification, marking on the cylinder sidewall is prohibited.

(1) Requalification and required specification markings must be legible so the applicable specification. The markings must be made by stamping, engraving, scribing or other method that produces a legible, durable mark.

(1) A cylinder used as a fire extinguisher (§ 180.209(j)) may be marked by using a pressure sensitive label.

(2) For a DOT 3HT cylinder, the test date and RIN must be applied by low-stress steel stamps to a depth no greater than that prescribed at the time of manufacture. Stamping on the sidewall is not authorized.

(d) *Requalification markings.* Each cylinder that has successfully passed requalification must be marked with the RIN set in a square pattern, between the month and year of the requalification date. The first character of the RIN 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.

Answer…

- Requalification marking on a cylinder used as a dry chemical fire extinguisher may be by means of a pressure sensitive label. Other cylinders must use permanent marking (other than stamping a composite).

Question…

- A dry chemical fire extinguisher may not contain more than 30% Carbon Dioxide by volume or any other _____ extinguishing agent.

18 This description is authorized only for fire extinguishers listed in §173.309(b) of this subchapter meeting the following conditions:

a. Each fire extinguisher may only have extinguishing contents that are nonflammable, non-poisonous, non-corrosive and commercially free from corroding components.

b. Each fire extinguisher must be charged with a nonflammable, non-poisonous, dry gas that has a dew-point at or below minus 46.7 °C (minus 52 °F) at 101 kPa (1 atmosphere) and is free of corroding components to not more than the service pressure of the cylinder.

c. A fire extinguisher may not contain more than 30% carbon dioxide by volume or any other corrosive extinguishing agent.

d. Each fire extinguisher must be protected externally by suitable corrosion-resisting coating.

cells and batteries which do not comply with the provisions of §173.185 of this subchapter may be transported only if they are approved by the Associate Administrator.

30 Sulfur is not subject to the requirements of this subchapter if transported in a non-bulk packaging or if formed to a specific shape (for example, prills, granules, pellets, pastilles, or flakes). A bulk packaging containing sulfur is not subject to the placarding requirements of subpart F of this part, if it is marked with the appropriate identification number as required by subpart D of this part. Molten sulfur must be marked as required by §172.325 of this subchapter.

31 Materials which have undergone sufficient heat treatment to render them non-hazardous are not subject to the requirements of this subchapter.

32 Polymeric beads and molding compounds may be made from polystyrene,

Answer…

- A dry chemical fire extinguisher may not contain more than 30% Carbon Dioxide by volume or any other corrosive extinguishing agent.

Question…

- When specific conditions are met, previous requalification markings may be obliterated.

  A. True?

  B. False?

a metal plate and attached as provided by the original specification.

(2) Previous requalification markings may not be obliterated, except that, when the space originally provided for requalification dates becomes filled, additional dates may be added as follows:

(i) All preceding requalification dates may be removed by peening provided that—

(A) Permission is obtained from the cylinder owner;

(B) The minimum wall thickness is maintained in accordance with manufacturing specifications for the cylinder; and

(C) The original manufacturing test date is not removed.

(ii) When the cylinder is fitted with a footring, additional dates may be marked on the external surface of the footring.

(c) *Requalification marking method.* The depth of requalification markings may not be greater than specified in

markings prescribed in this paragraph (d) is as follows:

$$9\ \frac{A1}{32}\ 98\ X$$

Where:
"9" is the month of requalification,
"A123" is the RIN,
"98" is the year of requalification, and
"X" represents the symbols described in paragraphs (f)(2) through (f)(7) of this section.

(1) Upon a written request, variation from the marking requirement may be approved by the Associate Administrator.

(2) *Exception.* A cylinder subject to the requirements of §173.301(l) of this subchapter may not be marked with a RIN.

(e) *Size of markings.* The size of the markings must be at least 6.35 mm (¼ in.) high, except RIN characters must be at least 3.18 mm (⅛ in.) high.

Answer…

- When specific conditions are met, previous requalification markings may be obliterated.

  True

Question…

- Because CFR Title 49, section 180.205 stipulates that visual inspection must be performed in accordance with CGA pamphlets, series C-__, one would expect to find criteria for neck and thread defects to be outlined there.

(3) For DOT specification cylinders, the marked service pressure may be changed upon approval of the Associate Administrator and in accordance with written procedures specified in the approval.

(4) For a specification 3, 3A, 3AA, 3AL, 3AX, 3AXX, 3B, 3BN, or 3T cylinder filled with gases in other than Division 2.2, from the first requalification due on or after December 31, 2003, the burst pressure of a CG–1, CG–4, or CG–5 pressure relief device must be at test pressure with a tolerance of plus zero to minus 10%. An additional 5% tolerance is allowed when a combined rupture disc is placed inside a holder. This requirement does not apply if a CG–2, CG–3 or CG–9 thermally activated relief device or a CG–7 reclosing pressure valve is used on the cylinder.

(d) *Conditions requiring test and inspection of cylinders.* Without regard to any other periodic requalification requirements, a cylinder must be tested and inspected in accordance with this sec-

Class 8 material.

(f) *Visual inspection.* Except as otherwise provided in this subpart, each time a cylinder is pressure tested, it must be given an internal and external visual inspection.

(1) The visual inspection must be performed in accordance with the following CGA Pamphlets: C–6 for steel and nickel cylinders (IBR, see §171.7 of this subchapter); C–6.1 for seamless aluminum cylinders (IBR, see §171.7 of this subchapter); C–6.2 for fiber reinforced composite exemption cylinders (IBR, see §171.7 of this subchapter); C–6.3 for low pressure aluminum cylinders (IBR, see §171.7 of this subchapter); C–8 for DOT 3HT cylinders (IBR, see §171.7 of this subchapter); and C–13 for DOT 8 series cylinders (IBR, see §171.7 of this subchapter).

(2) For each cylinder with a coating or attachments that would inhibit inspection of the cylinder, the coating or attachments must be removed before performing the visual inspection.

Answer…

- Because CFR Title 49, section 180.205 stipulates that visual inspection must be performed in accordance with CGA pamphlets, series C- 6, one would expect to find criteria for neck and thread defects to be outlined there.

Question…

- Without regard to any other periodic requalification requirements, a cylinder may be required to be tested and reinspected.

  A. True?

  B. False?

CG–3 or CG–9 thermally activated relief device or a CG–7 reclosing pressure valve is used on the cylinder.

(d) *Conditions requiring test and inspection of cylinders.* Without regard to any other periodic requalification requirements, a cylinder must be tested and inspected in accordance with this section prior to further use if—

(1) The cylinder shows evidence of dents, corrosion, cracked or abraded areas, leakage, thermal damage, or any other condition that might render it unsafe for use in transportation;

(2) The cylinder has been in an accident and has been damaged to an extent that may adversely affect its lading retention capability;

(3) The cylinder shows evidence of or is known to have been over-heated; or

(4) The Associate Administrator determines that the cylinder may be in an unsafe condition.

(e) *Cylinders containing Class 8 (corrosive) liquids.* A cylinder previously containing a Class 8 (corrosive) liquid may not be used to transport a Class 2 material in commerce unless the cylinder is—

(IBR, see §171.7 of this subchapter); and C–13 for DOT 8 series cylinders (IBR, see §171.7 of this subchapter).

(2) For each cylinder with a coating or attachments that would inhibit inspection of the cylinder, the coating or attachments must be removed before performing the visual inspection.

(3) Each cylinder subject to visual inspection must be approved, rejected, or condemned according to the criteria in the applicable CGA pamphlet.

(4) In addition to other requirements prescribed in this paragraph (f), a specification or exemption cylinder made of aluminum alloy 6351–T6 must be inspected for evidence of sustained load cracking (SLC) in the neck and shoulder area.

(g) *Pressure test.* (1) Unless otherwise provided, each cylinder required to be retested under this subpart 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.

(2) The pressure indicating device of

Answer…

- Without regard to any other periodic requalification requirements, a cylinder may be required to be tested and reinspected.

  True

Question…

- A cylinder must be retested if it shows evidence of any condition that might render it unsafe for use in transportation.

  A. True?

  B. False?

CG–3 or CG–9 thermally activated relief device or a CG–7 reclosing pressure valve is used on the cylinder.

(d) *Conditions requiring test and inspection of cylinders.* Without regard to any other periodic requalification requirements, a cylinder must be tested and inspected in accordance with this section prior to further use if—

(1) The cylinder shows evidence of dents, corrosion, cracked or abraded areas, leakage, thermal damage, or any other condition that might render it unsafe for use in transportation;

(2) The cylinder has been in an accident and has been damaged to an extent that may adversely affect its lading retention capability;

(3) The cylinder shows evidence of or is known to have been over-heated; or

(4) The Associate Administrator determines that the cylinder may be in an unsafe condition.

(e) *Cylinders containing Class 8 (corrosive) liquids.* A cylinder previously con-

(IBR, see §171.7 of this subchapter); and C–13 for DOT 8 series cylinders (IBR, see §171.7 of this subchapter).

(2) For each cylinder with a coating or attachments that would inhibit inspection of the cylinder, the coating or attachments must be removed before performing the visual inspection.

(3) Each cylinder subject to visual inspection must be approved, rejected, or condemned according to the criteria in the applicable CGA pamphlet.

(4) In addition to other requirements prescribed in this paragraph (f), a specification or exemption cylinder made of aluminum alloy 6351–T6 must be inspected for evidence of sustained load cracking (SLC) in the neck and shoulder area.

(g) *Pressure test.* (1) Unless otherwise provided, each cylinder required to be retested under this subpart must be retested by means suitable for measuring the expansion of the cylinder under pressure. Bands and other removable

Answer…

- A cylinder must be retested if it shows evidence of any condition that might render it unsafe for use in transportation.

  True

Question…

- If a cylinder shows evidence of or is known to have been over - _____, it must be retested in accordance with the CFR.

device or a CG–7 reclosing pressure valve is used on the cylinder.

(d) *Conditions requiring test and inspection of cylinders.* Without regard to any other periodic requalification requirements, a cylinder must be tested and inspected in accordance with this section prior to further use if—

(1) The cylinder shows evidence of dents, corrosion, cracked or abraded areas, leakage, thermal damage, or any other condition that might render it unsafe for use in transportation;

(2) The cylinder has been in an accident and has been damaged to an extent that may adversely affect its lading retention capability;

(3) The cylinder shows evidence of or is known to have been over-heated; or

(4) The Associate Administrator determines that the cylinder may be in an unsafe condition.

(e) *Cylinders containing Class 8 (corrosive) liquids.* A cylinder previously containing a Class 8 (corrosive) liquid may not be used to transport a Class 2 material in commerce unless the cylinder is—

C–13 for DOT 8 series cylinders (IBR, see §171.7 of this subchapter).

(2) For each cylinder with a coating or attachments that would inhibit inspection of the cylinder, the coating or attachments must be removed before performing the visual inspection.

(3) Each cylinder subject to visual inspection must be approved, rejected, or condemned according to the criteria in the applicable CGA pamphlet.

(4) In addition to other requirements prescribed in this paragraph (f), a specification or exemption cylinder made of aluminum alloy 6351–T6 must be inspected for evidence of sustained load cracking (SLC) in the neck and shoulder area.

(g) *Pressure test.* (1) Unless otherwise provided, each cylinder required to be retested under this subpart 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.

(2) The pressure indicating device of

Answer…

- If a cylinder shows evidence of or is known to have been over - heated, it must be retested in accordance with the CFR.

Question…

- A person who re-qualifies cylinders must maintain _____ at each location at which it inspects, tests, or marks cylinders.

(vii) 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.

(viii) For an aluminum or an aluminum-lined composite exemption cylinder, the cylinder is known to have been or shows evidence of having been over-heated.

§ 180.209 Requirements for requalification of specification cylinders.

(a) *Periodic qualification of cylinders.* (1) Each specification cylinder that becomes due for periodic requalification, as specified in the following table, must be requalified and marked in conformance with the requirements of this subpart. Requalification records must be maintained in accordance with § 180.215. Table 1 follows:

TABLE 1—REQUALIFICATION OF CYLINDERS [1]

Specification under which cylinder was made	Minimum test pressure (psig) [2]	Requalification period (years)
DOT 3	3000 psig	5
DOT 3A, 3AA	5/3 times service pressure, except non-corrosive service (*see* § 180.209(g)).	5, 10, or 12 (*see* § 180.209(b), (f), (h), and (j)
DOT 3AL	5/3 times service pressure	5 or 12 (*see* § 180.209(j))
DOT 3AX, 3AAX	5/3 times service pressure	5
3B, 3BN	2 times service pressure (*see* § 180.209(g)).	5 or 10 (see § 180.209(f))
3E	Test not required.	
3HT	5/3 times service pressure	3 (*see* §§ 180.209(k) and 180.213(c))
3T	5/3 times service pressure	5
4AA480	2 times service pressure (*see* § 180.209(g)).	5 or 10 (*see* § 180.209(h))

Answers…

- A person who requalifies cylinders must maintain records at each location at which it inspects, tests, or marks cylinders.

Question…

- A cylinder filled before requalification becomes due may remain in service until it is _____.

Volumetric expansion test means a pressure test to determine the total and permanent expansion of a cylinder at a given pressure. The *volumetric expansion test* is conducted using the water jacket or direct expansion methods:

(1) *Water jacket method* means a volumetric expansion test to determine a cylinder's total and permanent expansion by measuring the difference between the volume of water the cylinder externally displaces at test pressure and the volume of water the cylinder externally displaces at ambient pressure.

(2) *Direct expansion method* means a volumetric expansion test to calculate a cylinder's total and permanent expansion by measuring the amount of water forced into a cylinder at test pressure, adjusted for the compression Table in this subpart. Each cylinder bearing a DOT exemption number must be requalified and marked in conformance with this section and the terms of the applicable exemption. No cylinder may be filled with a hazardous material and offered for transportation in commerce unless that cylinder has been successfully requalified and marked in accordance with this subpart. A cylinder may be requalified at any time during or before the month and year that the requalification is due. However, a cylinder filled before the requalification becomes due may remain in service until it is emptied. A cylinder with a specified service life may not be refilled and offered for transportation after its authorized service life has expired.

(1) Each cylinder that is requalified in accordance with the requirements

Answer…

- A cylinder filled before requalification becomes due may remain in service until it is emptied.

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