

**DEPARTMENT OF TRANSPORTATION****Research and Special Programs Administration**

**49 CFR Parts 107, 171, 172, 173, 177, 178, 179, and 180**

[Docket No. RSPA-01-10373 (HM-220D)]

RIN 2137-AD58

**Hazardous Materials: Requirements for Maintenance, Requalification, Repair and Use of DOT Specification Cylinders**

**AGENCY:** Research and Special Programs Administration (RSPA), DOT.

**ACTION:** Final rule.

**SUMMARY:** In this final rule, RSPA is amending the requirements of the Hazardous Materials Regulations applicable to the maintenance, requalification, repair, and use of DOT specification cylinders. In addition, RSPA is adopting changes to revise the requirements for approval of cylinder requalifiers, independent inspection agencies, and non-domestic chemical analysis and tests. Further, RSPA is removing authorization for the manufacture of DOT specification cylinders made with aluminum alloy 6351-T6. This action is being taken to simplify the regulations, respond to petitions for rulemaking, address recommendations of the National Transportation Safety Board, and enhance the safe transportation of hazardous materials in cylinders.

**DATES:** *Effective Date:* October 1, 2002.

*Incorporation by Reference Date:* The incorporation by reference of publications listed in this final rule has been approved by the Director of the Federal Register as of October 1, 2002.

**FOR FURTHER INFORMATION CONTACT:** Cheryl Freeman or Mark Toughiry, (202) 366-4545, Office of Hazardous Materials Technology, Research and Special Programs Administration.

**SUPPLEMENTARY INFORMATION:**

**I. Background**

On October 30, 1998, the Research and Special Programs Administration (RSPA, we) published a notice of proposed rulemaking (NPRM) under Docket HM-220 (63 FR 58460). In the NPRM, we proposed to amend the Hazardous Materials Regulations (HMR; 49 CFR Parts 171-180) to: (1) Establish four new DOT cylinder specifications to replace the 12 current seamless and welded cylinder specifications; (2) revise the requirements for maintenance, requalification, repair, and use of all DOT specification

cylinders; and (3) discontinue the manufacture of certain specification cylinders. We took this action because many of our current cylinder specifications have not been updated since their adoption into the regulations over 50 years ago. The proposed changes were intended to enhance operational controls and transportation safety by incorporating into the HMR new manufacturing and testing technologies and clarifying existing regulatory requirements. In addition, the proposed changes addressed three National Transportation Safety Board (NTSB) recommendations for improving the safety of cylinders in transportation. Finally, the proposed changes would have eased the regulatory burden on the regulated industry by incorporating the provisions of more than 30 exemptions into the HMR.

More than 140 commenters submitted over 200 comments in response to the NPRM, including representatives of cylinder and equipment manufacturers, requalifiers, refillers and users, trade associations, gas producers, distributors, shippers, carriers, emergency responders, representatives of federal and state governmental agencies, private consultants, and the general public. In addition, we held a series of public meetings to obtain comments.

Many commenters objected to the proposed new metric-marked cylinder specifications, identified as 3M, 3ALM, 3FM, and 4M. Commenters also opposed the proposed requirement for these new metric-marked cylinders and certain cylinders manufactured to the current specifications, that is, non-metric marked cylinders, to be requalified by ultrasonic examination. These commenters suggested we allow continued manufacture of cylinders to the current DOT specifications and revise the current requirements to include certain enhancements from the metric-marked cylinder proposals. These commenters preferred we wait until after the International Organization for Standardization (ISO) cylinder standards were completed and adopted into the United Nation (UN) Recommendations on the Transport of Dangerous Goods (UN Model Regulations) before we considered incorporating new specification requirements into the HMR. Based on the merits of the comments received, we agree the proposed metric-marked cylinder standards and related proposals that were based on the draft ISO standard should not be adopted. Because of significant opposition to many of the proposals in the 1998 NPRM, we published a notice in the **Federal Register** on February 13, 2002

(67 FR 6667), terminating rulemaking action under Docket HM-220. The termination notice announced that we were withdrawing the proposals applicable to metric-marked cylinders and ultrasonic examination.

We worked closely with the UN Committee of Experts as it developed an international cylinder standard based on the above-referenced ISO requirements. The new international standard was adopted as part of the UN Model Regulations in December 2000. We will address issues related to the harmonization of the U.S. cylinder regulations with the UN Model Regulations in a future rulemaking. The proposals in the 1998 NPRM relating to maintenance, requalification, repair, and use of DOT specification cylinders and approval of cylinder requalifiers, independent inspection agencies, and non-domestic chemical analyses and tests are addressed in this final rule, which has been designated HM-220D (RSPA-01-10373).

The 1998 NPRM proposed to require all cylinders manufactured or rebuilt to the proposed new metric-marked cylinder specifications to undergo inspection and certification by an Independent Inspection Agency rather than an employee of the manufacturing company. This proposal responded to an NTSB recommendation (I-90-009) that RSPA require independent inspection of new and reconditioned low pressure cylinders consistent with current independent inspection requirements for high pressure cylinders. Because we are not adopting the metric-marked cylinder specifications in this final rule, we are not adopting the proposed independent inspection requirements. However, we will address this issue in a rulemaking to harmonize the U.S. cylinder regulations with the UN Model Regulations that we plan to initiate in the near future.

**II. Overview of Changes in this Final Rule**

In this final rule, we are amending the HMR to:

(1) Prohibit a filled cylinder with a specified service life from being offered for transportation in commerce after its service life has expired.

(2) Remove authorization for the manufacture of DOT specification cylinders using aluminum alloy 6351-T6. Cylinders manufactured with this aluminum alloy have a greater risk of failure than other aluminum cylinders.

(3) Incorporate by reference new and updated Compressed Gas Association (CGA) standards and updated American

Society for Testing and Materials (ASTM) standards.

(4) Require each person who performs a requalification function that requires marking of an inspection or retest date on a cylinder to have approval from the Associate Administrator for Hazardous Materials Safety (Associate Administrator).

(5) Standardize requirements for repair and rebuilding of DOT-4 series cylinders, other than the DOT 4L.

(6) Allow the application of requalification markings on cylinders by using alternative methods that produce durable, legible marks.

(7) Require pressure relief devices on all DOT-3 series specification cylinders to be set at test pressure with a tolerance of -10% to +0 beginning at the first requalification due on or after the effective date of this final rule.

In addition, we are consolidating requirements for obtaining approval to be a cylinder requalifier, independent inspection agency, or to have chemical tests or analyses performed outside the United States on cylinders manufactured outside the United States in a new Subpart I in Part 107.

The safety of cylinders constructed with aluminum alloy 6351-T6 was first raised in a safety advisory and NPRM published in 1987 under Docket HM-176A. With publication of this final rule, further action under Docket HM-176A is terminated.

### III. Section-by-Section Review

The following is a section-by-section review of the changes adopted in this final rule and, where applicable, a discussion of comments received.

#### Part 107

##### Section 107.1

This final rule adopts the proposal in the 1998 NPRM to remove the reference to a cylinder retester who is registered pursuant to § 173.34(a)(1) from the definition of "registration." Commenters did not address this issue.

#### Subpart I

The 1998 NPRM proposed to add a new subpart I to Part 107 to consolidate procedures currently in §§ 173.34(e)(2), 173.300a, and 173.300b of the HMR for obtaining approval from the Associate Administrator. The approval procedures address requirements for cylinder requalifiers and independent inspection agencies (IIAs), and to have chemical tests or analyses performed outside the United States on DOT specification cylinders manufactured outside the United States. Commenters generally supported this proposal. This final rule

adopts the proposed consolidation in Part 107, with the revisions noted below.

#### Section 107.803

Prescribes application procedures for approval or renewal as an IIA. These procedures permit an approved IIA to perform other functions relating to the cylinder requalification requirements. The criteria permit the approval of any person or organization technically competent to perform cylinder requalification functions and free from undue influence by persons involved with the fabrication, ownership, or movement of the cylinders that the applicant, if approved, would be called upon to evaluate and certify. We are not adopting a proposal to permit persons or organizations approved by foreign governments to perform these functions. This latter proposal was contingent upon our adopting the metric-marked cylinder specifications proposed in the NPRM.

#### Section 107.805

Sets forth application procedures for a person seeking approval to perform periodic cylinder requalifications. The NPRM proposed to broaden the current approval requirement to apply to any person who performs a requalification function after which the cylinder is required to be marked with a date. The affected requalification functions include visual inspections, pressure tests, repairs, and rebuilding of cylinders. The new approval procedures will enhance the accountability of the cylinder requalification process. This change was supported by most commenters. However, the National Propane Gas Association (NPGA) and some of its members opposed the proposal because it would require persons who perform only visual inspections of cylinders to obtain DOT approval. NPGA stated that this new approval requirement is burdensome, unenforceable, and an excessive response to a safety problem only identifiable through individual instances of egregious cylinder wear. NPGA also said that the proposal could potentially affect tens of thousands of individuals and many small facilities. We disagree. As we stated in the NPRM, this change ensures the accountability of a person performing visual requalifications. In addition, this change provides RSPA with the authority to revoke or suspend a person's approval for demonstrated noncompliance with the requalification requirements. Also, if an applicant must certify it has the ability to perform requalifications, each applicant's awareness of the importance

of compliance should be heightened. We estimate the number of affected requalifiers to be 7,200. Under the provisions in this final rule, these requalifiers must submit a letter containing information on their qualifications and the location at which they work. The regulatory burden imposed by this new requirement is minimal. Moreover, this final rule includes a transition period of one year to allow sufficient time for affected individuals to obtain the requisite approvals.

As requested by commenters, we are making editorial changes to paragraph (f) to recognize that visual cylinder requalifications are often performed at the owner's or end-user's facility rather than the requalifier's facility.

Because this final rule expands the approval provisions to apply to repairers and rebuilders, we are replacing the terms "retester" and "retester identification number" in this final rule with the terms "requalifier" and "requalifier identification number," respectively.

#### Section 107.807

Sets forth the application procedures, currently in § 173.300b, for issuance or renewal of an approval to perform chemical analyses and tests outside the United States on DOT specification cylinders manufactured outside the United States. These procedures are unchanged from current requirements.

#### Part 171

##### Section 171.2.

In this final rule, we are adopting the NPRM proposal to revise paragraph (d)(3). The revision clarifies that no person may mark a requalifier identification number (RIN) on a cylinder that has not been requalified according to the applicable requirements.

##### Section 171.6.

We are revising certain section references in the table of OMB control numbers for consistency with this final rule.

##### Section 171.7

The NPRM proposed to revise this section to incorporate by reference the latest editions of previously approved CGA Pamphlets and ASTM standards and certain additional ASTM and CGA standards. In this final rule, we are incorporating the 1999 edition of the ASTM standards for tension testing of metallic materials; the 1999 edition of the ASTM standard specification for heat-resisting chromium and chromium-nickel stainless steel plate, sheet, and

strip for pressure vessels; and the 1998 edition of the ASTM standards for notched bar impact testing of metallic materials instead of the 1996 editions proposed in the NPRM. We reviewed the more recent editions and identified no significant differences from the 1996 editions. In addition, we are incorporating the 1997 edition of the ASTM standard specification for liquefied petroleum gases (*see* discussion under "Section 180.203" below). We are also incorporating the 1998 edition of the ASTM standard for ultrasonic examination of metal pipe and tubing instead of the 1993 edition proposed in the NPRM. We reviewed the more recent edition and found no significant differences from the 1993 edition. The ASTM standard for ultrasonic examination replaces a 1967 standard that is no longer available and applies to the manufacture of specification DOT 3T stainless steel cylinders. We are not incorporating the ASTM standards addressing the metric-marked cylinder proposals in the NPRM. Further, we are not incorporating CGA pamphlet C-1, "Methods for Hydrostatic Testing of Compressed Gas Cylinders," 1996 edition. It is our understanding that CGA is in the process of completely revising the C-1 standard. We will consider incorporating the revised C-1 standard in a future rulemaking.

#### Section 171.12

As proposed in the NPRM, we are revising paragraph (b)(15) to include a reference to a provision on Canadian manufactured cylinders contained in current § 171.12a(b)(13).

#### Part 172

##### Section 172.101

In the § 172.101 Hazardous Materials Table, for the entries "Cyanogen," "Germane," and "Iron Pentacarbonyl," we are revising the references in column (8b) to specify packaging authorization sections consistent with the materials' toxic properties. Commenters did not specifically address this proposal.

#### Part 173

##### Section 173.34

We are adopting the changes proposed in the NPRM and supported by most commenters to move the provisions in this section to Subpart I of Part 107, § 173.301, and Subpart B of Part 180, as appropriate, and remove § 173.34. We are removing all references to § 173.34 in the HMR, and replacing them with the appropriate new section references.

##### Section 173.40

We are adopting the proposed change to paragraph (a) of this section to prohibit the use of DOT 3AL cylinders made of aluminum alloy 6351-T6 for Hazard Zone A materials. The major domestic cylinder manufacturers of DOT 3AL cylinders discontinued using aluminum alloy 6351-T6 in specification cylinders before July 1990. The prohibition on the use of cylinders made of aluminum alloy 6351-T6 for Hazard Zone A materials is effective on October 1, 2002. After that date, cylinders made of aluminum alloy 6351-T6 may not be filled and offered for transportation in toxic inhalation hazard service. In this final rule, we are adding a provision to permit cylinders filled before October 1, 2002, to be offered for transportation and transported to their ultimate destinations until April 1, 2003. When necessary, cylinders containing unused gas may be returned to the filler. Cylinders prohibited for use under this provision are seamless aluminum cylinders marked "DOT 3AL", including exemption cylinders authorized under exemption numbers DOT-E 6498, 7042, 8107, 8364, and 8422, and composite cylinders authorized under exemption numbers DOT-E 7235, 8023, and 8115.

Several commenters requested we add a table in the HMR to identify all cylinders made of aluminum alloy 6351-T6 by date of manufacture, serial number, manufacturer, etc. We agree that a need exists to identify all affected cylinders. We are making this information available from the Associate Administrator and at our web site Homepage at "[hazmat.dot.gov](http://hazmat.dot.gov)". Making the information available as a separate document permits greater flexibility in de-listing cylinders removed from hazardous material service.

We are adopting paragraph (b) to include current requirements for outage and pressure in cylinders used for toxic materials. This paragraph was inadvertently omitted from the NPRM.

We are not adopting proposed paragraph (c)(1) to require cylinders containing Hazard Zone A and B materials to meet puncture resistance criteria. A number of commenters opposed the puncture-resistance requirement for Zone B materials. These commenters said that Zone B materials have an excellent safety record in transportation, and that the proposed requirements would pose a significant and unjustified financial burden for transporters of Hazard Zone B materials. Several commenters opposed the proposal to add a puncture-resistance

requirement even for Hazard Zone A materials. One commenter noted the NPRM did not include statistics on the incidence of cylinder punctures. Other commenters stated that DOT specification cylinders such as the 3A and 3AA have had excellent safety records for a number of years, and there is no substantial evidence to support the need for puncture-resistance testing. Based on these comments, we are not adopting the proposed puncture-resistance requirements. However, minimum thickness requirements for cylinders used to transport Hazard Zone A or B material remain in effect. Further, this final rule includes a new performance requirement, applicable to all cylinders, for metal attachments to be constructed or protected so as to prevent the likelihood of puncturing or damaging hazardous materials packages transported in the same transport conveyance.

In the NPRM, we sought comments on whether the current Hazard Zone A closure requirements in paragraph (c) should be extended to Hazard Zone B materials. Several commenters opposed such an extension. They said that the change is excessive and unjustified, and would require changing the valving on many cylinders used to transport Hazard Zone B materials. Based on these comments, we are not adopting the Hazard Zone A closure requirements for Hazard Zone B materials in this final rule.

We are adopting new paragraph (d) to specify cylinder valve protection requirements for Hazard Zone A and B materials. None of the commenters opposed extending the valve protection requirements to Hazard Zone B materials. Indeed, one commenter stated its company is currently shipping both Hazard Zone A and B materials in cylinders conforming to the current valve protection drop test requirement for Hazard Zone A materials. In this final rule, we are revising the valve protection requirements to require that when a protective cap is used, it must be made of metal. This change responds to a commenter who pointed out that current § 173.301(h)(2)(i) provides for equipping a cylinder with a securely attached metal cap. The commenter stated that nonmetallic caps should not be permitted under § 173.40. We agree, and have included the change.

Several commenters suggested the protection device should be designed to protect against leakage in the event of valve deformation rather than to prevent deformation or breakage of the valve. We disagree. A deformed or broken valve presents a potential safety hazard that could affect the integrity of the

cylinder. One commenter asked for a better definition of the term "deformation." In this context, "deformation" means a valve that is bent, distorted, mangled, misshapen, twisted, warped, or in a similar condition. We have added a definition of "deformation" in this final rule.

A commenter asked us to revise the drop height requirement from 2 meters (6.5 feet) to 1.2 meters (4 feet) for consistency with ISO Standard 11117 (Gas Cylinders—Valve Protection Caps and Valve Guards for Industrial and Medical Gas Cylinders—Design, Construction, and Tests). We disagree. Because these cylinders are used to transport Division 2.3 materials in Hazard Zone A or B, they must be able to survive severe handling and abuse without leakage of contents. Therefore, a more stringent drop test requirement is warranted. Further, the ISO Standard 11117 drop test requires the cylinder to be filled with water, while the drop test adopted in this final rule requires the cylinder to be empty. Since the tests are conducted under different conditions, the drop heights must be different to assure meaningful test results.

We are adopting paragraph (e), which restates the current prohibition against manifolding or interconnecting cylinders containing toxic materials.

#### *Section 173.115*

As proposed in the NPRM, this section permits LC50 values for mixtures to be determined using CGA pamphlet P-20 and adds a definition for "refrigerant or dispensant gas."

#### *Section 173.163*

A number of commenters opposed the proposal in the NPRM to require cylinders used for hydrogen fluoride to be requalified by ultrasonic examination only. They said that there is no safety justification for the proposal, and it will significantly increase costs for the regulated industry. Commenters noted that ultrasonic examination requires sophisticated equipment and highly trained personnel. They expressed concern that retest facilities do not have infrastructure in place to accommodate the proposed examination procedures. Because of commenter concerns, we are not adopting the ultrasonic examination proposal in this final rule. We are retaining the current requirement for an external visual inspection in place of the hydrostatic test and internal visual inspection. We will continue to permit the use of ultrasonic examination under the exemption program. Issues related to ultrasonic testing will be addressed in a subsequent rulemaking.

#### *Section 173.192*

We are revising the section title to reflect that the requirements in this section apply only to Hazard Zone A gases, as proposed. In addition, we are extending the current restriction in § 173.192(a)(3), which limits transportation of DOT 3AL cylinders in arsine and phosphine service to highway and rail, to include all Hazard Zone A gases. Thus, Hazard Zone A gases in 3AL cylinders may only be transported by highway or rail. CGA and another commenter requested that we authorize transportation of DOT 3AL cylinders by vessel and by cargo aircraft. CGA stated that prohibiting such transportation places U.S. companies at an economic disadvantage in the world market. We have some reservations about the CGA comment. Aluminum undergoes a marked reduction in tensile strength when subjected to high temperatures. This occurs at much lower temperatures than for steel cylinders. The potential consequences of a fire on board a vessel or aircraft are more serious than a fire occurring on a truck or rail car. The release of toxic vapors in the confined space of a vessel hold or cargo aircraft compartment could have significant adverse consequences. However, on August 30, 2001, we issued an exemption (DOT-E-12339) that permits the transportation by cargo vessel of DOT 3AL cylinders (6061 aluminum alloy) containing various Division 2.1 and 2.3 gases. The cylinders must be contained inside steel freight containers. We will evaluate the safety record of cylinders transported on cargo vessels under this exemption, and consider incorporating its terms into a regulation of general applicability in a future rulemaking.

Also, we are revising paragraph (c), as proposed, to permit the use of alternative leakage tests having equivalent levels of sensitivity as the current water bath leakage test, upon written approval from the Associate Administrator. Currently, paragraph (c) requires a cylinder containing any amount of phosgene gas to be subjected to a water bath leakage test before it is offered for transportation. CGA noted that the water bath test is conducted at 150° F, and the normal filling densities and liquid full conditions for phosgene cylinders are based on 130° F. For this reason, CGA suggested that we should add a precautionary statement to warn persons that a cylinder filled to 125% of capacity could experience an overfill condition when it is heated to 150° F. Alternatively, CGA suggested the water bath test should be conducted at 130° F. We disagree. The water bath

requirements for phosgene cylinders are long-standing regulatory requirements. However, to accommodate CGA's concerns, we are adding a precautionary safety statement to alert requalifiers.

#### *Section 173.198*

We are making a minor editorial change to paragraph (a).

#### *Section 173.226*

Currently, Division 6.1, Hazard Zone A materials may be shipped in any DOT specification cylinder, except DOT 8, 8AL, and 39. The NPRM proposed a revision to paragraph (a) to permit materials that are poisonous by inhalation (PIH materials) in Hazard Zone A to be transported only in seamless specification cylinders conforming to the requirements of § 173.40. A commenter requested that we continue to permit the use of welded cylinders for PIH materials. We disagree. Because of the inherent risk involved in the transportation of PIH materials, they should only be permitted in cylinders providing the highest level of safety. Therefore, this final rule adopts the change as proposed in the NPRM. This change also provides consistency in packaging assignments with current § 173.192, which authorizes only seamless specification cylinders for Packing Group I materials.

#### *Section 173.227*

We are adopting the proposal in the NPRM to revise paragraph (a). The revision authorizes only seamless and welded specification cylinders conforming to the requirements in § 173.40 for transportation of PIH materials in Hazard Zone B.

#### *Section 173.228*

As proposed in the NPRM, we are revising paragraph (a) to require bromine pentafluoride and bromine trifluoride, which are Hazard Zone A materials, to be transported only in seamless specification cylinders that conform to the requirements in § 173.40.

#### *Sections 173.300a–173.300c*

We are moving the provisions contained in these sections to new Subpart I of Part 107. We are deleting §§ 173.300a, 173.300b, and 173.300c.

#### *Sections 173.301–173.301b*

We are revising § 173.301 to specify the general shipper requirements for the use of specification cylinders. These requirements include general refill requirements, maintenance and legibility of markings, pressure relief devices (PRDs), valve protection, manifolding of cylinders, and charging

of foreign cylinders. We are removing the cargo tank manifolding requirements currently in § 173.301(d), and placing them with other cargo tank requirements in § 173.315. A derivation table showing the relocation of the requirements appeared in Part X of the preamble in the NPRM.

Paragraph (a) includes general cylinder qualification requirements. We are revising the wording in paragraph (a)(2) in response to several commenters who stated the proposed wording implied that defective PRDs could be repaired. This was not our intent. The wording is revised to state that, in some cases, the *cylinder* may be repaired and requalified if the work is performed according to Part 180.

In the NPRM, we proposed to place in paragraph (a)(4) a current provision authorizing the use of a cylinder with a higher marked pressure limit when a cylinder of the same specification, but a lower marked pressure limit, is prescribed. We proposed no change to the wording. A commenter suggested that, when a cylinder with a higher marked pressure limit is used for Division 2.2 gases, the PRD setting should be based on the lowest acceptable test pressure of the cylinder for the particular gas service. We disagree. This is a long-standing regulatory requirement with a demonstrated safety benefit. If a higher pressure cylinder is chosen for a particular service, another user may not be aware the PRD setting has been lowered. If the cylinder were overheated or over-pressurized, a premature release of product could result.

We are making a minor editorial change in the second sentence of paragraph (a)(5). The sentence in the NPRM stated "This requirement does not apply to a cylinder filled before the requalification due date". In response to a comment, the sentence is revised for clarification to read "This *prohibition* does not apply \* \* \*" Another commenter suggested the first sentence should be revised to read "No person may fill a cylinder overdue for periodic requalification with a hazardous material." We disagree. HMR requirements for filling a cylinder do not apply unless the cylinder is offered for transportation.

We are revising paragraph (a)(6), as proposed, to prohibit the offering for transportation and transportation in commerce of a filled cylinder after its specified service life has expired. For example, DOT 3HT cylinders would be prohibited from transportation 24 years after the date of the original test or 4,380 pressurizations, whichever occurs first (see current § 173.34(e)(15)(ii)(C)).

Similarly, aluminum lined, hoop wrapped, and fiber reinforced plastic composite cylinders would be prohibited from transportation after 15 years. Several commenters requested a revision to allow the transportation of affected non-leaking cylinders for reprocessing or disposing of the cylinder contents. Another commenter requested we require the cylinders to be stamped as condemned or be rendered unserviceable when the authorized service life has expired. We agree, and have adopted the suggested changes in this final rule.

We are revising the wording in proposed paragraph (a)(7) to prohibit the pressure of the hazardous material at 55° C (131° F) from exceeding 5/4 of the service pressure of the cylinder. Commenters pointed out the "5/4" was omitted from the text in the NPRM. This was an oversight. We have corrected the text in this final rule.

Paragraph (b) sets forth requirements for cylinder markings and is adopted as proposed in the NPRM.

Paragraph (c) specifies requirements for toxic gases and mixtures and is adopted as proposed in the NPRM.

Paragraph (d) addresses gases capable of combining chemically. In this final rule, we are prohibiting the use of DOT 3AL cylinders made of aluminum alloy 6351-T6 for gases having pyrophoric properties. Commenters requested we allow time for transporting the affected cylinders for reprocessing or disposal of the cylinder's contents. We agree time should be provided for transporting the cylinders. We are providing a transition period of six months after the effective date of the final rule to provide for transportation of cylinders filled before the effective date of the final rule.

As proposed in the NPRM, we are adopting paragraph (e). This paragraph restates the current requirement to prohibit a cylinder from being offered for transportation unless it was filled by the cylinder owner or with the owner's consent.

Paragraph (f) sets forth requirements for PRDs. The NPRM restated the current provision in § 173.34(d) to require a cylinder filled with gas and transported in commerce to be equipped with one or more PRDs sized and selected in accordance with CGA Pamphlets S-1.1 and S-7. Compliance with paragraph 9.1.1.1 of CGA Pamphlet S-1.1, which requires periodic replacement of a PRD, is not required. Several commenters objected to this provision, stating compliance with paragraph 9.1.1.1 should be mandatory. These commenters cited data generated by Transport Canada and industry tests that suggest a large percentage of PRDs

fail to operate as designed. As we stated in the 1998 NPRM (63 FR 58465), we have previously proposed voluntary compliance with paragraph 9.1.1.1 of CGA Pamphlet S-1.1. Commenters generally opposed this proposal, citing its cost and the lack of incident data justifying the requirement. In the NPRM, we asked for data and comments on the cost, effectiveness, and need for adopting paragraph 9.1.1.1. Commenters did not provide specific information. Therefore, we are not adopting paragraph 9.1.1.1 at this time. However, we will examine this issue in a future rulemaking, as necessary.

We are revising the wording in proposed paragraph (f)(2) that would have required a PRD, when installed, to be in the vapor space of the cylinder. Several commenters objected to requiring the PRD to be in the vapor space of a cylinder containing liquefied Division 2.2 gases. They stated the proposal would require valve redesign at substantial costs and would be ineffective in tube trailers and other cylinders loaded in horizontal positions. The commenters suggested we revise the provision to require the PRD to be "in communication with the vapor space." We agree. The paragraph is revised to require the inlet port to the relief channel to be in the vapor space of the cylinder.

We also are revising the wording of proposed paragraph (f)(3) that would have required the pressure relief setting (the start-to-discharge or ruptured pressure) of a PRD for DOT-3 series cylinders to be not less than the minimum designed test pressure. In the NPRM, the proposed allowable tolerances for these PRDs were minus zero to plus 10%. Many commenters were concerned about the cost of producing PRDs with tolerances of minus zero to plus 10%. They stated that the proposed amendment would necessitate retrofitting many cylinders with new PRDs. Several commenters reiterated that CGA Pamphlet S-1.1 stipulates a maximum burst pressure for a disk as minus 10% to zero of test pressure. They stated that we provided no justification for requiring a cylinder pressure greater than the cylinder's specified test pressure. They also suggested that, in some situations, a shipper may want a cylinder to be fitted with a PRD that will function at a pressure much lower than the test pressure of the cylinder.

Considering the comments received, we believe a setting of 100% of test pressure, with an allowable tolerance of minus 10% to plus zero of its setting for a PRD, is appropriate. This will provide a reasonable balance between keeping a

gas in a cylinder and preventing the cylinder from rupturing in case of a fire or overfill. PRDs designed to release at not less than test pressure, within the allowable tolerance, will eliminate the possibility of gas release through the relief device at a temperature less than or equal to 54° C (130° F). At the same conditions and test pressure, the safety factor for cylinder rupture is 1.6. It is our understanding, based on discussions with gas distributors, that many major gas distributors using DOT-3 series cylinders are currently setting the PRDs at 90–100% of test pressure for toxic and flammable gases. Because it is common practice for many shippers of DOT-3 series cylinders to replace the PRD at the time of a cylinder's requalification, we believe this final rule will result in minimal incremental cost. Further, for most gases, the increased PRD setting will not significantly affect the performance of cylinders in bonfire tests. To allow users sufficient time to modify cylinders to meet the new PRD settings, we are providing that each cylinder must be brought into conformance at the first requalification of the cylinder after the effective date of this final rule.

We are not adopting the change in proposed paragraph (f)(4) that would have required a PRD to be visually inspected for damage before filling the cylinder. We agree with commenters who stated that a visual inspection of the PRD will not detect defects associated with internal components and their ability to function. Neither are we adopting proposed paragraph (f)(5) that would have required a cylinder filling facility to test a PRD for leaks before offering a filled cylinder for transportation. Rather, we are adding a new subparagraph to paragraph (a) to include the long-standing regulatory requirement, currently in § 173.34(d), that safety relief devices must be tested for leaks before the filled cylinder is transported. We are also adding language pertaining to repair of leaking fuse plug devices, also currently in § 173.34(d), that was inadvertently omitted in the NPRM. In addition, several commenters suggested revising the wording to prohibit a cylinder with a leaking PRD from being offered for transportation. We agree with the commenters. We have included a restriction on leaking PRDs in paragraph (a)(2) of this final rule.

We are correcting the wording that appeared in proposed paragraph (f)(6)(i)(B), adopted as paragraph (f)(5)(i)(B) in this final rule, to state that a PRD is not required on a cylinder of 305 mm (12 inches) or less in length and 114 mm (4.5 inches) or less in outside

diameter. However, if the cylinder is filled with a nonliquefied gas to a pressure of 1800 psig or higher, then it must have a PRD.

Paragraph (g) specifies requirements for manifolded cylinders in transportation. We are revising the wording in proposed paragraph (g)(1) that would have required the PRD on manifolded cylinders containing any compressed gas to be arranged to discharge upward and unobstructed to the open air. Our intent for expanding the original requirement in the HMR from flammable gases to all compressed gases was to protect personnel and adjacent cylinders from gases released due to a PRD function. Upon further consideration, we agree with commenters that the need for PRDs to discharge upward is more crucial for horizontal cylinders containing flammable gases. Discharges of flammable gases could result in flame impingement on personnel or adjacent cylinders. We agree the requirement is not necessary on cylinders containing nonflammable gases or on vertical cylinders. We revised the final rule to reflect these changes.

Commenters were also concerned with the wording in proposed paragraph (g)(1)—“equivalent valve protection required in § 173.301(h).” These comments said that the wording implies that manifolded cylinders must be drop tested in the manifolded configuration. This was not our intent. Therefore, we are revising the wording to specify that valves and PRDs must be protected by framing, a cabinet, or other method.

Paragraph (h) contains cylinder valve protection requirements. The requirements adopted in this final rule prescribe a performance-oriented approach to valve assembly protection. The requirements include a drop test to verify the performance of valve protection devices. In response to commenters, we are revising paragraph (h)(1) to grant an exception from the valve assembly protection requirements for cylinders used as fire extinguishers, acetylene MC cylinders, and Medical E styles with a water capacity of 300 in<sup>3</sup> or less.

Several commenters also suggested that the drop test should be performed at 2 m (6.5 ft) instead of 1.8 m (6 ft) for consistency with the 2 m (6.5 ft) puncture resistance requirement in § 173.40. We disagree. We are prescribing a 6-foot drop test for consistency with performance requirements adopted for cylinders by the UN Committee of Experts on the Transport of Dangerous Goods. The final rule provides a transition period of five years, until October 1, 2007, for

cylinders to be brought into conformance with this requirement. In this final rule, we are revising the language proposed in the NPRM to clarify that cylinders manufactured before October 1, 2007, must conform to current valve protection requirements.

The Chlorine Institute stated that tracking protective valve hoods to make sure they are used on the type of cylinder on which they were tested is unrealistic. The Chlorine Institute said hoods are frequently interchanged with others on cylinders in the same type of service and suggested that a valve hood that has been tested on at least one cylinder specified for a particular gas should be accepted for use with the manufacturer's other cylinders in the same or lower net weight service. We recognize that protective caps and hoods may be interchanged among cylinders. However, we are concerned that different protective hoods may not provide the same level of protection. If cylinder hoods and caps are interchanged among different cylinders, each must provide an equivalent level of safety to the performance standard specified in this final rule.

Paragraph (i) addresses cylinders mounted on motor vehicles or in frames. In the NPRM, we proposed revisions to clarify the following points: (1) Any DOT specification cylinder over 6.5 meters transported in container-on-flat-car (COFC) or trailer-on-flat-car (TOFC) service *by rail* must be transported under conditions approved by the FRA; (2) the force the valve and PRD must withstand is equal to twice the weight of the cylinder and the framework assembly; and (3) a discharge of any compressed gas from the PRD must not contact personnel or adjacent cylinders. CGA requested we revise paragraph (i) to: (1) Provide examples of protective structure, such as rear bumpers, frame rails, and bulkheads; (2) add a detailed description of the forces involved in a road accident (static compressive longitudinal force, parallel to the ground, equal to twice the weight of the loaded tube trailer); and (3) add language describing the latest technology in front safety design for tube trailers. CGA stated that an in-tube safety device has the burst disc inside the neck of the tube. Therefore, if a front end collision occurs, the safety device will not be sheared off, and product will not be discharged. The clarifications proposed in the NPRM in paragraph (i) primarily address service by rail. We agree with CGA that requirements for cylinders transported horizontally by road (DOT 3T and DOT 3AX and 3AAX cylinders configured as tube trailers) may need to be updated. However, that

issue is beyond the scope of this rulemaking. We will address this issue in a future rulemaking.

Paragraph (j) prohibits filled non-DOT specification cylinders, except for certain foreign cylinders, from being transported in the United States. Two commenters asked us to revise paragraph (j) to specifically permit transportation of non-specification cylinders used as fire extinguishers in accordance with § 173.309. We agree, and have revised paragraph (j) accordingly.

Paragraph (k) specifies requirements for transportation of foreign cylinders within a single port area. A commenter suggested we define a single port area as a distance of 360 miles from any port. That issue is beyond the scope of this rulemaking. The U.S. Coast Guard expressed concern that this proposal would impose a greater burden on cylinders intended to be filled in the United States and shipped for export only. The Coast Guard stated that the inflatable life raft servicing industry relies on this provision to transport foreign cylinders taken from foreign flag vessels to and from servicing industries. The provision referenced by the Coast Guard is adopted as paragraph (l) in this final rule, with no change from current requirements. Further, we issued an exemption on December 31, 2001, to authorize non-specification cylinders used in self-inflating life-saving appliances to be transported between a vessel and a USCG-approved servicing facility.

Another commenter opposed the proposal in the NPRM that foreign cylinders transported within a single port area must be transported in a closed freight container. This commenter stated that such foreign cylinders must be certified by the importer to provide an equivalent level of safety as DOT specification cylinders. For this reason, there is no need to require their transportation in a closed freight container. We disagree. The requirement is intended to reduce the possibility a foreign cylinder may inadvertently be included in a load of DOT-authorized cylinders. The European Industrial Gases Association urged us to allow the use in the United States of cylinders of foreign origin that have been approved for use in Europe by the European Conference of Ministers of Transport. This issue is beyond the scope of this rulemaking. However, we may consider it in a future action.

As proposed in the NPRM, we are adopting paragraph (l), which restates the current requirements for filling foreign cylinders for export.

Paragraph (m) proposed to prohibit the use of metal cylinder attachments with sharp features that may cause damage to other packages. This proposal responds to NTSB Recommendation I-92-001, which urges RSPA to require attachments to DOT hazardous materials packagings to be designed to minimize the risk of puncturing other hazardous materials packagings. Several commenters expressed confusion as to the meaning of the term "sharp" as used in the NPRM. They stated that the term is vague and not based on any objective measure. They also said that it is impossible to guarantee that any corner, edge, or other feature cannot cause damage to other freight. Commenters were also concerned that variations on how other freight is packaged, the other freight's susceptibility to impact damage, the vehicle speed, and the vehicle acceleration and deceleration speeds make it impossible to evaluate a cylinder attachment's performance in transportation. We agree it may not be possible to prevent a corner, edge, or other feature of a cylinder attachment from damaging other freight in an accident. However, we believe attachments can be designed to minimize potential damage. In response to comments, the provision in this final rule is written as a performance standard.

#### *Section 173.301a*

We are adopting, as proposed, this new section containing the current requirements for the pressure in a cylinder at 70° F and 130° F and a grandfather provision currently in § 173.34(b).

#### *Section 173.302*

We are adopting this section containing general requirements for filling specification cylinders with a nonliquefied (permanent) compressed gas. Paragraph (a) sets forth general requirements for transporting a cylinder filled with a nonliquefied compressed gas. It is adopted as proposed in the NPRM.

Paragraph (b) specifies requirements for aluminum cylinders in oxygen service. We are revising proposed paragraph (b)(1) to require an aluminum cylinder in oxygen service to be equipped with brass or stainless steel valves only. A commenter noted the valves on many medical oxygen cylinders are chrome-plated in areas that do not come into contact with the oxygen. Our intent is to prevent oxygen from coming into contact with an aluminum valve having internal rubbing or abrading aluminum parts. Therefore, we are revising proposed paragraph

(b)(1) to require any portion of the valve that contacts the oxygen in the cylinder to be made of brass or stainless steel.

Several commenters pointed out that proposed paragraph (b)(3) cites former Federal specification RR-C-901b and not the current RR-C-901C. The paragraph cites are corrected in this final rule.

Paragraph (c) addresses cylinders containing oxygen that is continuously fed to fish tanks. It is adopted as proposed in the NPRM.

Paragraph (d) permits shipment of Division 2.1 materials in aluminum cylinders only when transported by highway, rail, or cargo-only aircraft. A commenter requested we revise paragraph (d) to authorize the transportation of specification aluminum cylinders containing Division 2.1 gases by vessel. As stated above in the preamble discussion for § 173.192, we will evaluate the safety record of cylinders transported on cargo vessels under an exemption issued on August 30, 2001. We will consider incorporating the terms of this exemption into a regulation of general applicability if the safety record indicates that such incorporation is appropriate.

Another commenter suggested there is no scientific rationale for limiting the transportation of Division 2.1 materials in aluminum cylinders to cargo-only aircraft. As we have previously explained, a cylinder must be able to withstand fire without rupture for at least 90 minutes to enable an aircraft to reach the nearest airport and land safely in the event of an emergency. Heat exposure such as a pressurized aluminum cylinder would experience in a fire would cause the cylinder to burst well before 90 minutes had elapsed and possibly disable the aircraft.

#### *Section 173.302a*

In this final rule, we are adopting this new section specifying requirements for filling a cylinder with a nonliquefied compressed gas.

Paragraph (a) sets forth detailed filling requirements. A commenter requested we revise the filling requirement applicable to flammable gases in DOT 39 cylinders. Current § 173.302(a)(4) says that, for DOT 39 cylinders used to transport flammable gas, the "internal volume may not exceed 75 cubic inches." The commenter suggested that, as currently written, it is not clear whether the term "internal volume" refers to the amount of gas permitted in the cylinder or the total capacity of the cylinder. We agree. The volume limitation is intended to apply to a cylinder's internal volume. In this final

rule, we revised paragraph (a)(3) to clarify that the restriction applies to a cylinder's internal volume.

Paragraph (b) specifies special filling limits for DOT 3A, 3AX, 3AA, 3AAX, and 3T cylinders. We are adopting paragraph (b)(3)(iv), as proposed, to provide for a cylinder's average wall stress calculation to be determined through computation of the rejection elastic expansion limit (REE) in accordance with CGA Pamphlet C-5, or through the use of the manufacturer's marked REE on the cylinder. A commenter requested that we also allow the use of the standard calculated values listed in CGA Pamphlet C-5 or the use of a previously determined REE marked on the cylinder. It was not our intent to prevent use of standard calculated values listed in CGA Pamphlet C-5. In this final rule, we revised the wording to authorize the use of these values. However, we are not authorizing the use of an REE marking applied to the cylinder by a person other than the manufacturer because it may be inaccurate.

Paragraph (c) prescribes requirements for carbon monoxide. In response to a CGA petition (P-1082), we are removing the 5/6 filling pressure limitation for DOT 3AL cylinders in carbon monoxide service. CGA furnished information to support its conclusion that, although evidence shows carbon monoxide can cause stress corrosion cracking in steel cylinders, there is no evidence carbon monoxide causes corrosion cracking or carbonyl formation in aluminum cylinders. We agree with CGA, and are permitting a DOT 3AL cylinder to be filled to its marked service pressure when used for carbon monoxide. We also modified the paragraph to indicate that the 5/6 pressure limitation applies to steel cylinders.

Paragraph (d) sets forth requirements for diborane and diborane mixtures. It is adopted as proposed in the NPRM.

#### *Section 173.304*

This section specifies filling requirements for cylinders used to transport liquefied compressed gas. With minor editorial revisions, it is revised as proposed in the NPRM.

#### *Section 173.304a*

This new section, proposed in the NPRM, addresses additional requirements for transporting liquefied compressed gases in specification cylinders. Paragraph (a) specifies detailed filling requirements for a number of gases, including a table of maximum filling densities. As requested by commenters, this section is revised in the final rule to add DOT 3AL

cylinders to the authorized list of cylinders. We inadvertently omitted the DOT 3AL reference from the NPRM.

In paragraph (a)(3), the NPRM proposed extending the provision limiting cylinder volume to 75 cubic inches, which currently applies to liquefied petroleum gas and Division 2.1 materials listed in the § 173.304 table, to all Division 2.1 materials. One commenter suggested this proposal would have a negative impact on companies using DOT 39 cylinders larger than 75 cubic inches in aerosol applications. We plan to address issues related to requirements for all cylinders used in aerosol applications in a future rulemaking. This rulemaking will harmonize, to the extent possible, the U.S. cylinder regulations with international regulations recently adopted by the UN Committee of Experts on the Transport of Dangerous Goods. Therefore, in this final rule, we are not adopting paragraph (a)(3) as proposed. We will address filling limits for liquefied compresses gases and Division 2.1 materials in a future rulemaking.

Paragraph (b) is reserved.

Paragraph (c) establishes requirements for verifying a cylinder's contents and is adopted as proposed in the NPRM.

Paragraph (d) specifies filling requirements for liquefied petroleum gas and is adopted as proposed in the NPRM. One commenter requested a change to the filling densities. The request is beyond the scope of this rulemaking. It will be considered under a separate rulemaking.

Paragraph (e) sets forth requirements for carbon dioxide, refrigerated liquid, and nitrous oxide, refrigerated liquid. It is adopted as proposed in the NPRM.

#### *Section 173.305*

This section is revised as proposed in the NPRM to add a reference to § 173.301 to paragraph (b).

#### *Section 173.306*

This section is revised as proposed in the NPRM to change the reference for overpack requirements.

#### *Section 173.315*

Consistent with the NPRM, this final rule adds paragraph (q) to this section. Paragraph (q) specifies conditions under which cargo tanks containing anhydrous ammonia may be manifolded.

#### *Section 173.334*

This section establishes requirements for organic phosphates mixed with compressed gas. In this final rule, this section is amended as proposed, except

we are not adopting the proposed metric-marked cylinder provisions.

#### *Section 173.336*

This section sets forth requirements for nitrogen dioxide, liquefied, and dinitrogen tetroxide, liquefied and is amended, as proposed, except we are not adopting the proposed metric-marked cylinder provisions. We are correcting the referenced Federal Specification RR-C-901C paragraph cites.

#### *Section 173.337*

This section prescribes requirements for nitric oxide and is amended, as proposed, except we are not adopting the proposed metric-marked cylinder provisions. We are correcting the referenced Federal Specification RR-C-901C paragraph cites and adding a reference to § 173.40 in the introductory paragraph that was inadvertently omitted in the NPRM.

#### *Part 177*

#### *Section 177.840*

We are revising current paragraph (a)(1) to allow horizontal loading of cylinders containing Class 2 materials if the cylinders are designed so the inlet to the PRD is located in the vapor space. The cylinders must be properly secured during transportation.

We had proposed to require the use of cylinder restraint systems to reduce the likelihood of cylinders being ejected from a vehicle in the case of an accident. We issued this proposal in response to NTSB Recommendation I-90-008, which urges RSPA to require hazardous materials packages to be secured with adequate cargo restraint systems to prevent their ejection from the vehicle during transportation.

Considering the wide variation in cylinder sizes, and the various types of restraints that would be required, we solicited information in the NPRM on the NTSB recommendation. We asked commenters to address anticipated safety benefits and the costs of requiring the use of restraint systems, particularly on small businesses. Numerous commenters objected to the proposed amendment. They stated it is common practice to secure carbon dioxide and other Division 2.2 gases in horizontal positions. NPGA requested that we allow Class 2 gases to be loaded in a horizontal position if the cylinder is designed so the inlet to the PRD is located in the vapor space. We agree with NPGA that the inlet port must be in the vapor space.

Several commenters also objected to our usage of the word "lash." This term appears in the current regulations, and

we have received no previous requests for a revision. The commenters stated that lashing should be considered an appropriate means of securing cylinders, but should not be made a prescriptive requirement. One commenter asked us to remove the wording "and securely attached to motor vehicle." The commenter stated that thousands of low-pressure cylinders containing nonliquefied gases are shipped on stretch-wrapped pallets. The commenter said requiring such pallets to be securely attached to a motor vehicle would be overly burdensome, costly to the regulated industry and consumers, and would provide no added safety benefits.

We reviewed the HM-220 comments and considered the wide range of packaging configurations and sizes that may be loaded on a vehicle. We find it neither practicable nor cost-beneficial to require carriers to secure each hazardous material package on a vehicle in a manner that will withstand every conceivable accident or overturn situation. The current regulations require hazardous materials packages containing Class 2 (gases), Class 3 (flammable liquid), Division 6.1 (toxic), Class 7 (radioactive), or Class 8 (corrosive) materials to be secured against movement within the vehicle under conditions normally incident to transportation. We believe this standard provides an acceptable level of safety. However, we recognize the requirement should be broadened to include all hazardous materials packages rather than limited to hazardous materials of certain hazard classes. We will propose these changes in a future rulemaking.

#### Part 178

##### Section 178.35

This section establishes general requirements for cylinders. We are revising paragraph (c)(3)(iv) to reference a new Appendix C, which provides illustrations of recommended locations for selecting test specimens from welded cylinders. In the NPRM, we proposed the use of Appendix C for metric-marked welded cylinders. Although commenters opposed adoption of the metric-marked cylinder proposals, they requested that we include the appendix as guidance of use with non-metric-marked cylinders.

We are revising paragraph (d) of this section to set forth requirements, established elsewhere in this final rule, applicable to specification cylinders. A cylinder may not be constructed of material having seams, cracks or laminations or other defects, and metal attachments must be constructed to

prevent the possibility of puncturing or damaging other hazardous materials packages.

We are revising paragraph (f), as proposed in the NPRM, to except DOT 3E cylinders from the requirement to be marked with an inspector's mark or serial number.

##### Section 178.45

We are revising paragraph (h) to update an old incorporation by reference.

##### Section 178.46

This section prescribes requirements for DOT 3AL seamless cylinders. This final rule revises the tables in paragraph (b)(4) to remove aluminum alloy 6351-T6 as an authorized material for the manufacture of DOT 3AL seamless cylinders. In addition, in Table 1, this final rule makes several changes to the chemical composition limits for 6061 alloy for consistency with limits stated in *The Aluminum Association Standards and Data*, 1993 edition. The currently stated silicon (Si) maximum of 0.80% is revised to read 0.8%, the currently stated iron (Fe) maximum of 0.70% is revised to read 0.7%, the currently stated magnesium (Mg) minimum of 0.80% is revised to read 0.8%, and the currently stated Mg maximum of 1.20% is revised to read 1.2%. Finally, the currently stated Table 1 limit of 0.01 for the chemical composition of lead (Pb) and bismuth (Bi) is changed to 0.005.

##### Appendix to Subpart C of Part 178

We are adopting an appendix containing illustrations of the recommended locations for taking test specimens for specific welded cylinder designs.

#### Part 180

##### Part 180, Subpart C

We are adopting a new subpart to specify requirements for the continuing qualification, maintenance, repair, and rebuilding of DOT specification and exemption cylinders. Most of the requirements are currently contained in §§ 173.34 and 173.301.

##### Section 180.201

This section lists the entities to which Subpart C applies and is adopted as proposed in the NPRM.

##### Section 180.203

This section contains definitions for terms used throughout Subpart C.

We are adopting the definition of "commercially free of corrosive components" as proposed in the NPRM. CGA and several other commenters

requested we revise the wording to read "a hazardous material having a *moisture pressure* dew point at or below \* \* \*". They stated the change would recognize water as the contaminant at service pressure. NPGA stated propane has a dew point of  $-42.2^{\circ}\text{C}$  ( $-44^{\circ}\text{F}$ ). NPGA noted that ASTM D-1835 "Standard Specification for Liquefied Petroleum (LP) Gases" incorporates provisions to control moisture content and the level of corrosive sulfur compounds in propane. NPGA urged us to adopt the moisture content criteria contained in the ASTM standard. We agree an exception from hydrostatic test requirements should be granted for cylinders used exclusively for the transportation of petroleum gas that is essentially free of moisture and corroding components. We are revising the table in § 180.209(g) accordingly.

We are adopting the definitions of "condemn," "defect," and "elastic expansion," as proposed in the NPRM.

The NPRM proposed a definition for "filled." A commenter stated the words "charged" and "filled" are used interchangeably in Part 173 of the HMR and suggested we add the wording "(or charged)" following the word "filled." We agree; this final rule adopts a definition for "filled or charged."

We are adopting the definition of "non-corrosive service" as proposed in the NPRM, revised slightly for clarity.

We had proposed to define the term "over-heated" to mean a condition in which any part of a cylinder has been subjected to a temperature in excess of  $176^{\circ}\text{C}$  ( $350^{\circ}\text{F}$ ). Several commenters noted a temperature of  $176^{\circ}\text{C}$  ( $350^{\circ}\text{F}$ ) is conservatively low for steel. They requested we reference a temperature of  $176^{\circ}\text{C}$  ( $350^{\circ}\text{F}$ ) for aluminum and  $343^{\circ}\text{C}$  ( $650^{\circ}\text{F}$ ) for nickel or steel. We agree, and revised the definition accordingly in this final rule. In addition, we revised the definition to indicate that a cylinder is over-heated if the temperature of any portion of the cylinder reaches the specified temperatures. This change responds to the concerns expressed by firefighters discussed below under § 180.205.

We had proposed to define the term "over-pressurized" to mean a condition in which a cylinder has been subjected to an internal pressure in excess of 30% of its test pressure. This definition was intended to apply to the pressure to which a cylinder may be subjected during requalification testing, not to a cylinder's service pressure or to pressure during normal transportation operations. Since publication of the NPRM, we have determined that a single definition for "over-pressurized" that would apply to all cylinders is not

practicable. Pressure limits may vary depending on the design specification of the cylinder, its material of construction, and the material transported. Therefore, we are not adopting the proposed definition in this final rule. Persons who use cylinders to transport hazardous materials in commerce should be aware that a cylinder subjected to pressures beyond its design capability may be rendered unfit for continued service. Any person in possession of an over-pressurized cylinder must determine the cylinder's suitability for continued use prior to offering the cylinder for transportation in commerce.

We are adopting the definitions for "permanent expansion," "proof pressure test," "rebuild," "rejected cylinder," "repair," "requalification," "requalification identification number or RIN," "test pressure," "total expansion," "visual inspection," and "volumetric expansion test" as proposed in the NPRM.

#### Section 180.205

This section prescribes general requirements for the continuing qualification and use of cylinders and for persons who perform cylinder requalification functions. Paragraph (a) states that a cylinder must be an authorized packaging. Paragraph (b) sets forth requirements for persons performing requalification functions. We are adopting both as proposed in the NPRM.

In response to comments, we made several editorial revisions to paragraph (c). Several commenters requested we revise the paragraph to state a cylinder may be requalified at any time *prior to the date* requalification is due. They also suggested we reiterate the restriction against filling and offering a cylinder for transportation after its authorized service life has expired. We agree, and include the suggested changes in this final rule. Also, we are revising paragraph (c)(4) to require the set pressure of PRDs on DOT-3 series cylinders to be set at test pressure with a tolerance of plus zero to minus 10% at the first requalification due on or after October 1, 2002, as discussed in the preamble discussion to 173.301(f)(4).

Two commenters suggested we revise paragraph (d), which prescribes conditions requiring test and inspection of cylinders, to require the requalification of any DOT specification cylinder used for nonhazardous material service prior to its being returned to hazardous material service. This change is beyond the scope of this rulemaking and, therefore, is not adopted in this final rule. For the same reason, we are

not adopting a suggestion to require any cylinder removed from service to be marked with a notation that the cylinder has been removed from service.

We revised the proposed wording in paragraph (d)(3) that read "the cylinder has been over-heated or over-pressurized" to state, instead, that the cylinder "shows evidence of, or is known to have been" over-heated. We removed the reference to over-pressurized cylinders for the reasons noted above in the discussion concerning the definition for "over-pressurized." Any person in possession of an over-pressurized cylinder must determine the cylinder's suitability for continued use prior to offering the cylinder for transportation in commerce.

Paragraph (e) addresses cylinders containing Class 8 liquids. In this final rule, we modified the paragraph for consistency and clarity.

Paragraph (f) sets forth visual inspection requirements. A commenter suggested we revise the paragraph (f) introductory text to require an internal and an external visual inspection to be performed prior to the pressure test, and another internal inspection for contaminants and damaged threads after the pressure test. The commenter stated that performing the visual inspection prior to the pressure test will save time if the cylinder is unfit for pressure testing. The commenter stated that a cylinder that ruptures during the pressure test can damage equipment and property and may cause operational delays. We disagree. Some requalifiers have modernized their operations and perform hydrostatic tests on all cylinders, followed by visual inspections. We find no reason to limit the requalifiers' flexibility in deciding whether to perform the visual requalifications before or after the pressure test.

We are revising paragraph (f)(2) to require any coating or attachments that would inhibit inspection of the cylinder to be removed prior to performing a visual inspection. We had proposed to require any vinyl or plastic coating on a cylinder to be completely removed prior to performing a visual inspection. CGA suggested we revise the provision to apply only to cylinders with removable vinyl or plastic coatings. Other commenters suggested the removal of both internal and external vinyl or plastic coatings and, when necessary, layers of paint. A different commenter questioned whether wire wrapping should be removed prior to performing the inspection. In consideration of the comments, we are requiring the removal of any coating, attachment, or wrapping that hinders

proper inspection of the cylinder surface.

We had proposed in paragraph (f)(4) to require DOT 3AL cylinders to be inspected for evidence of sustained load cracking in the neck and shoulder areas in accordance with the cylinder manufacturer's written recommendation. The manufacturer's recommendation must be approved in writing by the Associate Administrator. A commenter suggested we clarify that the procedure applies only to cylinders made of aluminum alloy 6351-T6. We agree. In this final rule, we revised the provision to require the inspection only for DOT specification or exemption cylinders made of aluminum alloy 6351-T6.

We are not adopting the provision in paragraph (g) to require the pressure test to be conducted in accordance with the procedures in paragraphs 4 and 5 of CGA Pamphlet C-1. One commenter objected to incorporation of Pamphlet C-1. In addition, it is our understanding that CGA is in the process of completely revising the C-1 standard. In this final rule, we revised paragraph (g) to incorporate the requirements for pressure testing cylinders that are currently in § 173.34(e)(4). We will consider incorporating the revised C-1 standard in a future rulemaking.

We had proposed to provide for use of an ultrasonic examination as an alternative requalification method. We had also proposed to allow other nondestructive test methods with the approval of the Associate Administrator. As discussed in the above referenced HM-220 termination notice, we are not adopting these provisions. We will continue to permit the use of ultrasonic examinations and other nondestructive methods under the exemption program.

Paragraph (h) establishes criteria for rejecting cylinders. We are adopting the provision in paragraph (h)(1) prohibiting a rejected cylinder from being marked as meeting the requirements of this section. A commenter requested we revise the paragraph to recognize that CGA Pamphlet C-6.2 establishes levels of damage for fiber reinforced exemption cylinders, some of which is repairable. This issue is more appropriately addressed in the specific exemptions authorizing use of fiber reinforced cylinders. Provided it is permitted under the exemption, repairs of such cylinders in accordance with CGA Pamphlet C-6.2 are permitted. Paragraph (h)(4)(iii) of this final rule permits a cylinder with a service pressure of less than 900 psig to be repaired in accordance with an

exemption covering the manufacture, requalification, or use of the cylinder.

Paragraph (i) sets forth criteria for condemning cylinders. We had proposed in paragraph (i)(1)(viii) to require an aluminum or aluminum-lined cylinder to be condemned if exposed to a temperature exceeding 177° C (350° F). Numerous commenters representing fire fighters and emergency responder organizations strongly objected to the proposal. They stated it would require the removal of aluminum and composite exemption cylinders used as self-contained breathing apparatus (SCBAs) based on possible exposure to temperatures in excess of 350° F. These commenters noted that most SCBAs are exposed to temperatures exceeding 177° C (350° F) whenever they are carried into a fire. The commenters suggested that the NPRM proposal would require replacement of SCBAs after each fire exposure, resulting in substantial costs to the emergency response community.

Our intent was to require the removal from service of any aluminum cylinder or aluminum-lined composite exemption cylinder with reduced structural integrity resulting from the metal temperature of the aluminum cylinder or liner reaching a temperature above 350° F. Such cylinders may pose a safety risk. We did not intend to require the removal of undamaged cylinders from service. During typical firefighting operations, the metal temperature of an aluminum cylinder or liner does not reach temperatures above 350° F. We are revising the paragraph to require a cylinder to be condemned if over-heated. As defined in § 180.203 of this final rule, for an aluminum cylinder, "over-heated" means that the metal temperature of any part of the cylinder has reached a temperature in excess of 350° F.

#### Section 180.209

This section includes the requirements currently contained in § 173.34(e) for the periodic requalification of specification cylinders.

Paragraph (a) sets forth specific periodic requalification requirements for each specification cylinder. As discussed elsewhere in this preamble, we are not adopting the proposal to permit ultrasonic testing in place of a hydrostatic test. Ultrasonic testing will continue to be permitted under exemption.

Paragraph (b) establishes requalification requirements for DOT 3A and 3AA cylinders. We are revising the provision in paragraph (b)(1) to increase the requalification interval from five to

10 years for a DOT 3A and 3AA cylinder with a water capacity of 125 pounds or less that is used for certain named gases. A commenter stated numerous new refrigerants and blends are being marketed and requested we allow cylinders containing "fluorinated hydrocarbons, liquefied hydrocarbons, and mixtures thereof which are commercially free from corroding components" to be requalified every 10 years rather than every 5 years. The commenter also pointed out that we authorized these materials under DOT Exemptions 10184 and 12084. Several other commenters requested we add certain other gases to the list. We agree the listing in paragraph (b)(1)(ii) should be updated. In this final rule, we are revising this paragraph to accommodate commenters concerns.

Paragraph (c) sets forth requalification requirements for DOT 4-series cylinders, and is adopted as proposed in the NPRM.

Paragraph (d) prescribes requalification requirements for cylinders 12 pounds or less with service pressures of 300 psig or less, and is adopted as proposed in the NPRM.

Paragraph (e) includes requirements for proof pressure testing for certain DOT-4 series cylinders, and is adopted as proposed in the NPRM.

Paragraph (f) sets forth requalification requirements for cylinders used to transport poisonous materials, and is adopted as proposed in the NPRM.

We are revising paragraph (g) to clarify the interval for performance of a visual inspection, in place of a five-year periodic retest, for cylinders used exclusively for the listed non-corrosive gases.

Paragraph (h) sets forth requalification requirements for cylinders used to transport anhydrous ammonia, and is adopted as proposed in the NPRM.

Paragraph (i) sets forth requalification requirements for DOT-8 series cylinders, currently in § 173.34(e)(18). The provision requires the replacement valve to be the same weight as the valve to be replaced. If it is not, the cylinder's marked tare weight must be adjusted to compensate for the valve weight differential. The Chlorine Institute and two valve manufacturers requested we revise paragraph (i)(3) to allow a tolerance on the replacement valve weight to compensate for variations. The valve manufacturers suggested the tolerance should be a stated weight or a percentage of the weight of the valve being replaced. They recommended no specific weight or percentage. In the absence of a specific recommendation, we are adopting the provision as stated in the NPRM.

#### Section 180.211

This section prescribes repair, rebuild, and heat treatment requirements currently prescribed in §§ 173.34(g) thru 173.34(l), with certain revisions. We received no comments on these provisions and are adopting them as proposed with editorial revisions for clarity. We are not adopting the proposed requirements for metric-marked cylinders.

#### Section 180.213

This section consolidates the marking requirements currently contained in § 173.34, with certain revisions. These marking requirements identify the type of inspection, test, or work performed on a cylinder. Locating the marking requirements in a single section of the HMR will facilitate their use by shippers, carriers, and enforcement personnel.

We had proposed to allow the application of requalification markings by stamping, engraving, scribing, or any other method approved in writing by the Associate Administrator. NSWA and another commenter objected to the permissive use of electric or manual scribes as an alternative method. They stated markings made by a scribe are of poor quality, particularly over multiple coats of paint, and should not be permitted. Also, NSWA stated that, unless specifically approved for flammable atmospheres, electrical apparatuses may create a safety hazard when used to mark cylinders containing flammable gases or in plants where flammable gases may be present. The proposal was fully accepted by other commenters. Because of concerns raised about the quality of certain marking methods and to alleviate unnecessary delays incurred by obtaining an approval from the Associate Administrator, we have revised this provision in this final rule. We will permit the use of any marking method capable of producing durable, legible marks. A cylinder with illegible requalification markings will be considered out-of-test and will have to be retested before being returned to service. Also, we are allowing the use of pressure sensitive labels to display the requalification markings on fire extinguishers, as proposed.

#### Section 180.215

This section contains the reporting and record retention requirements currently prescribed in § 173.34(e)(8), with certain revisions.

We revised the retester authorization record requirements in current § 173.34(e)(8)(i) to include all cylinder

requalifiers who inspect, test, repair, or rebuild cylinders. In addition, proposed paragraph (d)(1) requires records covering any work involving welding or brazing repairs, or the building or reheat treatment of cylinders to be retained by the cylinder requalifier for 15 years. The requalifier must retain inspection and test records until expiration of the inspection or requalification period or until the cylinder is again requalified, whichever occurs first. Records of any welding or brazing repair, rebuilding or reheat treatment must be retained for 15 years.

#### IV. Regulatory Analyses and Notices

##### A. Executive Order 12866 and DOT Regulatory Policies and Procedures

This final rule is not considered a significant regulatory action under section 3(f) of Executive Order 12866. It was reviewed informally by the Office of Management and Budget. The rule is not considered significant under the Regulatory Policies and Procedures of the Department of Transportation (44 FR 11034). A regulatory evaluation is available for review in the docket.

The compliance costs associated with this final rule are minimal. Most increased compliance costs involve the new requirement for a person who performs visual inspections of cylinders to obtain approval from the Associate Administrator and mark his RIN number on the cylinders he inspects. The aggregate cost to the industry of this new requirement is \$29,520 per year. On a per facility basis, the cost is \$20.50 per filing or \$4.10 per year. Although they are difficult to quantify, the benefits associated with the provisions in this final rule are significant. This final rule will: (1) Enhance the accountability of the cylinder requalification process; (2) improve voluntary compliance with the cylinder requirements; (3) enhance enforcement related to cylinder requalifications; and (4) reduce the regulatory burden on the regulated industry while increasing its flexibility and providing an opportunity to use new technologies. Further, this final rule will improve cylinder transportation safety by reducing the number of unintentional releases of flammable and toxic material from DOT-3 series cylinders, prohibiting the use of an unsafe aluminum alloy for cylinder manufacture, and prohibiting the use of a cylinder after the expiration of its service life. Although we cannot assign definitive dollar amounts to these potential benefits, we believe that, taken together, the provisions of this final rule are the least costly alternatives available for ensuring an acceptable level of

transportation safety. The potential benefits to society more than offset the potential costs associated with the final rule.

##### B. Regulatory Flexibility Act

The Regulatory Flexibility Act (5 U.S.C. 601 *et seq.*) requires an agency to review regulations to assess their impact on small entities unless the agency determines a rule is not expected to have a significant economic impact on a substantial number of small entities. This final rule imposes only minimal new costs of compliance on the regulated industry and, in fact, should reduce overall costs of compliance. Based on the assessment in the regulatory evaluation, I hereby certify that while this final rule applies to a substantial number of small entities, there will not be a significant economic impact on those small entities. A detailed Regulatory Flexibility analysis is available for review in the docket.

##### C. Executive Order 13132

This final rule has been analyzed in accordance with the principles and criteria contained in Executive Order 13132 ("Federalism"). This final rule preempts state, local, and Indian tribe requirements but does not propose any regulation with substantial direct effects on the states, the relationship between the national government and the states, or the distribution of power and responsibilities among the various levels of government. Therefore, the consultation and funding requirements of Executive Order 13132 do not apply.

Federal hazardous materials transportation law, 49 U.S.C. 5101-5127, contains an express preemption provision (49 U.S.C. 5125(b)) preempting state, local, and Indian tribe requirements on certain covered subjects. Covered subjects are:

(1) The designation, description, and classification of hazardous materials;

(2) The packing, repacking, handling, labeling, marking, and placarding of hazardous materials;

(3) The preparation, execution, and use of shipping documents related to hazardous materials and requirements related to the number, contents, and placement of those documents;

(4) The written notification, recording, and reporting of the unintentional release in transportation of hazardous material; or

(5) The design, manufacture, fabrication, marking, maintenance, reconditioning, repair, or testing of a packaging or container represented, marked, certified, or sold as qualified for use in transporting hazardous material.

This final rule addresses covered subject items 2 and 5 above and preempts state, local, and Indian tribe requirements not meeting the "substantively the same" standard. This final rule is necessary to assure an acceptable level of safety for the transportation of hazardous materials in cylinders.

Federal hazardous materials transportation law provides at section 5125(b)(2) that, if DOT issues a regulation concerning any of the covered subjects, DOT must determine and publish in the **Federal Register** the effective date of federal preemption. The effective date may not be earlier than the 90th day following the date of issuance of the final rule and not later than two years after the date of issuance. The effective date of federal preemption of this final rule is 90 days from publication of this final rule in the **Federal Register**.

##### D. Executive Order 13175

This final rule has been analyzed in accordance with the principles and criteria contained in Executive Order 13175 ("Consultation and Coordination with Indian Tribal Governments"). Because this final rule does not significantly or uniquely affect the communities of the Indian tribal governments and does not impose substantial direct compliance costs, the funding and consultation requirements of Executive Order 13175 do not apply.

##### E. Unfunded Mandates Reform Act of 1995

This final rule does not impose unfunded mandates under the Unfunded Mandates Reform Act of 1995. It does not result in costs of \$100 million or more, in the aggregate, to any of the following: State, local, or Indian tribal governments, or the private sector. This rule is the least burdensome alternative to achieve the objective of the rule.

##### F. Paperwork Reduction Act

RSPA has current information collection approvals under OMB No. 2137-0022, Testing, Inspection, and Marking Requirements for Cylinders, with 168,431 burden hours and \$10,882,516 annual costs, which expires October 31, 2004; and OMB No. 2137-0557, Approvals for Hazardous Materials, with 18,381 burden hours and \$413,737.40 annual costs, which expires July 31, 2004. We believe that this rule may result in a minimal increase or decrease in annual burden hours and costs. These current approvals have been revised and submitted to OMB for extension and re-

approval. Under the Paperwork Reduction Act of 1995, no person is required to respond to an information collection unless it displays a valid OMB control number.

The information collection and recordkeeping requirements in current §§ 173.34, 173.302(c), and 178.35 (pertaining to records prepared by persons performing the requalification, repair, rebuild and use of cylinders) and requirements in current § 173.34 (pertaining to persons seeking approval to requalify cylinders) were approved by the Office of Management and Budget (OMB) and assigned OMB No. 2137-0022, with an expiration date of October 31, 2004. This information is used to verify that cylinders meet the required manufacturing standards prior to being authorized for initial use, and that, once manufactured, the cylinders are maintained and used in compliance with applicable requirements of the HMR. In this rule, these information collection and recordkeeping requirements for records used to verify that cylinders are being properly maintained for continuing hazardous material service are revised and redesignated in new §§ 180.205, 180.209, 180.211, 180.213, and 180.215, with no change in burden.

The information collection and recordkeeping requirements in current §§ 173.300a and 173.300b (pertaining to persons seeking approval to be an independent inspection agency and for chemical analyses and tests of DOT specification and exemption cylinders conducted outside the United States) were approved by OMB and assigned OMB No. 2137-0557, with an expiration date of July 31, 2004. The information is used to evaluate an applicant's qualification to perform the applicable requalification functions and to ensure that cylinders made outside the United States conform to the applicable HMR requirements. In this rule, the information collection and recordkeeping requirements are moved to new subpart I of part 107 and §§ 107.803, 107.805, 107.807, and 180.205(c). This final rule includes a new information collection and recordkeeping requirement for persons seeking approval to perform requalification functions that require marking a date on a cylinder. This new requirement is placed with the other hazardous materials approval requirements under OMB control number 2137-0557. This new approval is required every five years; therefore, first year and subsequent years' estimates are included in the burden estimates for OMB No. 2137-0557.

Because this final rule broadens the approval requirements for affected persons who requalify cylinders and relocates cylinder requalification requirements to other sections of the HMR, we revised the current burden hour submission and resubmitted the revised submission to OMB for extension and re-approval.

We estimate the total revised information collection and recordkeeping burden in this rule as follows:

OMB No. 2137-0022:  
*Number of Respondents:* 139,352.  
*Total Annual Responses:* 153,287.  
*Total Annual Burden Hours:* 168,431.  
*Total Annual Burden Cost:* \$10,882,516.00.  
 OMB No. 2137-0557:  
*Number of Respondents:* 10,718.  
*Total Annual Responses:* 11,069.  
*Total Annual Burden Hours:* 25,581 (1st year).  
*Total Annual Burden Cost:* \$561,337.40 (1st year).  
*Subsequent years 2-5 Burden Hours:* 1,440 per year.  
*Subsequent years 2-5 Burden Cost:* \$29,520 per year.

Requests for a copy of the information collections should be directed to Deborah Boothe, Office of Hazardous Materials Standards (DHM-10), Research and Special Programs Administration, Room 8102, 400 Seventh Street, SW., Washington, DC 20590-0001, Telephone (202) 366-8553.

#### G. Regulation Identifier Number (RIN)

A regulation identifier number (RIN) is assigned to each regulatory action listed in the Unified Agenda of Federal Regulations. The Regulatory Information Service Center publishes the Unified Agenda in April and October of each year. The RIN contained in the heading of this document can be used to cross-reference this action with the Unified Agenda.

#### H. Environmental Assessment

This final rule incorporates new cylinder technologies through new and updated incorporations by reference of consensus standards developed by CGA; increases flexibility for cylinder manufacturers, requalifiers, and users; and facilitates compliance with the HMR by clarifying and reorganizing regulatory requirements applicable to cylinders. In addition, this final rule improves the overall safety performance of DOT specification cylinders by addressing several identified safety problems. To the extent that this final rule will reduce unintentional releases of hazardous materials from cylinders during transportation, it will reduce

environmental damage associated with such releases. We find that there are no significant environmental impacts associated with this final rule.

#### List of Subjects

##### 49 CFR Part 107

Administrative practice and procedure, Hazardous materials transportation, Packaging and containers, Penalties, Reporting and recordkeeping requirements.

##### 49 CFR Part 171

Exports, Hazardous materials transportation, Hazardous waste, Imports, Incorporation by reference, Reporting and recordkeeping requirements.

##### 49 CFR Part 172

Hazardous materials transportation, Hazardous waste, Labeling, Packaging and containers, Reporting and recordkeeping requirements.

##### 49 CFR Part 173

Hazardous materials transportation, Incorporation by reference, Packaging and containers, Radioactive materials, Reporting and recordkeeping requirements, Uranium.

##### 49 CFR Part 177

Hazardous materials transportation, Motor vehicle safety, Packaging and containers, Reporting and recordkeeping requirements.

##### 49 CFR Part 178

Hazardous materials transportation, Incorporation by reference, Packaging and containers, Reporting and recordkeeping requirements.

##### 49 CFR Part 179

Hazardous materials transportation, Incorporation by reference, Railroad safety, Reporting and recordkeeping requirements.

##### 49 CFR Part 180

Hazardous materials transportation, Incorporation by reference, Motor vehicle safety, Packaging and containers, Reporting and recordkeeping requirements.

In consideration of the foregoing, title 49, Chapter I, Subchapters A and C of the Code of Federal Regulations, are amended as follows:

#### PART 107—HAZARDOUS MATERIALS PROGRAM PROCEDURES

1. The authority citation for part 107 continues to read as follows:

**Authority:** 49 U.S.C. 5101-5127, 44701; Sec. 212-213, Pub. L. 104-121, 110 Stat. 857; 49 CFR 1.45, 1.53.

**§ 107.1 [Amended]**

2. In § 107.1, the definition of "Registration" is amended by removing the wording "registration with RSPA as a cylinder retester pursuant to 49 CFR 173.34(e)(1), or".

3. Subpart I is added to part 107 to read as follows:

**Subpart I—Approval of Independent Inspection Agencies, Cylinder Requalifiers, and Non-domestic Chemical Analyses and Tests of DOT Specification Cylinders**

Sec.

107.801 Purpose and scope.

107.803 Approval of independent inspection agency.

107.805 Approval of cylinder requalifiers.

107.807 Approval of non-domestic chemical analyses and tests.

**Subpart I—Approval of Independent Inspection Agencies, Cylinder Requalifiers, and Non-domestic Chemical Analyses and Tests of DOT Specification Cylinders**

**§ 107.801 Purpose and scope.**

(a) This subpart prescribes procedures for—

(1) A person who seeks approval to be an independent inspection agency to perform cylinder inspections and verifications required by parts 178 and 180 of this chapter;

(2) A person who seeks approval to engage in the requalification (*e.g.*, inspection, testing, or certification), rebuilding, or repair of a cylinder manufactured in accordance with a DOT specification under subchapter C of this chapter or under the terms of an exemption issued under this part;

(3) A person who seeks approval to perform the manufacturing chemical analyses and tests of DOT specification or exemption cylinders outside the United States.

(b) No person may engage in a function identified in paragraph (a) of this section unless approved by the Associate Administrator in accordance with the provisions of this subpart. Each person must comply with the applicable requirements in this subpart. In addition, the procedural requirements in subpart H of this part apply to the filing, processing, and termination of an approval issued under this subpart.

**§ 107.803 Approval of independent inspection agency.**

(a) *General.* Prior to performing cylinder inspections and verifications required by parts 178 and 180 of this chapter, a person must apply to the Associate Administrator for an approval as an independent inspection agency. A person approved as an independent inspection agency is not an RSPA agent or representative.

(b) *Criteria.* No applicant for approval as an independent inspection agency may be engaged in the manufacture of cylinders for use in the transportation of hazardous materials, or be directly or indirectly controlled by, or have a financial involvement with, any entity that manufactures cylinders for use in the transportation of hazardous materials, except for providing services as an independent inspector.

(c) *Application information.* Each applicant must submit an application in conformance with § 107.705 containing the information prescribed in § 107.705(a). In addition, the application must contain the following information:

(1) Name and address of each facility where tests and inspections are to be performed.

(2) Detailed description of the inspection and testing facilities to be used by the applicant.

(3) Detailed description of the applicant's qualifications and ability to perform the inspections and to verify the inspections required by part 178 of this chapter or under the terms of an exemption issued under this part.

(4) Name, address, and principal business activity of each person having any direct or indirect ownership interest in the applicant greater than three percent and any direct or indirect ownership interest in each subsidiary or division of the applicant.

(5) Name of each individual whom the applicant proposes to employ as an inspector and who will be responsible for certifying inspection and test results, and a statement of that person's qualifications.

(6) An identification or qualification number assigned to each inspector who is supervised by a certifying inspector identified in paragraph (c)(3) of this section.

(7) A statement that the applicant will perform its functions independent of the manufacturers and owners of the cylinders.

(8) The signature of the person certifying the approval application and the date on which it was signed.

(d) *Facility inspection.* Upon the request of the Associate Administrator, the applicant must allow the Associate Administrator or the Associate Administrator's designee to inspect the applicant's facilities and records. The person seeking approval must bear the cost of the inspection.

**§ 107.805 Approval of cylinder requalifiers.**

(a) *General.* A person must meet the requirements of this section to be approved to inspect, test, certify, repair, or rebuild a cylinder in accordance with a DOT specification under subpart C of

part 178 or subpart C of part 180 of this chapter or under the terms of an exemption issued under this part.

(b) *Independent Inspection Agency Review.* Each applicant must arrange for an independent inspection agency, approved by the Associate Administrator pursuant to this subpart, to perform a review of its inspection or requalification operation. The person seeking approval must bear the cost of the inspection. A list of approved independent inspection agencies is available from the Associate Administrator at the address listed in § 107.705. Assistance in obtaining an approval is available from the same address.

(c) *Application for approval.* If the inspection performed by an independent inspection agency is completed with satisfactory results, the applicant must submit a letter of recommendation from the independent inspection agency, an inspection report, and an application containing the information prescribed in § 107.705(a). In addition, the application must contain—

(1) The name of the facility manager;

(2) The DOT specification/exemption cylinders that will be inspected, tested, repaired, or rebuilt at the facility;

(3) A certification that the facility will operate in compliance with the applicable requirements of subchapter C of this chapter; and

(4) The signature of the person making the certification and the date on which it was signed.

(d) *Issuance of requalifier identification number (RIN).* The Associate Administrator issues a RIN as evidence of approval to requalify DOT specification/exemption cylinders if it is determined, based on the applicant's submission and other available information, that the applicant's qualifications and, when applicable, facility are adequate to perform the requested functions in accordance with the criteria prescribed in subpart C of Part 180 of this chapter.

(e) *Expiration of RIN.* Unless otherwise provided in the issuance letter, an approval expires five years from the date of issuance, provided the applicant's facility and qualifications are maintained at or above the level observed at the time of inspection by the independent inspection agency, or at the date of the certification in the application for approval for requalifiers only performing inspections made under § 180.209(g) of this chapter.

(f) *Exceptions.* Notwithstanding the requirements in paragraphs (b) and (c) of this section, a person who only performs inspections in accordance

with § 180.209(g) of this chapter may submit an application that, in addition to the information prescribed in § 107.705(a), identifies the DOT specification/exemption cylinders to be inspected; certifies the requalifier will operate in compliance with the applicable requirements of subchapter C of this chapter; certifies the persons performing inspections have been trained and have the information contained in each applicable CGA pamphlet incorporated by reference in § 171.7 of this chapter applicable to the requalifiers' activities; and includes the signature of the person making the certification and the date on which it was signed. Each person must comply with the applicable requirements in this subpart. In addition, the procedural requirements in subpart H of this part apply to the filing, processing and termination of an approval issued under this subpart. After September 30, 2003, no person may requalify a DOT specification/exemption cylinder in accordance with § 180.209(g) of this chapter unless that person has been issued a RIN as provided in paragraph (d) of this section.

**§ 107.807 Approval of non-domestic chemical analyses and tests.**

(a) *General.* A person who seeks to manufacture DOT specification or exemption cylinders outside the United States must seek an approval from the Associate Administrator to perform the

chemical analyses and tests of those cylinders outside the United States.

(b) *Application for approval.* Each applicant must submit an application containing the information prescribed in § 107.705(a). In addition, the application must contain—

(1) The name, address, and a description of each facility at which cylinders are to be manufactured and chemical analyses and tests are to be performed;

(2) Complete details concerning the dimensions, materials of construction, wall thickness, water capacity, shape, type of joints, location and size of openings and other pertinent physical characteristics of each specification or exemption cylinder for which approval is being requested, including calculations for cylinder wall stress and wall thickness, which may be shown on a drawing or on separate sheets attached to a descriptive drawing;

(3) The name of the independent inspection agency to be used; and

(4) The signature of the person making the certification and the date on which it was signed.

(c) *Facility inspections.* Upon the request of the Associate Administrator, the applicant must allow the Associate Administrator or the Associate Administrator's designee to inspect the applicant's cylinder manufacturing and testing facilities and records, and must provide such materials and cylinders for analyses and tests as the Associate Administrator may specify. The

applicant or holder must bear the cost of the initial and subsequent inspections, analyses, and tests.

**PART 171—GENERAL INFORMATION, REGULATIONS, AND DEFINITIONS**

4. The authority citation for part 171 continues to read as follows:

**Authority:** 49 U.S.C. 5101–5127; 49 CFR 1.53.

5. In § 171.2, paragraph (d)(3) is revised to read as follows:

**§ 171.2 General requirements.**

\* \* \* \* \*

(d) \* \* \*

(3) Test dates associated with specification, registration, approval, retest, exemption, or requalification identification number (RIN) markings indicating compliance with a test or retest requirement of this subchapter, or an exemption, an approval, or a registration issued under this subchapter or subchapter A of this chapter.

\* \* \* \* \*

6. In § 171.6, the table in paragraph (b)(2) is amended by revising the entries for 2137–0022 and 2137–0057, to read as follows:

**§ 171.6 Control numbers under the Paperwork Reduction Act.**

\* \* \* \* \*

(b) \* \* \*

(2) Table.

Current OMB Control No.	Title	Title 49 CFR part or section where identified or described
2137–0022	Testing, Inspection, and Marking Requirements for Cylinders.	Secs. 173.302a, 173.303, 173.304, 173.309, 178.2, 178.3, 178.35, 178.44, 178.45, 178.46, 178.57, 178.59, 178.60, 178.61, 178.68, 180.205, 180.209, 180.211, 180.213, 180.215.
2137–0557	Approvals for Hazardous Materials	Secs. 107.402; 107.403; 107.405; 107.503; 107.705; 107.713; 107.715; 107.717; 107.803; 107.805; 107.807; 110.30; 172.101; 172.102, Special Provisions 26, 19, 53, 55, 60, 105, 118, 121, 125, 129, 131, 133, 136; 172.102, Special Provisions B45, B55, B61, B69, B77, B81, N10, N72, Code: T42; 173.2a; 173.4; 173.7; 173.21; 173.22; 173.24; 173.38; 173.31; 173.51; 173.56; 173.58; 173.59; 173.124; 173.128; 173.159; 173.166; 173.171; 173.214; 173.222; 173.224; 173.225; 173.245; 173.301; 173.305; 173.306; 173.314; 173.315; 173.316; 173.318; 173.334; 173.340; 173.411; 173.433; 173.457; 173.471; 173.472; 173.473; 173.476; 174.50; 174.63; 175.10; 175.701; 176.168; 176.340; 176.704; 178.3; 178.35; 178.47; 178.53; 178.58; 178.270–3; 178.270–13; 178.273; 178.274; 178.503; 178.509; 178.605; 178.606; 178.608; 178.801; 178.813; 180.213.

7. In § 171.7, in the table in paragraph (a)(3), the following changes are made:

a. In the entry ASTM A 240/A 240M–94b, the wording “A 240M–94b” is revised to read “A 240M–99b”.

b. The entry ASTM A 388–67 is removed.

c. In the entry ASTM E 8–89, the wording “E 8–89 Tension Testing of

Metallic Materials” is revised to read “E 8–99 Standard Test Methods for Tension Testing of Metallic Materials”.

d. In the entry ASTM E 23–60, in column 1, the wording “E 23–60 Notched Bar Impact Testing of Metallic Materials” is revised to read “E 23–98 Standard Test Methods for Notched Bar Impact Testing of Metallic Materials” and in column 2, the reference “; 179.400” is removed.

e. In the entry CGA Pamphlet C–3, in column 1, the wording “Standards for Welding and Brazing on Thinned Walled Containers, 1975” is revised to read “Standards for Welding on Thin-Walled Steel Cylinders, 1994” and in column 2, the reference “; 180.211” is added, in numerical order.

f. In the entry CGA Pamphlet C–5, in column 2, the reference “173.302” is removed and the reference “173.302a” is added in its place.

g. In the entry CGA Pamphlet C–6, in column 2, the reference “173.34;” is removed and the references “173.198;

180.205; 180.209; 180.211;” are added, in numerical order.

h. In the entry CGA Pamphlet C–6.1, in column 2, the reference “173.34” is removed and the references “180.205; 180.209” are added, in its place.

i. In the entry CGA Pamphlet C–6.2, in column 2, the reference “173.34” is removed and the reference “180.205” is added, in its place.

j. In the entry CGA Pamphlet C–6.3, in column 2, the reference “173.34” is removed and the references “180.205; 180.209” are added, in its place.

k. In the entry CGA Pamphlet C–8, in column 2, the reference “173.34” is removed and the reference “180.205” is added, in its place.

l. In the entry CGA Pamphlet C–12, in column 2, the reference “173.34;” is removed and the reference “173.301;” is added, in numerical order.

m. In the entry CGA Pamphlet C–13, in column 2, the reference “173.34;” is removed and the references “; 180.205; 180.209.” are added, in numerical order.

n. In the entry CGA Pamphlet C–14, in column 2, the reference “173.34” is removed and the reference “173.301” is added, in its place.

o. In the entry CGA Pamphlet S–1.1, in column 2, the reference “173.34” is removed and the reference “173.301; 173.304a.” is added, in its place.

p. Under General Services Administration, in the entry Federal Specification RR–C–901C, in column 2, the reference “173.304;” is removed and the reference “; 173.337” is added, in numerical order.

q. Two new entries are added in alphanumeric sequence under American Society for Testing and Materials, the address for Compressed Gas Association, Inc., is revised, and two new entries are added in alphanumeric sequence under Compressed Gas Association, to read as follows:

**§ 171.7 Reference material.**

(a) \* \* \*

(3) *Table of material incorporated by reference.* \* \* \*

Source and name of material	49 CFR reference
American Society for Testing and Materials * * *	*
ASTM D 1835–97, Standard Specification for Liquefied Petroleum (LP) Gases	180.209
ASTM E 213–98, Standard Practice for Ultrasonic Examination of Metal Pipe and Tubing	178.45
Compressed Gas Association, Inc., 4221 Walney Road, 5th Floor, Chantilly, Virginia 20151	*
CGA Pamphlet P–20, Standard for the Classification of Toxic Gas Mixtures, 1995 .....	173.115
CGA Pamphlet S–7, Method for Selecting Pressure Relief Devices for Compressed Gas Mixtures in Cylinders, 1996 .....	173.301

\* \* \* \* \*

**§ 171.8 [Amended]**

8. In § 171.8, in the definition of “Filling density”, paragraph (1) is amended by revising the reference “§ 173.304(a)(2) table note 1” to read “§ 173.304a(a)(2) table note 1”.

9. In § 171.12, paragraph (b)(15) is revised to read as follows:

**§ 171.12 Import and export shipments.**

\* \* \* \* \*

(b) \* \* \*

(15) Cylinders not manufactured to a DOT specification must conform to the

requirements of § 173.301(j) through (l) of this subchapter or, for Canadian manufactured cylinders, to the requirements of § 171.12a(b)(13).

\* \* \* \* \*

**PART 172—HAZARDOUS MATERIALS TABLE, SPECIAL PROVISIONS, HAZARDOUS MATERIALS COMMUNICATIONS, EMERGENCY RESPONSE INFORMATION, AND TRAINING REQUIREMENTS**

10. The authority citation for part 172 continues to read as follows:

**Authority:** 49 U.S.C. 5101–5127; 49 CFR 1.53.

11. In § 172.101, the Hazardous Materials Table is amended by revising the entries Cyanogen, Germane, and Iron pentacarbonyl, to read as follows:

**§ 172.101 Purpose and use of hazardous materials table.**

\* \* \* \* \*

§ 172.101.—HAZARDOUS MATERIALS TABLE

Symbols	Hazardous materials descriptions and proper shipping names	Hazard class or division	Identification numbers	PG	Label codes	Special provisions (§ 172.102)	(8) Packaging (§ 173.***)			(9) Quantity limitations		(10) Vessel stowage	
							Excep-tions	Nonbulk	Bulk	Passenger aircraft/rail	Cargo air-craft only	Loca-tion	Other
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8A)	(8B)	(8C)	(9A)	(9B)	(10A)	(10B)
	* Cyanogen	2.3	UN1026 ..		2.3, 2.1 ..	2 .....	None ....	304 .....	245 .....	Forbidden	Forbidden	D .....	40
	* Germane Iron penta carbonyl.	2.3 6.1	UN2192 .. UN1994 ..	I .....	2.3, 2.1 .. 6.1, 3 .....	2 .....	None .... None ....	302 .....	245 .....	Forbidden Forbidden	Forbidden Forbidden	D .....	40 40
						1, B9, B14, B30, B72, B77, T22, TP2, TP13, TP38, TP44.							

**PART 173—SHIPPERS—GENERAL REQUIREMENTS FOR SHIPMENTS AND PACKAGINGS**

12. The authority citation for part 173 continues to read as follows:

**Authority:** 49 U.S.C. 5101–5127, 44701; 49 CFR 1.45, 1.53.

**§ 173.34 [Removed]**

13. Section 173.34 is removed.

14. Section 173.40 is revised to read as follows:

**§ 173.40 General packaging requirements for toxic materials packaged in cylinders.**

When this section is referenced for a Hazard Zone A or B hazardous material elsewhere in this subchapter, the requirements in this section are applicable to cylinders used for that material.

(a) *Authorized cylinders.* (1) A cylinder must conform to one of the specifications for cylinders in subpart C of part 178 of this subchapter, except that specification 8, 8AL, and 39 cylinders are not authorized.

(2) After September 30, 2002, DOT 3AL cylinders made of aluminum alloy 6351–T6 may not be filled and offered for transportation or transported with a Division 2.3 Hazard Zone A material, a Division 6.1 Hazard Zone A material, or any liquid meeting the definition of Division 6.1 and the criteria for Packing Group I Hazard Zone A, as specified in § 173.133. If it is otherwise serviceable and conforms to the regulations in effect on September 30, 2002, a DOT 3AL cylinder made of aluminum alloy 6351–T6 and filled before October 1, 2002, may be transported for reprocessing or disposal of the cylinder’s contents until April 1, 2003.

(b) *Outage and pressure requirements.* The pressure of the hazardous material at 55° C(131° F) may not exceed the

service pressure of the cylinder. Sufficient outage must be provided so that the cylinder will not be liquid full at 55° C(131° F).

(c) *Closures.* Each cylinder containing a Hazard Zone A material must be closed with a plug or valve conforming to the following:

(1) Each plug or valve must have a taper-threaded connection directly to the cylinder and be capable of withstanding the test pressure of the cylinder without damage or leakage.

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

(3) Each valve outlet must be sealed by a threaded cap or threaded solid plug and inert gasketing material.

(4) The materials of construction for the cylinder, valves, plugs, outlet caps, luting, and gaskets must be compatible with each other and with the lading.

(d) *Additional handling protection.* Each cylinder or cylinder overpack combination offered for transportation containing a Division 2.3 or 6.1 Hazard Zone A or B material must conform to the valve damage protection performance requirements of this section. In addition to the requirements of this section, overpacks must conform to the overpack provisions of § 173.25.

(1) Each cylinder with a wall thickness at any point of less than 2.03 mm (0.08 inch) and each cylinder that does not have fitted valve protection must be overpacked in a box. The box must conform to overpack provisions in § 173.25. Box and valve protection must be of sufficient strength to protect all

parts of the cylinder and valve, if any, from deformation and breakage resulting from a drop of 2.0 m (7 ft) or more onto a non-yielding surface, such as concrete or steel, impacting at an orientation most likely to cause damage.

“Deformation” means a cylinder or valve that is bent, distorted, mangled, misshapen, twisted, warped, or in a similar condition.

(2) Each cylinder with a valve must be equipped with a protective metal cap, other valve protection device, or an overpack sufficient to protect the valve from deformation, breakage or leakage resulting from a drop of 2.0 m (7 ft) onto a non-yielding surface, such as concrete or steel. Impact must be at an orientation most likely to cause damage.

(e) *Interconnection.* Cylinders may not be manifolded or interconnected.

15. In § 173.115, the last sentence in paragraph (c)(2) and paragraph (j) are revised to read as follows:

**§ 173.115 Class 2, Divisions 2.1, 2.2, and 2.3—Definitions.**

\* \* \* \* \*

(c) \* \* \*

(2) \* \* \* LC50 values for mixtures may be determined using the formula in § 173.133(b)(1)(i) or CGA Pamphlet P–20 (incorporated by reference; see § 171.7 of this subchapter).

\* \* \* \* \*

(j) *Refrigerant gas or Dispersant gas.* The terms *Refrigerant gas* and *Dispersant gas* apply to all nonpoisonous refrigerant gases; dispersant gases (fluorocarbons) listed in § 172.101 of this subchapter and §§ 173.304, 173.314(c), 173.315(a)(1), and 173.315(h) and mixtures thereof; and any other compressed gas having a vapor pressure not exceeding 260 psia at 54° C(130° F), used only as a refrigerant, dispersant, or blowing agent.

16. Section 173.163 is revised to read as follows:

**§ 173.163 Hydrogen fluoride.**

Hydrogen fluoride (hydrofluoric acid, anhydrous) must be packaged in a specification 3, 3A, 3AA, 3B, 3BN, 3E, or 4A cylinder; or a specification 4B, 4BA, or 4BW cylinder, if the cylinder is not brazed. Filling density may not exceed 85 percent of the cylinder's water weight capacity. In place of the periodic hydrostatic retest, cylinders used in exclusive service may be given a complete external visual inspection in conformance with part 180, subpart C, of this subchapter, at the time such retest becomes due. Cylinders removed from hydrogen fluoride service must be condemned in accordance with § 180.205 of this subchapter or, at the direction of the owner, rendered incapable of holding pressure.

17. Section 173.192 is revised to read as follows:

**§ 173.192 Packaging for certain toxic gases in Hazard Zone A.**

When § 172.101 of this subchapter specifies a toxic material must be packaged under this section, only specification cylinders are authorized, as follows:

(a) Specification 3A1800, 3AA1800, 3AL1800, or 3E1800 cylinders, under the following conditions:

(1) Specification 3A, 3AA, or 3AL cylinders may not exceed 57 kg (125 lb) water capacity (nominal).

(2) Specification 3AL cylinders may only be offered for transportation or transported by highway and rail.

(b) Packagings must conform to the requirements of § 173.40.

(c) For cylinders used for phosgene:

(1) The filling density may not exceed 125 percent;

(2) A cylinder may not contain more than 68 kg (150 lb) of phosgene; and

(3) Each cylinder containing phosgene must be tested for leakage before it is offered for transportation or transported and must show no leakage. The leakage test must consist of immersing the cylinder and valve, without the protective cap attached, in a bath of water at a temperature of approximately 66° C (150° F) for at least 30 minutes, during which time frequent examinations must be made to note any escape of gas. The valve of the cylinder may not be loosened after this test. Suitable safeguards must be provided to protect personnel and facilities should failure occur during the test. As an alternative, each cylinder containing phosgene may be tested for leakage by a method approved in writing by the Associate Administrator.

18. In § 173.198, the last two sentences in paragraph (a) are revised to read as follows:

**§ 173.198 Nickel carbonyl.**

(a) \* \* \* A cylinder used exclusively for nickel carbonyl may be given a complete external visual inspection instead of the pressure test required by § 180.205 of this subchapter. Visual inspection must be in accordance with CGA Pamphlet C-6 (incorporated by reference; see § 171.7 of this subchapter).

\* \* \* \* \*

19. In § 173.226, paragraph (a) is revised to read as follows:

**§ 173.226 Materials poisonous by inhalation, Division 6.1, Packing Group I, Hazard Zone A.**

\* \* \* \* \*

(a) In seamless specification cylinders conforming to the requirements of § 173.40.

\* \* \* \* \*

20. In § 173.227, the section heading and paragraph (a) are revised to read as follows:

**§ 173.227 Materials poisonous by inhalation, Division 6.1, Packing Group I, Hazard Zone B.**

\* \* \* \* \*

(a) In packagings as authorized in § 173.226 and seamless and welded specification cylinders conforming to the requirements of § 173.40.

\* \* \* \* \*

21. Section 173.228 is revised to read as follows:

**§ 173.228 Bromine pentafluoride or bromine trifluoride.**

The following packagings are authorized for bromine pentafluoride and bromine trifluoride:

(a) Specification 3A150, 3AA150, 3B240, 3BN150, 4B240, 4BA240, 4BW240 and 3E1800 cylinders. No cylinder may be equipped with a pressure relief device.

(b) A material in Hazard Zone A must be transported in a seamless specification cylinder conforming to the requirements of § 173.40. No cylinder may be equipped with a pressure relief device.

**§§ 173.300a, 173.300b, 173.300c [Removed]**

22. In part 173, §§ 173.300a, 173.300b, and 173.300c are removed.

23. Section 173.301 is revised to read as follows:

**§ 173.301 General requirements for shipment of compressed gases in cylinders and spherical pressure vessels.**

(a) *General qualifications for use of cylinders.* As used in this subpart, *filled*

or *charged* means an introduction or presence of a hazardous material in a cylinder. A Class 2 material (gas) offered for transportation in a cylinder must be prepared in accordance with this section and §§ 173.302 through 173.305, as applicable.

(1) Compressed gases must be in metal cylinders and containers built in accordance with the DOT and ICC specifications, as shown in this paragraph (a)(1), in effect at the time of manufacture, and requalified and marked as required by the specification and the regulation for requalification, if applicable:

Packagings  
2P  
2Q  
ICC-3<sup>1</sup>\*COM019\*  
3A  
3AA  
3AL  
3AX  
3A480X  
3AAX  
3B  
3BN  
3E  
3HT  
3T  
4AA480  
4B  
4B240ET  
4BA  
4BW  
4D  
4DA  
4DS  
4E  
4L  
8  
8AL  
39

(2) A cylinder must be filled in accordance with this part. Before each filling of a cylinder, the person filling the cylinder must visually inspect the outside of the cylinder. A cylinder that has a crack or leak, is bulged, has a defective valve or a leaking or defective pressure relief device, or bears evidence of physical abuse, fire or heat damage, or detrimental rusting or corrosion, may not be filled and offered for transportation. A cylinder may be repaired and requalified only as prescribed in subpart C of part 180 of this subchapter.

(3) Pressure relief devices must be tested for leaks before the charged cylinder is shipped from the cylinder filling plant. It is expressly forbidden to repair a leaking fuse plug device, where the leak is through the fusible metal or between the fusible metal and the opening in the plug body, except by

<sup>1</sup> Use of existing cylinders is authorized. New construction is not authorized.

removal of the device and replacement of the fusible metal.

(4) A cylinder that previously contained a Class 8 material must be requalified in accordance with § 180.205(e) of this subchapter.

(5) When a cylinder with a marked pressure limit is prescribed, another cylinder made under the same specification but with a higher marked pressure limit is authorized. For example, a cylinder marked "DOT-4B500" may be used when "DOT-4B300" is specified.

(6) No person may fill a cylinder overdue for periodic requalification with a hazardous material and then offer it for transportation. The prohibition against offering a cylinder for transportation that is overdue for periodic requalification does not apply to a cylinder filled prior to the requalification due date.

(7) A cylinder with an authorized service life may not be offered for transportation in commerce after its authorized service life has expired. However, a cylinder in transportation or a cylinder filled prior to the expiration of its authorized service life may be transported for reprocessing or disposal of the cylinder's contents. After emptying, the cylinder must be condemned in accordance with § 180.205 of this subchapter.

(8) The pressure of the hazardous material at 55° C (131° F) may not exceed 5/4 of the service pressure of the cylinder. Sufficient outage must be provided so the cylinder will not be liquid full at 55° C (131° F).

(9) Specification 2P, 2Q, 3E, 3HT, spherical 4BA, 4D, 4DA, 4DS, and 39 cylinders must be shipped in strong outer packagings. The strong outer packaging must conform to paragraph (h) of this section and to § 173.25.

(b) *Cylinder markings.* Required markings on a cylinder must be legible and must meet the applicable requirements of subpart C of part 180 of this subchapter. Additional information may be marked on the cylinder provided it does not affect the required markings prescribed in the applicable cylinder specification.

(c) *Toxic gases and mixtures.* Cylinders containing toxic gases and toxic gas mixtures meeting the criteria of Division 2.3 Hazard Zone A or B must conform to the requirements of § 173.40 and CGA Pamphlets S-1.1 and S-7 (incorporated by reference; see § 171.7 of this subchapter). A DOT 39 cylinder may not be used for toxic gases or toxic gas mixtures meeting the criteria for Division 2.3, Hazard Zone A or B.

(d) *Gases capable of combining chemically.* A filled cylinder may not

contain any gas or material capable of combining chemically with the cylinder's contents or with the cylinder's material of construction, so as to endanger the cylinder's serviceability. After September 30, 2002, DOT 3AL cylinders made of aluminum alloy 6351-T6 may not be filled and offered for transportation with pyrophoric gases; however, if it is otherwise serviceable and conforms to the regulations in effect on September 30, 2002, a DOT 3AL cylinder made of aluminum alloy 6351-T6 and filled before October 1, 2002, may be transported for reprocessing or disposal of the cylinder's contents until April 1, 2003.

(e) *Ownership of cylinder.* A cylinder filled with a hazardous material may not be offered for transportation unless it was filled by the owner of the cylinder or with the owner's consent.

(f) *Pressure relief device systems.* (1) Except as provided in paragraphs (f)(5) and (f)(6) of this section, a cylinder filled with a gas and offered for transportation must be equipped with one or more pressure relief devices sized and selected as to type, location, and quantity, and tested in accordance with CGA Pamphlets S-1.1 (incorporated by reference; see § 171.7 of this subchapter; compliance with paragraph 9.1.1.1 of CGA Pamphlet S-1.1 is not required) and S-7 (incorporated by reference; see § 171.7 of this subchapter). The pressure relief device must be capable of preventing rupture of the normally filled cylinder when subjected to a fire test conducted in accordance with CGA Pamphlet C-14 (incorporated by reference; see § 171.7 of this subchapter), or, in the case of an acetylene cylinder, CGA Pamphlet C-12 (incorporated by reference; see § 171.7 of this subchapter).

(2) When a pressure relief device is installed, the inlet port to the relief channel must be in the vapor space of the cylinder.

(3) For a DOT 3, 3A, 3AA, 3AL, 3AX, 3AXX, 3B or 3BN cylinder, from the first requalification due on and after October 1, 2002, the set pressure of the pressure relief device must be at test pressure with a tolerance of plus zero to minus 10%.

(4) A pressure relief device is required on a DOT 39 cylinder regardless of cylinder size or filled pressure. A DOT 39 cylinder used for liquefied Division 2.1 materials must be equipped with a metal pressure relief device. Fusible pressure relief devices are not authorized on a DOT 39 cylinder containing a liquefied gas.

(5) A pressure relief device is not required on—

(i) A cylinder 305 mm (12 inches) or less in length, exclusive of neck, and 114 mm (4.5 inches) or less in outside diameter, except when the cylinder is filled with a liquefied gas for which this part requires a service pressure of 1800 psig or higher or a nonliquefied gas to a pressure of 1800 psig or higher at 21° C (70° F);

(ii) A cylinder with a water capacity of less than 454 kg (1000 lbs) filled with a nonliquefied gas to a pressure of 300 psig or less at 21°C (70°F), except for a DOT 39 cylinder or a cylinder used for acetylene in solution; or

(iii) A cylinder containing a Class 3 or a Class 8 material without pressurization, unless otherwise specified for the hazardous material.

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

(g) *Manifolding cylinders in transportation.* (1) Cylinder manifolding is authorized only under conditions prescribed in this paragraph (g). Manifolled cylinders must be supported and held together as a unit by structurally adequate means. Except for Division 2.2 materials, each cylinder must be equipped with an individual shutoff valve that must be tightly closed while in transit. Manifold branch lines must be sufficiently flexible to prevent damage to the valves that otherwise might result from the use of rigid branch lines. Each cylinder must be individually equipped with a pressure relief device as required in paragraph (f) of this section. Pressure relief devices on manifolded horizontal cylinders filled with a compressed gas must be arranged to discharge unobstructed to the open air in such a manner as to prevent any escaping gas from contacting personnel or any adjacent cylinders. Pressure relief devices on manifolded horizontal cylinders filled with a flammable compressed gas must be arranged to discharge upward to prevent any escaping gas from contacting any adjacent cylinders. Valves and pressure relief devices on manifolded cylinders filled with a compressed gas must be protected from damage by framing, a cabinet, or other method. Manifolding is authorized for cylinders containing the following gases:

(i) Nonliquefied (permanent) compressed gases authorized by § 173.302.

(ii) Liquefied compressed gases authorized by § 173.304. Each manifolded cylinder containing a liquefied compressed gas must be separately filled and means must be provided to ensure no interchange of

cylinder contents can occur during transportation.

(iii) Acetylene as authorized by § 173.303.

(2) For the checking of tare weights or replacing solvent, the cylinder must be removed from the manifold. This requirement is not intended to prohibit filling acetylene cylinders while manifolded.

(h) *Cylinder valve protection.* (1) A cylinder used to transport a hazardous material must meet the requirements specified in this paragraph (h). The following cylinders are not subject to the cylinder valve protection requirements in this paragraph (h):

(i) A cylinder containing only a Division 2.2 material without a Division 5.1 subsidiary hazard;

(ii) A cylinder containing a Class 8 liquid corrosive only to metal;

(iii) A cylinder with a water capacity of 4.8 liters (293 in<sup>3</sup>) or less containing oxygen, compressed;

(iv) A cylinder containing oxygen, refrigerated liquid (cryogenic liquid);

(v) A Medical E cylinder with a water capacity of 4.9 liters (300 in<sup>3</sup>) or less;

(vi) A fire extinguisher; or

(vii) A cylinder containing acetylene.

(2) For cylinders manufactured before October 1, 2007, a cylinder must have its valves protected by one of the following methods:

(i) By equipping the cylinder with securely attached metal caps of sufficient strength to protect valves from damage during transportation;

(ii) By boxing or crating the cylinders so as to protect valves from damage during transportation; or

(iii) By constructing the cylinder so that the valve is recessed into the cylinder or otherwise protected to the extent that it will not be subjected to a blow when the container is dropped onto a flat surface.

(3) For cylinders manufactured after October 1, 2007, each cylinder valve assembly must be of sufficient strength or protected such that no leakage occurs when a cylinder with the valve installed is dropped 1.8 m (6 ft.) or more onto a non-yielding surface, such as concrete or steel, impacting the valve assembly or protection device at an orientation most likely to cause damage. The cylinder valve assembly protection may be provided by any method meeting the performance requirement in this paragraph (h)(3). Examples include:

(i) Equipping the cylinder with a securely attached metal cap.

(ii) Packaging the cylinder in a box, crate, or other strong outside packaging conforming to the requirements of § 173.25.

(iii) Constructing the cylinder such that the valve is recessed into the cylinder or otherwise protected.

(i) *Cylinders mounted on motor vehicles or in frames.* Seamless DOT specification cylinders longer than 2 m (6.5 feet) are authorized for transportation only when horizontally mounted on a motor vehicle or in an ISO framework or other framework of equivalent structural integrity.

Cylinders may not be transported by rail in container on freight car (COFC) or trailer on flat car (TOFC) service except under conditions approved by the Associate Administrator for Safety, Federal Railroad Administration. The cylinder must be configured as follows:

(1) Each cylinder must be fixed at one end of the vehicle or framework with provision for thermal expansion at the opposite end attachment;

(2) The valve and pressure relief device protective structure must be sufficiently strong to withstand a force equal to twice the weight of the cylinder and framework assembly with a safety factor of four, based on the ultimate strength of the material used; and

(3) Discharge from a pressure relief device must be arranged in such a manner as to prevent any escaping gas from contacting personnel or any adjacent cylinders.

(j) *Non-specification cylinders in domestic use.* Except as provided in paragraphs (k) and (l) of this section, a filled non-DOT specification cylinder, other than a DOT exemption cylinder or a cylinder used as a fire extinguisher in conformance with § 173.309, may not be offered for transportation or transported to, from, or within the United States.

(k) *Importation of foreign cylinders for discharge within a single port area.* A cylinder manufactured to other than a DOT specification and certified as being in conformance with the transportation regulations of another country may be authorized, upon written request to and approval by the Associate Administrator, for transportation within a single port area, provided—

(1) The cylinder is transported in a closed freight container;

(2) The cylinder is certified by the importer to provide a level of safety at least equivalent to that required by the regulations in this subchapter for a comparable DOT specification cylinder; and

(3) The cylinder is not refilled for export unless in compliance with paragraph (l) of this section.

(l) *Filling of foreign cylinders for export.* A cylinder not manufactured, inspected, tested and marked in accordance with part 178 of this subchapter, or a cylinder manufactured

to other than a DOT specification or exemption, may be filled with a gas in the United States and offered for transportation and transported for export, if the following conditions are met:

(1) The cylinder has been requalified and marked with the month and year of requalification in accordance with subpart C of part 180 of this subchapter, or has been requalified as authorized by the Associate Administrator.

(2) The maximum filling density and service pressure for each cylinder conform to the requirements of this part for the gas involved.

(3) The bill of lading or other shipping paper identifies the cylinder and includes the following certification: "This cylinder has (These cylinders have) been qualified, as required, and filled in accordance with the DOT requirements for export."

(m) *Metal attachments.* Metal attachments to cylinders must have rounded or chamfered corners, or be otherwise protected, so as to prevent the likelihood of causing puncture or damage to other hazardous materials packages. This requirement applies to anything temporarily or permanently attached to the cylinder, such as metal skids.

24. Section 173.301a is added to read as follows:

**§ 173.301a Additional general requirements for shipment of specification cylinders.**

(a) *General.* The requirements in this section are in addition to the requirements in § 173.301 and apply to the shipment of gases in specification cylinders.

(b) *Authorized cylinders not marked with a service pressure.* For authorized cylinders not marked with a service pressure, the service pressure is designated as follows:

Specification marking	Service Pressure psig
3 .....	1800
3E .....	1800
8 .....	250

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

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

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

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

(3) For toxic materials, the pressure in the cylinder at 55° C (131° F) may not exceed the service pressure of the cylinder.

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

**§ 173.301b [Reserved]**

25. Section 173.301b is added and reserved.

26. Section 173.302 is revised to read as follows:

**§ 173.302 Filling of cylinders with nonliquefied (permanent) compressed gases.**

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

(b) *Aluminum cylinders in oxygen service*. Each aluminum cylinder filled with oxygen must meet all of the following conditions:

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

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

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

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

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

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

27. Section 173.302a is added to read as follows:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Where:

S = wall stress, pounds per square inch;  
 EE = elastic expansion (total less permanent) in cubic centimeters;  
 K = factor × 10<sup>-7</sup> experimentally determined for the particular type of cylinder being tested or derived

in accordance with CGA Pamphlet C-5;

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

P = test pressure, pounds per square inch.

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

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

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

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

Where:

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

D = outside diameter, inches;

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

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

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

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

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

(d) *Diborane and diborane mixtures.* Diborane and diborane mixed with compatible compressed gas must be offered in a DOT 3AA1800 cylinder. The maximum filling density of the diborane may not exceed 7 percent. Diborane mixed with compatible

compressed gas may not have a pressure exceeding the service pressure of the cylinder if complete decomposition of the diborane occurs. Cylinder valve assemblies must be protected in accordance with § 173.301(h).

#### § 173.302b [Reserved]

28. Section 173.302b is added and reserved.

29. Section 173.304 is revised to read as follows:

#### § 173.304 Filling of cylinders with liquefied compressed gases.

(a) *General requirements.* Liquefied compressed gases (except gas in solution) must be shipped in accordance with the requirements in this section and in §§ 173.301, 173.301a, 173.304a, and 173.305.

(1) A DOT 3AL cylinder may not be used for any material with a primary or subsidiary hazard of Class 8.

(2) Shipments of Division 2.1 materials in aluminum cylinders are authorized only when transported by motor vehicle, rail car, or cargo-only aircraft.

(b) *Filling limits.* Except for carbon dioxide; 1,1-Difluoroethylene (R-1132A); nitrous oxide; and vinyl fluoride, inhibited, the liquid portion of a liquefied gas may not completely fill the packaging at any temperature up to and including 54° C (130° F). The liquid portion of vinyl fluoride, inhibited, may completely fill the cylinder at 54° C (130° F) provided the pressure at the critical temperature does not exceed 1.25 times the service pressure of the cylinder.

(c) *Mixture of compressed gas and other material.* A mixture of compressed gas must be shipped in accordance with § 173.305.

(d) *Refrigerant and dispersant gases.* Nontoxic and nonflammable refrigerant or dispersant gases must be offered for transportation in cylinders prescribed in § 173.304a, or in DOT 2P and 2Q containers (§§ 178.33, 178.33a of this subchapter). DOT 2P and 2Q containers must be packaged in a strong wooden or fiberboard box of such design as to protect valves from damage or accidental functioning under conditions incident to transportation. Pressure in the inside metal containers may not exceed 87 psia at 21° C (70° F). Each completed metal container filled for shipment must be heated until its contents reach a minimum temperature

of 54° C (130° F) without evidence of leakage, distortion, or other defect. Each outside package must be plainly marked "INSIDE CONTAINERS COMPLY WITH PRESCRIBED SPECIFICATIONS".

(e) *Engine starting fluid.* Engine starting fluid containing a flammable compressed gas or gases must be shipped in a cylinder as prescribed in § 173.304a or as follows:

(1) Inside non-refillable metal containers having a capacity not greater than 500 mL (32 in<sup>3</sup>). The containers must be packaged in strong, tight outer packagings. The pressure in the container may not exceed 145 psia at 54° C (130° F). If the pressure exceeds 145 psia at 54° C (130° F), a DOT 2P container must be used. In either case, the metal container must be capable of withstanding, without bursting, a pressure of 1.5 times the pressure of the contents at 54° C (130° F). The liquid content of the material and gas may not completely fill the container at 54° C (130° F). Each container filled for shipment must have been heated until its contents reach a minimum temperature of 54° C (130° F), without evidence of leakage, distortion, or other defect. Each outside shipping container must be plainly marked, "INSIDE CONTAINERS COMPLY WITH PRESCRIBED SPECIFICATIONS".

(2) [Reserved]

30. Section 173.304a is added to read as follows:

#### § 173.304a Additional requirements for shipment of liquefied compressed gases in specification cylinders.

(a) *Detailed filling requirements.* Liquefied gases (except gas in solution) must be offered for transportation, subject to the requirements in this section and §§ 173.301 and 173.304, in specification cylinders, as follows:

(1) DOT 3, 3A, 3AA, 3AL, 3B, 3BN, 3E, 4B, 4BA, 4B240ET, 4BW, 4E, 39, except that no DOT 4E or 39 packaging may be filled and shipped with a mixture containing a pyrophoric liquid, carbon bisulfide (disulfide), ethyl chloride, ethylene oxide, nickel carbonyl, spirits of nitroglycerin, or toxic material (Division 6.1 or 2.3), unless specifically authorized in this part.

(2) For the gases named, the following requirements apply (for cryogenic liquids, see § 173.316):

Kind of gas	Maximum permitted filling density (percent) (see Note 1)	Packagings marked as shown in this column or of the same type with higher service pressure must be used except as provided in §§ 173.301(a)(1), 173.301(a)(4) (see notes following table)
Anhydrous ammonia .....	54 .....	DOT-4; DOT-3A480; DOT-3AA480; DOT-3A480X; DOT-4A480; DOT-4AA480; DOT-3; DOT-3E1800; DOT-3AL480.
Bromotrifluoromethane (R-13B1 or H-1301) .....	124 .....	DOT-3A400; DOT-3AA400; DOT-3B400; DOT-4A400; DOT-4AA480; DOT-4B400; DOT-4BA400; DOT-4BW400; DOT-3E1800; DOT-39; DOT-3AL40.
Carbon dioxide (see Notes 4, 7, and 8) .....	68 .....	DOT-3A1800; DOT-3AX1800; DOT-3AA1800; DOT-3AAX1800; DOT-3; DOT-3E1800; DOT-3T1800; DOT-3HT2000; DOT-39; DOT-3AL1800.
Carbon dioxide, refrigerated liquid (see paragraph (e) of this section).		DOT-4L.
Chlorine (see Note 2) .....	125 .....	DOT-3A480; DOT-3AA480; DOT-3; DOT-3BN480; DOT-3E1800.
Chlorodifluoroethane or 1-Chloro-1, 1-difluoroethane (R-142b).	100 .....	DOT-3A150; DOT-3AA150; DOT-3B150; DOT-4B150; DOT-4BA225; DOT-4BW225; DOT-3E1800; DOT-39; DOT-3AL150.
Chlorodifluoromethane (R-22) (see Note 8) .....	105 .....	DOT-3A240; DOT-3AA240; DOT-3B240; DOT-4B240; DOT-4BA240; DOT-4BW240; DOT-4B240ET; DOT-4E240; DOT-39; DOT-41; DOT-3E1800; DOT-3AL240.
Chloropentafluoroethane (R-115) .....	110 .....	DOT-3A225; DOT-3AA225; DOT-3B225; DOT-4A225; DOT-4BA225; DOT-4B225; DOT-4BW225; DOT-3E1800; DOT-39; DOT-3AL225.
Chlorotrifluoromethane (R-13) (see Note 8) .....	100 .....	DOT-3A1800; DOT-3AA1800; DOT-3; DOT-3E1800; DOT-39; DOT-3AL1800.
Cyclopropane (see Note 8) .....	55 .....	DOT-3A225; DOT-3A480X; DOT-3AA225; DOT-3B225; DOT-4A225; DOT-4AA480; DOT-4B225; DOT-4BA225; DOT-4BW225; DOT-4B240ET; DOT-3; DOT-3E1800; DOT-39; DOT-3AL225.
Dichlorodifluoromethane (R-12) (see Note 8) .....	119 .....	DOT-3A225; DOT-3AA225; DOT-3B225; DOT-4A225; DOT-4B225; DOT-4BA225; DOT-4BW225; DOT-4B240ET; DOT-4E225; DOT-9; DOT-39; DOT-41; DOT-3E1800; DOT-3AL225.
Dichlorodifluoromethane and difluoroethane mixture (constant boiling mixture) (R-500) (see Note 8).	Not liquid full at 130°F .....	DOT-3A240; DOT-3AA240; DOT-3B240; DOT-3E1800; DOT-4A240; DOT-4B240; DOT-4BA240; DOT-4BW240; DOT-4E240; DOT-9; DOT-39.
1,1-Difluoroethane (R-152a) (see note 8) .....	79 .....	DOT-3A150; DOT-3AA150; DOT-3B150; DOT-4B150; DOT-4BA225; DOT-4BW225; DOT-3E1800; DOT-3AL150.
1,1-Difluoroethylene (R-1132A) .....	73 .....	DOT-3A2200; DOT-3AA2200; DOT-3AX2200; DOT-3AAX2200; DOT-3T2200; DOT-39.
Dimethylamine, anhydrous .....	59 .....	DOT-3A150; DOT-3AA150; DOT-3B150; DOT-4B150; DOT-4BA225; DOT-4BW225; ICC-3E1800.
Ethane (see Note 8) .....	35.8 .....	DOT-3A1800; DOT-3AX1800; DOT-3AA1800; DOT-3AAX1800; DOT-3; DOT-3E1800; DOT-3T1800; DOT-39; DOT-3AL1800.
Ethane (see Note 8) .....	36.8 .....	DOT-3A2000; DOT-3AX2000; DOT-3AA2000; DOT-3AAX2000; DOT-3T2000; DOT-39; DOT-3AL2000.
Ethylene (see Note 8) .....	31.0 .....	DOT-3A1800; DOT-3AX1800; DOT-3AA1800; DOT-3AAX1800; DOT-3; DOT-3E1800; DOT-3T1800; DOT-39; DOT-3AL1800.
Ethylene (see Note 8) .....	32.5 .....	DOT-3A2000; DOT-3AX2000; DOT-3AA2000; DOT-3AAX2000; DOT-3T2000; DOT-39; DOT-3AL2000.
Ethylene (see Note 8) .....	35.5 .....	DOT-3A2400; DOT-3AX2400; DOT-3AA2400; DOT-3AAX2400; DOT-3T2400; DOT-39; DOT-3AL2400.
Hydrogen chloride, anhydrous .....	65 .....	DOT-3A1800; DOT-3AA1800; DOT-3AX1800; DOT-3AAX1800; DOT-3; DOT-3T1800; DOT-3E1800.
Hydrogen sulfide (see Note 10) .....	62.5 .....	DOT-3A480; DOT-3AA480; DOT-3B480; DOT-4A480; DOT-4B480; DOT-4BA480; DOT-4BW480; DOT-3E1800; DOT-3AL480.
Insecticide, gases liquefied (see Notes 8 and 12) .....	Not liquid full at 130°F .....	DOT-3A300; DOT-3AA300; DOT-3B300; DOT-4B300; DOT-4BA300; DOT-4BW300; DOT-9; DOT-40; DOT-41; DOT-3E1800.
Liquefied nonflammable gases, other than classified flammable, corrosive, toxic & mixtures or solution thereof filled w/nitrogen, carbon dioxide, or air (see Notes 7 and 8)..	Not liquid full at 130°F .....	Specification packaging authorized in paragraph (a)(1) of this section and DOT-3HT; DOT 4D; DOT-4DA; DOT-4DS.

Kind of gas	Maximum permitted filling density (percent) (see Note 1)	Packagings marked as shown in this column or of the same type with higher service pressure must be used except as provided in §§ 173.301(a)(1), 173.301(a)(4) (see notes following table)
Methyl acetylene-propadiene, mixtures, stabilized DOT-3A240; (see Note 5)..	Not liquid at 130°F .....	DOT-4B240 without brazed seams; DOT-4BA240 without brazed seams; DOT-3A240; DOT-3AA240; DOT-3B240; DOT-3E1800; DOT-4BW240; DOT-4E240; DOT-4B240ET; DOT-4; DOT-41; DOT-3AL240.
Methyl chloride .....	84 .....	DOT-3A225; DOT-3AA225; DOT-3B225; DOT-4A225; DOT-4B225; DOT-4BA225; DOT-4BW225; DOT-3; DOT-4; DOT-38; DOT-3E1800; DOT-4B240ET. Cylinders complying with DOT-3A150; DOT-3B150; DOT-4A150; and DOT-4B150 manufactured prior to Dec. 7, 1936 are also authorized.
Methyl mercaptan .....	80 .....	DOT-3A240; DOT-3AA240; DOT-3B240; DOT-4B240; DOT-4B240ET; DOT-3E1800; DOT-4BA240; DOT-4BW240.
Nitrosyl chloride .....	110 .....	DOT-3BN400 only.
Nitrous oxide (see Notes 7, 8, and 11) .....	68 .....	DOT-3A1800; DOT-3AX1800; DOT-3AA1800; DOT-3AAX1800; DOT-3; DOT-3E1800; DOT-3T1800; DOT-3HT2000; DOT-39; DOT-3AL1800.
Nitrous oxide, refrigerated liquid (see paragraph (e) of this section.)	.....	DOT-4L.
Refrigerant gas, n.o.s. or Dispersant gas, n.o.s. (see Notes 8 and 13).	Not liquid full at 130°F .....	DOT-3A240; DOT-3AA240; DOT-3B240; DOT-3E1800; DOT-4A240; DOT-4B240; DOT-4BA240; DOT-4BW240; DOT-4E240; DOT-9; DOT-39; DOT-3AL240.
Sulfur dioxide (see note 8) .....	125 .....	DOT-3A225; DOT-3AA225; DOT-3B225; DOT-4A225; DOT-4B225; DOT-4BA225; DOT-4BW225; DOT-4B240ET; DOT-3; DOT-4; DOT-38; DOT-39; DOT-3E1800; DOT-3AL225.
Sulfur hexafluoride .....	120 .....	DOT-3A1000; DOT-3AA1000; DOT-AAX2400; DOT-3; DOT-3AL1000; DOT-3E1800; DOT-3T1800.
Sulfuryl fluoride .....	106 .....	DOT-3A480; DOT-3AA480; DOT-3E1800; DOT-4B480; DOT-4BA480; DOT-4BW480.
Tetrafluoroethylene/inhibit .....	90 .....	DOT-3A1200; DOT-3AA1200; DOT-3E1800.
Trifluorochloroethylene, inhibited .....	115 .....	DOT-3A300; DOT-3AA300; DOT-3B300; DOT-4A300; DOT-4B300; DOT-4BA300; DOT-4BW300; DOT-3E1800.
Trimethylamine, anhydrous .....	57 .....	DOT-3A150; DOT-3AA150; DOT-3B150; DOT-4B150; DOT-4BA225; DOT-4BW225; DOT-3E1800.
Vinyl chloride (see Note 5) .....	84 .....	DOT-4B150 without brazed seams; DOT-4BA225 without brazed seams; DOT-4BW225; DOT-3A150; DOT-3AA150; DOT-3E1800; DOT-3AL150.
Vinyl fluoride, inhibited .....	62 .....	DOT-3A1800; DOT-3AA1800; DOT-3E1800; DOT-3AL1800.
Vinyl methyl ether, inhibited (see Note 5) .....	68 .....	DOT-4B150, without brazed seams; DOT-4BA225 without brazed seams; DOT-4BW225; DOT-3A150; DOT-3AA150; DOT-3B1800; DOT-3E1800.

**Note 1:** "Filling density" means the percent ratio of the weight of gas in a packaging to the weight of water that the container will hold at 16° C (60° F). (1 lb of water=27.737 in<sup>3</sup> at 60° F.)

**Note 2:** Cylinders purchased after Oct. 1, 1944, for the transportation of chlorine must contain no aperture other than that provided in the neck of the cylinder for attachment of a valve equipped with an approved pressure relief device. Cylinders purchased after Nov. 1, 1935, and filled with chlorine may not contain over 68.04 kg (150 lb) of gas.

**Note 3:** [Reserved]

**Note 4:** Special carbon dioxide mining devices containing a heating element and filled with not over 2.72 kg (6 lb) of carbon dioxide may be filled to a density of not over 85 percent, provided the cylinder is made of steel with a calculated bursting pressure in excess of 39000 psig, fitted with a frangible disc that will operate at not over 57 percent of that pressure, and is able to withstand a drop of 10 feet when striking crosswise on a steel rail while under a pressure of at least 3000 psig. Such devices must be shipped in strong boxes or must be wrapped in heavy burlap and bound by 12-gauge wire with the wire completely covered by friction tape. Wrapping must be applied so as not to interfere with the functioning of the frangible disc pressure relief device. Shipments must be described as "liquefied carbon dioxide gas (mining device)" and marked, labeled, and certified as prescribed for liquefied carbon dioxide.

**Note 5:** All parts of valve and pressure relief devices in contact with contents of cylinders must be of a metal or other material, suitably treated if necessary, that will not cause formation of any acetylides.

**Note 6:** [Reserved]

**Note 7:** Specification 3HT cylinders for aircraft use only, having a maximum service life of 24 years. Authorized only for nonflammable gases. Cylinders must be equipped with pressure relief devices of the frangible disc type that meet the requirements of § 173.301(f). Each frangible disc must have a rated bursting pressure that does not exceed 90 percent of the minimum required test pressure of the cylinder. Discs with fusible metal backing are not permitted. Cylinders may be shipped only when packed in strong outside packagings.

**Note 8:** See § 173.301(a)(8).

**Note 9:** [Reserved]

**Note 10:** Each valve outlet must be sealed by a threaded cap or a threaded solid plug.

**Note 11:** Must meet the valve and cleaning requirements in § 173.302(b).

**Note 12:** For an insecticide gas that is nontoxic and nonflammable, see § 173.305(c).

**Note 13:** For a refrigerant or dispersant gas that is nontoxic and nonflammable, see § 173.304(d).

(b) [Reserved]  
 (c) *Verification of content in cylinder.* Except as noted in paragraph (d)(4) of this section, the amount of liquefied gas filled into a cylinder must be by weight or, when the gas is lower in pressure than required for liquefaction, a pressure-temperature chart for the specific gas may be used to ensure that the service pressure at 54° C (130° F) will not exceed 5/4 of the service pressure at 21° C (70° F). The weight of liquefied gas filled into the cylinder also must be checked, after disconnecting the cylinder from the filling line, by the use of an accurate scale.

(d) Requirements for liquefied petroleum gas. (1) Filling density limits are as follows:

Minimum specific gravity of liquid material at 60° F	Maximum the filling density in percent of the water-weight capacity of the cylinder
0.271 to 0.289 .....	26
0.290 to 0.306 .....	27
0.307 to 0.322 .....	28
0.323 to 0.338 .....	29

Minimum specific gravity of liquid material at 60° F	Maximum the filling density in percent of the water-weight capacity of the cylinder
0.339 to 0.354 .....	30
0.355 to 0.371 .....	31
0.372 to 0.398 .....	32
0.399 to 0.425 .....	33
0.426 to 0.440 .....	34
0.441 to 0.452 .....	35
0.453 to 0.462 .....	36
0.463 to 0.472 .....	37
0.473 to 0.480 .....	38
0.481 to 0.488 .....	39
0.489 to 0.495 .....	40
0.496 to 0.503 .....	41
0.504 to 0.510 .....	42
0.511 to 0.519 .....	43
0.520 to 0.527 .....	44
0.528 to 0.536 .....	45
0.537 to 0.544 .....	46
0.545 to 0.552 .....	47
0.553 to 0.560 .....	48
0.561 to 0.568 .....	49
0.569 to 0.576 .....	50
0.577 to 0.584 .....	51
0.585 to 0.592 .....	52
0.593 to 0.600 .....	53
0.601 to 0.608 .....	54
0.609 to 0.617 .....	55

Minimum specific gravity of liquid material at 60° F	Maximum the filling density in percent of the water-weight capacity of the cylinder
0.618 to 0.626 .....	56
0.627 to 0.634 .....	57

(2) Subject to § 173.301a(d), any filling density percentage prescribed in this section is authorized to be increased by a factor of 2 for liquefied petroleum gas in DOT 3 cylinders or in DOT 3A cylinders marked for 1800 psig, or higher, service pressure.

(3) Liquefied petroleum gas must be shipped in specification cylinders as follows:

(i) DOT 3, 3A, 3AA, 3B, 3E, 3AL, 4B, 4BA, 4B240ET, 4BW, 4E, or 39 cylinders. Shipments of flammable gases in DOT 3AL cylinders are authorized only when transported by motor vehicle, rail car, or cargo-only aircraft.

(ii) Additional containers may be used within the limits of quantity and pressure as follows:

Type of container	Maximum capacity (cubic inches)	Maximum filling pressure (psig)
DOT-2P or DOT-2Q (see Note 1) .....	31.83	45 psig at 70° F and 105 psig at 130° F (see Note 2).
DOT-2P or DOT-2Q (see Note 1) .....	31.83	35 psig at 70° F and 100 psig at 130° F.

**Note 1:** Containers must be packed in strong wooden or fiber boxes of such design as to protect valves from damage or accidental functioning under conditions normally incident to transportation. Each completed container filled for shipment must have been heated until its contents reach a temperature of 54° C (130° F), without evidence of leakage, distortion, or other defect. Each outside shipping container must be plainly marked "INSIDE CONTAINERS COMPLY WITH PRESCRIBED SPECIFICATIONS".

**Note 2:** A container must be equipped with a pressure relief device that will prevent rupture of the container and dangerous projection of a closing device when exposed to fire.

(4) *Verification of content.* A cylinder with a water capacity of 90.72 kg (200 lb) or more and for use with a liquefied petroleum gas with a specific gravity of 9.504 or greater at 16° C (60° F) may have the quantity of its contents determined by using a fixed length dip tube gauging device. The length of the dip tube must be such that when a liquefied petroleum gas, with a specific volume of 0.03051 cu. ft./lb. at a temperature of 40° F, is filled into the container, the liquid just reaches the bottom of the tube. The weight of this liquid may not exceed 42 percent of the water capacity of the container, which must be stamped on the cylinder. The length of the dip tube, expressed in inches carried out to one decimal place and prefixed with the letters "DT", must be stamped on the container and on the exterior of removable type dip tube. For the purpose of this requirement, the marked length must be expressed as the distance measured along the axis of a straight tube from the top of the boss

through which the tube is inserted to the proper level of the liquid in the container. The length of each dip tube must be checked when installed by weighing each container after filling except when installed in groups of substantially identical containers, in which case one of each 25 containers must be weighed. The quantity of liquefied gas in each container must be checked by means of the dip tube after disconnecting from the filling line. The outlet from the dip tube may not be larger than 0.1016 centimeters (0.040 inch; No. 54 drill bit size orifice). A container representative of each day's filling at each filling plant must have its contents checked by weighing after disconnecting from the filling line.

(e) *Carbon dioxide, refrigerated liquid or nitrous oxide, refrigerated liquid.* (1) The following provisions apply to carbon dioxide, refrigerated liquid, and nitrous oxide, refrigerated liquid:

(i) DOT 4L cylinders conforming to the provisions of this paragraph are authorized.

(ii) Each cylinder must be protected with at least one pressure relief device and at least one frangible disc conforming to § 173.301(f) and paragraph (a)(2) of this section. The relieving capacity of the pressure relief device system must be equal to or greater than that calculated by the applicable formula in paragraph 5.9 of CGA Pamphlet S-1.1 (incorporated by reference; see § 171.7 of this subchapter).

(iii) The temperature and pressure of the gas at the time the shipment is offered for transportation may not exceed -18° C (0° F) and 290 psig for carbon dioxide and -15.6° C (+4° F) and 290 psig for nitrous oxide. Maximum time in transit may not exceed 120 hours.

(2) The following pressure relief device settings, design service temperatures and filling densities apply:

Pressure relief device setting maximum start—to discharge gauge pressure inpsig	Maximum permitted filling density (percent by weight)	
	Carbon dioxide, refrigerated liquid	Nitrous oxide, refrigerated liquid
105 psig .....	108	104
170 psig .....	105	101
230 psig .....	104	99
295 psig .....	102	97
360 psig .....	100	95
450 psig .....	98	83
540 psig .....	92	87
625 psig .....	86	80
Design service temperature ° C(° F) .....	− 196 ° C(− 320 ° F)	− 196 ° C(− 320 ° F)

**§ 173.304b [Reserved]**

31. Section 173.304b is added and reserved.

32. In § 173.305, the parenthetical phrase in paragraph (b) is revised to read as follows:

**§ 173.305 Charging of cylinders with a mixture of compressed gas and other material.**

\* \* \* \* \*

(b) *Filling limits.* (See § 173.301.)

\* \* \* \* \*

\* \* \* \* \*

33. In § 173.306, paragraph (g)(5) is revised to read as follows:

**§ 173.306 Limited quantities of compressed gases.**

\* \* \* \* \*

(g) \* \* \*

(5) Each tank must be overpacked in a strong outside container in accordance with § 173.301(a)(8).

\* \* \* \* \*

34. In § 173.315, in paragraph (a), in Note 2 following the table, the reference “§ 173.301(d)” is revised to read “paragraph (q) of this section”, and paragraph (q) is added to read as follows:

**§ 173.315 Compressed gases in cargo tanks and portable tanks.**

\* \* \* \* \*

(q) Manifolding is authorized for cargo tanks containing anhydrous ammonia provided each individual cargo tank is equipped with a pressure relief device or valves and gauging devices as required by paragraphs (h) and (i) of this section. Each valve must be tightly closed while the cargo tank is in transit. Each cargo tank must be filled separately.

35. Section 173.334 is revised to read as follows:

**§ 173.334 Organic phosphates mixed with compressed gas.**

Hexaethyl tetraphosphate, parathion, tetraethyl dithio pyrophosphate, tetraethyl pyrophosphate, or other Division 6.1 organic phosphates

(including a compound or mixture), may be mixed with a non-flammable compressed gas. This mixture may not contain more than 20 percent by weight of organic phosphate and must be packaged in DOT 3A240, 3AA240, 3B240, 4A240, 4B240, 4BA240, or 4BW240 cylinders meeting all of the following requirements:

(a) Each cylinder may be filled with not more than 5 kg (11.0 lb) of the mixture, to a maximum filling density of not more than 80 percent of the water capacity.

(b) No cylinder may be equipped with an education tube or a fusible plug.

(c) No cylinder may be equipped with any valve unless the valve is a type approved by the Associate Administrator.

(d) Cylinders must be overpacked in a box, crate, or other strong outside packaging conforming to the requirements of § 173.25 and arranged to protect each valve or other closing device from damage. Except as provided in paragraph (e) of this section, no more than four cylinders may be packed in a strong outside packaging. Each strong outside packaging with its closing device protection must be sufficiently strong to protect all parts of each cylinder from deformation or leakage if the completed package is dropped 1.8 m (6 feet) onto a non-yielding surface, such as concrete or steel, impacting at the packaging’s weakest point.

(e) Cylinders may be packed in strong wooden boxes with valves or other closing devices protected from damage, with not more than twelve cylinders in one outside wooden box. An outer fiberboard box may be used when not more than four such cylinders are to be shipped in one packaging. Valves must be adequately protected. Box and valve protection must be of sufficient strength to protect all parts of inner packaging and valves from deformation or breakage resulting from a drop of at least 1.8 m (6 feet) onto a non-yielding surface, such as concrete or steel, impacting at the weakest point.

36. Section 173.336 is revised to read as follows:

**§ 173.336 Nitrogen dioxide, liquefied, or dinitrogen tetroxide, liquefied.**

Nitrogen dioxide, liquefied, or dinitrogen tetroxide, liquefied, must be packaged in specification cylinders as prescribed in § 173.192. Specification cylinders prescribed in § 173.192 with valve removed are authorized. Each valve opening must be closed by means of a solid metal plug with tapered thread properly luted to prevent leakage. Transportation in DOT 3AL cylinders is authorized only by highway or rail. Each cylinder must be cleaned in compliance with the requirements of Federal Specification RR-C-901C, paragraphs 3.3.1 and 3.3.2 (incorporated by reference; see § 171.7 of this subchapter). Cleaning agents equivalent to those specified in RR-C-901C may be used; however, any cleaning agent must not be capable of reacting with oxygen. One cylinder selected at random from a group of 200 or fewer and cleaned at the same time must be tested for oil contamination in accordance with Specification RR-C-901C, paragraphs 4.4.2.2 (incorporated by reference; see § 171.7 of this subchapter) and meet the standard of cleanliness specified therein.

37. Section 173.337 is revised to read as follows:

**§ 173.337 Nitric oxide.**

Nitric oxide must be packed in DOT 3A1800, 3AA1800, 3E1800, or 3AL1800 cylinders conforming to the requirements of § 173.40. Cylinders must be equipped with a stainless steel valve and valve seat that will not deteriorate if in contact with nitric oxide or nitrogen dioxide. Cylinders or valves may not be equipped with pressure relief devices of any type. In addition—

(a) Transportation in DOT 3AL or 3ALM cylinders is authorized only by highway or rail.

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

**PART 177 —CARRIAGE BY PUBLIC HIGHWAY**

38. The authority citation for part 177 continues to read as follows:

**Authority:** 49 U.S.C. 5101-5127; 49 CFR 1.53.

39. In § 177.840, paragraph (a)(1) is revised to read as follows:

**§ 177.840 Class 2 (gases) materials.**

\* \* \* \* \*

(a) \* \* \*

(1) *Cylinders.* Cylinders containing Class 2 (gases) materials must be securely restrained in an upright position, loaded in racks, or packed in boxes or crates and securely attached to the motor vehicle to prevent the cylinders from being shifted, overturned or ejected from the vehicle under normal transportation conditions. A cylinder containing a Class 2 material may be loaded in a horizontal position when the cylinder is designed so that the inlet port to the relief channel of the pressure relief device is located in the vapor space of the cylinder.

\* \* \* \* \*

**PART 178—SPECIFICATIONS FOR PACKAGINGS**

40. The authority citation for part 178 continues to read as follows:

**Authority:** 49 U.S.C. 5101-5127; 49 CFR 1.53.

41. In § 178.35, paragraphs (b) introductory text, (b)(1), (c)(3)(iv), (d), (e), and (f)(3) are revised to read as follows:

**§ 178.35 General requirements for specification cylinders.**

\* \* \* \* \*

(b) *Inspections and analyses.* Chemical analyses and tests required by this subchapter must be made within the United States, unless otherwise approved in writing by the Associate Administrator, in accordance with subpart I of part 107 of this chapter. Inspections and verification must be performed by—

(1) An independent inspection agency approved in writing by the Associate Administrator, in accordance with subpart I of part 107 of this chapter; or  
\* \* \* \* \*

(c) \* \* \*

(3) \* \* \*

(iv) Obtaining samples for all tests and check chemical analyses (**Note:** Recommended locations for test specimens taken from welded cylinders are depicted in Figures 1 through 5 in Appendix C to this subpart for the specific construction design.);  
\* \* \* \* \*

(d) *Defects and attachments.* Cylinders must conform to the following:

(1) A cylinder may not be constructed of material with seams, cracks or laminations, or other injurious defects.

(2) Metal attachments to cylinders must have rounded or chamfered corners or must be protected in such a manner as to prevent the likelihood of causing puncture or damage to other hazardous materials packages. This requirement applies to anything temporarily or permanently attached to the cylinder, such as metal skids.

(e) *Safety devices.* Pressure relief devices and protection for valves, safety devices, and other connections, if applied, must be as required or authorized by the appropriate specification, and as required in § 173.301 of this subchapter.

(f) \* \* \*

(3) *Marking exceptions.* A DOT 3E cylinder is not required to be marked with an inspector's mark or a serial number.  
\* \* \* \* \*

**§ 178.36 [Amended]**

42. In § 178.36, in paragraph (k)(3)(i), the wording "ASTM Standard E8" is revised to read "ASTM E 8 (incorporated by reference; see § 171.7 of this subchapter)".

**§ 178.37 [Amended]**

43. In § 178.37, in paragraph (k)(3)(i), the wording "ASTM Standard E8" is revised to read "ASTM E 8

(incorporated by reference; see § 171.7 of this subchapter)".

**§ 178.38 [Amended]**

44. In § 178.38, in paragraph (k)(3)(i), the wording "ASTM Standard E8" is revised to read "ASTM E 8 (incorporated by reference; see § 171.7 of this subchapter)".

**§ 178.39 [Amended]**

45. In § 178.39, in paragraph (k)(3)(i), the wording "ASTM Standard E8" is revised to read "ASTM E 8 (incorporated by reference; see § 171.7 of this subchapter)".

**§ 178.44 [Amended]**

46. In § 178.44, in paragraph (m)(3)(i), the wording "ASTM Standard E8" is revised to read "ASTM E 8 (incorporated by reference; see § 171.7 of this subchapter)".

47. In § 178.45, paragraphs (h) and (j)(3)(i) are revised to read as follows:

**§ 178.45 Specification 3T seamless steel cylinder.**

\* \* \* \* \*

(h) *Ultrasonic examination.* After the hydrostatic test, the cylindrical section of each vessel must be examined in accordance with ASTM Standard E 213 (incorporated by reference; see § 171.7 of this subchapter). The equipment used must be calibrated to detect a notch equal to five percent of the design minimum wall thickness. Any discontinuity indication greater than that produced by the five percent notch must be cause for rejection of the cylinder, unless the discontinuity is repaired within the requirements of this specification.

\* \* \* \* \*

(j) *Basic conditions for acceptable physical testing.* \* \* \*

(3) \* \* \*

(i) This yield strength must be determined by the "offset" method or the "extension under load" method described in ASTM E 8 (incorporated by reference; see § 171.7 of this subchapter).  
\* \* \* \* \*

48. In § 178.46, in paragraph (b)(4), in Table 2, the entry "6351-T6" is removed, and Table 1 is revised to read as follows:

**§ 178.46 Specification 3AL seamless aluminum cylinders.**

\* \* \* \* \*

(b) \* \* \*

(4) \* \* \*

TABLE 1.—HEAT OR CAST ANALYSIS FOR ALUMINUM; SIMILAR TO “ALUMINUM ASSOCIATION”<sup>1</sup> ALLOY 6061  
[CHEMICAL ANALYSIS IN WEIGHT PERCENT<sup>2</sup>]

Si min/max	Fe max	Cu min/max	Mn max	Mg min/max	Cr min/max	Zn max	Ti max	Pb max	Bi max	Other		A1
										each max	total max	
0.4/0.8	0.7	0.15/0.4	0.15	0.8/1.2	0.04/0.35	0.25	0.15	0.005	0.005	0.05	0.15	Bal.

<sup>1</sup> The “Aluminum Association” refers to “Aluminum Standards and Data 1993”, published by the Aluminum Association Inc.

<sup>2</sup> Except for “Pb” and “Bi”, the chemical composition corresponds with that of Table 1 of ASTM B221 for Aluminum Association alloy 6061.

\* \* \* \* \*

**§ 178.47 [Amended]**

49. In § 178.47, in the fourth sentence of paragraph (d), the wording “CGA Pamphlet C-3” is revised to read “CGA Pamphlet C-3 (incorporated by reference; see § 171.7 of this subchapter)”.

**§ 178.50 [Amended]**

50. In § 178.50, the following changes are made:

a. In paragraph (d) introductory text, in the fifth sentence, the wording “CGA Pamphlet C-3” is revised to read “CGA Pamphlet C-3 (incorporated by reference; see § 171.7 of this subchapter)”.

b. In paragraph (k)(3)(i), the wording “ASTM Standard E8” is revised to read “ASTM E 8 (incorporated by reference; see § 171.7 of this subchapter)”.

**§ 178.51 [Amended]**

51. In § 178.51, the following changes are made:

a. In paragraph (d)(2), the wording “CGA Pamphlet C-3” is revised to read “CGA Pamphlet C-3 (incorporated by reference; see § 171.7 of this subchapter)”.

b. In paragraph (j)(3)(i), the wording “ASTM Standard E8” is revised to read “ASTM E 8 (incorporated by reference; see § 171.7 of this subchapter)”.

c. In paragraph (l)(1), in the fourth sentence, the wording “CGA Pamphlet C-3” is revised to read “CGA Pamphlet C-3 (incorporated by reference; see § 171.7 of this subchapter)”.

d. In paragraph (l)(2), in the last sentence, the wording “CGA Pamphlet C-3” is revised to read “CGA Pamphlet C-3 (incorporated by reference; see § 171.7 of this subchapter)”.

e. In paragraph (l)(3), in the first sentence, the wording “CGA Pamphlet C-3” is revised to read “CGA Pamphlet C-3 (incorporated by reference; see § 171.7 of this subchapter)”.

**§ 178.53 [Amended]**

52. In § 178.53, the following changes are made:

a. In paragraph (d), in the last sentence, the wording “CGA Pamphlet

C-3” is revised to read “CGA Pamphlet C-3 (incorporated by reference; see § 171.7 of this subchapter)”.

b. In paragraph (j)(5)(i), the wording “ASTM Standard E8” is revised to read “ASTM E 8 (incorporated by reference; see § 171.7 of this subchapter)”.

**§ 178.55 [Amended]**

53. In § 178.55, in paragraph (k)(3)(i), the wording “ASTM Standard E8” is revised to read “ASTM E 8 (incorporated by reference; see § 171.7 of this subchapter)”.

**§ 178.56 [Amended]**

54. In § 178.56, the following changes are made:

a. In paragraph (j)(3)(i), the wording “ASTM Standard E8” is revised to read “ASTM E 8 (incorporated by reference; see § 171.7 of this subchapter)”.

b. In paragraph (l)(1), in the fourth sentence the wording “CGA Pamphlet C-3” is revised to read “CGA Pamphlet C-3 (incorporated by reference; see § 171.7 of this subchapter)”.

c. In paragraph (l)(2), in the last sentence, the wording “CGA Pamphlet C-3” is revised to read “CGA Pamphlet C-3 (incorporated by reference; see § 171.7 of this subchapter)”.

d. In paragraph (l)(3), in the first sentence, the wording “CGA Pamphlet C-3” is revised to read “CGA Pamphlet C-3 (incorporated by reference; see § 171.7 of this subchapter)”.

55. In § 178.57, the first sentence in paragraph (d)(5), the first sentence in paragraph (e)(3), paragraph (j)(3)(i), the fourth sentence in paragraph (l)(1), the last sentence in paragraph (l)(2), the first sentence in paragraph (l)(3), the first sentence in paragraph (l)(4)(v), the second sentence in paragraph (l)(4)(vi), paragraph (m)(1), and the first sentence in paragraph (o)(1) are revised to read as follows:

**§ 178.57 Specification 4L welded insulated cylinders.**

\* \* \* \* \*

(d) \* \* \*

(5) Welding procedures and operations must be qualified in accordance with CGA Pamphlet C-3

(incorporated by reference; see § 171.7 of this subchapter). \* \* \*

(e) \* \* \*

(3) For welding the cylinder, each procedure and operator must be qualified in accordance with the sections of CGA Pamphlet C-3 (incorporated by reference; see § 171.7 of this subchapter) that apply. \* \* \*

\* \* \* \* \*

(j) \* \* \*

(3) \* \* \*

(i) The yield strength must be determined by either the “offset” method or the “extension under load” method as prescribed in ASTM E 8 (incorporated by reference; see § 171.7 of this subchapter).

\* \* \* \* \*

(l) \* \* \*

(1) *Tensile test.* \* \* \* The specimen must be taken across the major seam and must be prepared in accordance with and must meet the requirements of CGA Pamphlet C-3 (incorporated by reference; see § 171.7 of this subchapter). \* \* \*

(2) *Guided bend test.* \* \* \* Specimens must be taken across the particular seam being tested and must be prepared and tested in accordance with and must meet the requirements of CGA Pamphlet C-3 (incorporated by reference; see § 171.7 of this subchapter).

(3) *Alternate guided-bend test.* This test may be used and must be as specified in CGA Pamphlet C-3 (incorporated by reference; see § 171.7 of this subchapter). \* \* \*

(4) *Impact tests.* \* \* \*

(v) All impact test specimens must be of the charpy type, keyhole or milled U-notch, and must conform in all respects to ASTM E 23 (incorporated by reference; see § 171.7 of this subchapter). \* \* \*

(vi) \* \* \* The apparatus for testing the specimens must conform to requirements of ASTM Standard E 23 (incorporated by reference; see § 171.7 of this subchapter). \* \* \*

\* \* \* \* \*

(m) *Radiographic examination.* \* \* \*

(1) The techniques and acceptability of radiographic inspection must conform to the standards set forth in CGA Pamphlet C-3 (incorporated by reference; see § 171.7 of this subchapter).

\* \* \* \* \*

(o) \* \* \*

(1) *Inner containment vessel (cylinder)*. Electric furnace steel of uniform quality must be used. Chemical analysis must conform to ASTM A 240/A 240M (incorporated by reference; see § 171.7 of this subchapter), Type 304 stainless steel. \* \* \*

\* \* \* \* \*

**§ 178.58 [Amended]**

56. In § 178.58, the following changes are made:

a. In paragraph (d)(1), in the last sentence, the wording “CGA Pamphlet C-3” is revised to read “CGA Pamphlet C-3 (incorporated by reference; see § 171.7 of this subchapter)”.

b. In paragraph (m)(5)(i), the wording “ASTM Standard E8” is revised to read “ASTM E 8 (incorporated by reference; see § 171.7 of this subchapter)”.

**§ 178.59 [Amended]**

57. In § 178.59, the following changes are made:

a. In paragraph (d), in the last sentence, the wording “CGA Pamphlet C-3” is revised to read “CGA Pamphlet C-3 (incorporated by reference; see § 171.7 of this subchapter)”.

b. In paragraph (j)(3)(i), the wording “ASTM Standard E8” is revised to read “ASTM E 8 (incorporated by reference; see § 171.7 of this subchapter)”.

**§ 178.60 [Amended]**

58. In § 178.60, the following changes are made:

a. In paragraph (d), in the last sentence, the wording “CGA Pamphlet C-3” is revised to read “CGA Pamphlet C-3 (incorporated by reference; see § 171.7 of this subchapter)”.

b. In paragraph (l)(3)(i), the wording “ASTM Standard E8” is revised to read “ASTM E 8 (incorporated by reference; see § 171.7 of this subchapter)”.

c. In paragraph (n)(1), in the second sentence, the wording “CGA Pamphlet C-3” is revised to read “CGA Pamphlet C-3 (incorporated by reference; see § 171.7 of this subchapter)”.

d. In paragraph (n)(2), in the last sentence, the wording “CGA Pamphlet C-3” is revised to read “CGA Pamphlet C-3 (incorporated by reference; see § 171.7 of this subchapter)”.

e. In paragraph (n)(3), in the first sentence, the wording “CGA Pamphlet C-3” is revised to read “CGA Pamphlet C-3 (incorporated by reference; see § 171.7 of this subchapter)”.

**§ 178.61 [Amended]**

59. In § 178.61, the following changes are made:

a. In paragraph (d)(4), the wording “CGA Pamphlet C-3” is revised to read “CGA Pamphlet C-3 (incorporated by reference; see § 171.7 of this subchapter)”.

b. In paragraph (j)(3)(i), the wording “ASTM Standard E8” is revised to read “ASTM E 8 (incorporated by reference; see § 171.7 of this subchapter)”.

c. In paragraph (l)(1), in the last sentence, the wording “CGA Pamphlet C-3” is revised to read “CGA Pamphlet C-3 (incorporated by reference; see § 171.7 of this subchapter)”.

d. In paragraph (l)(2), in the last sentence, the wording “CGA Pamphlet C-3” is revised to read “CGA Pamphlet C-3 (incorporated by reference; see § 171.7 of this subchapter)”.

e. In paragraph (l)(3), in the first sentence, the wording “CGA Pamphlet C-3” is revised to read “CGA Pamphlet C-3 (incorporated by reference; see § 171.7 of this subchapter)”.

f. In paragraph (m)(1), in the first sentence, the wording “CGA Pamphlet C-3” is revised to read “CGA Pamphlet C-3 (incorporated by reference; see § 171.7 of this subchapter)”.

**§ 178.65 [Amended]**

60. In § 178.65, in paragraph (c)(4), the wording “CGA Pamphlet C-3” is revised to read “CGA Pamphlet C-3 (incorporated by reference; see § 171.7 of this subchapter)”.

**§ 178.68 [Amended]**

61. In § 178.68, the following changes are made:

a. In paragraph (j)(3)(i), the wording “ASTM Standard E8” is revised to read “ASTM E 8 (incorporated by reference; see § 171.7 of this subchapter)”.

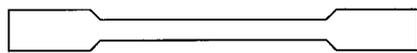
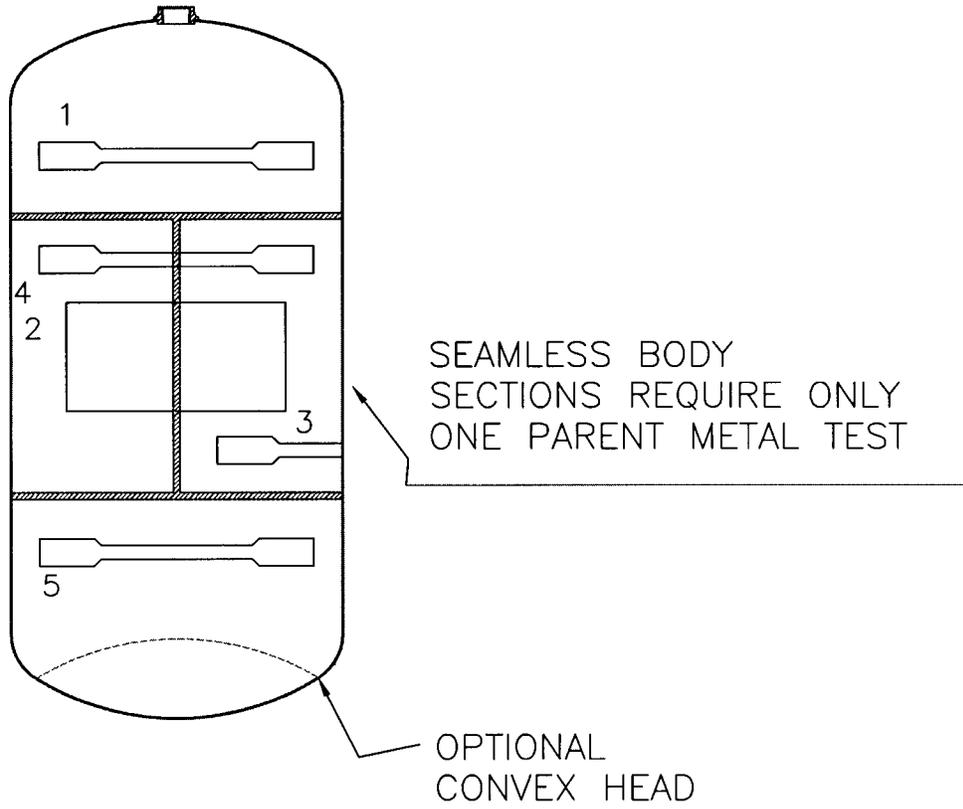
b. In paragraph (l)(2), in the third sentence, the wording “CGA Pamphlet C-3” is revised to read “CGA Pamphlet C-3 (incorporated by reference; see § 171.7 of this subchapter)”.

62. Appendix A is added to subpart C of part 178, to read as follows:

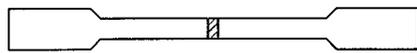
**Appendix A to Subpart C of Part 178—  
Illustrations: Cylinder Tensile Sample**

The following figures illustrate the recommended locations for test specimens taken from welded cylinders:

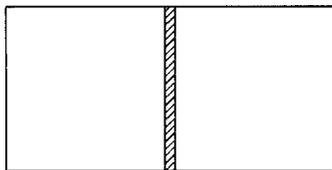
**BILLING CODE 4910-60-P**



PARENT MATERIAL TEST  
SAMPLE 1 & 3 & 5



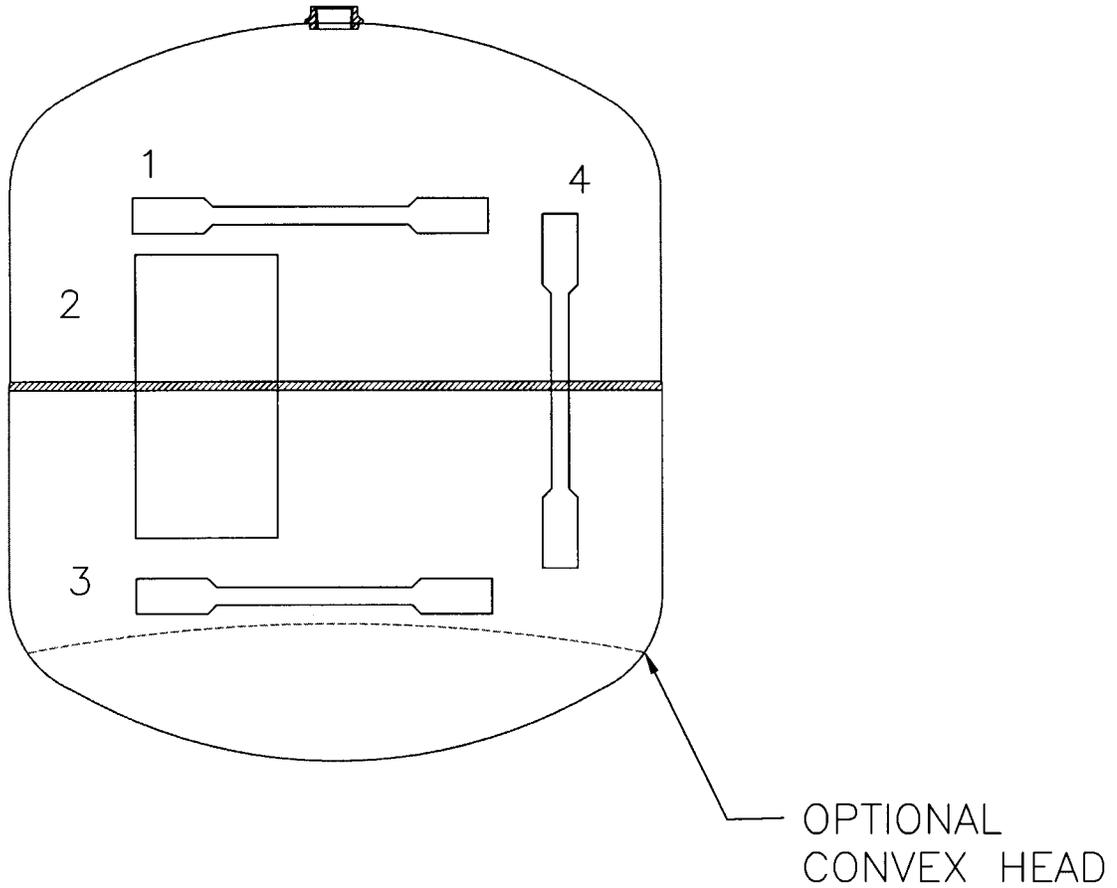
WELD TENSILE TEST  
SAMPLE 4

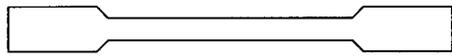


WELD BEND TEST  
SAMPLE 2

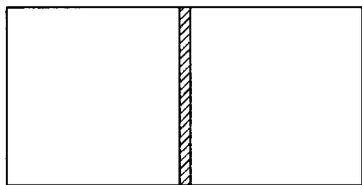
THIS FIGURE ILLUSTRATES THE PROPER TENSILE LOCATION FOR A 3 PIECE CYLINDER WITH THE HEADS HAVING STRAIGHT SIDEWALL.

FIGURE #1



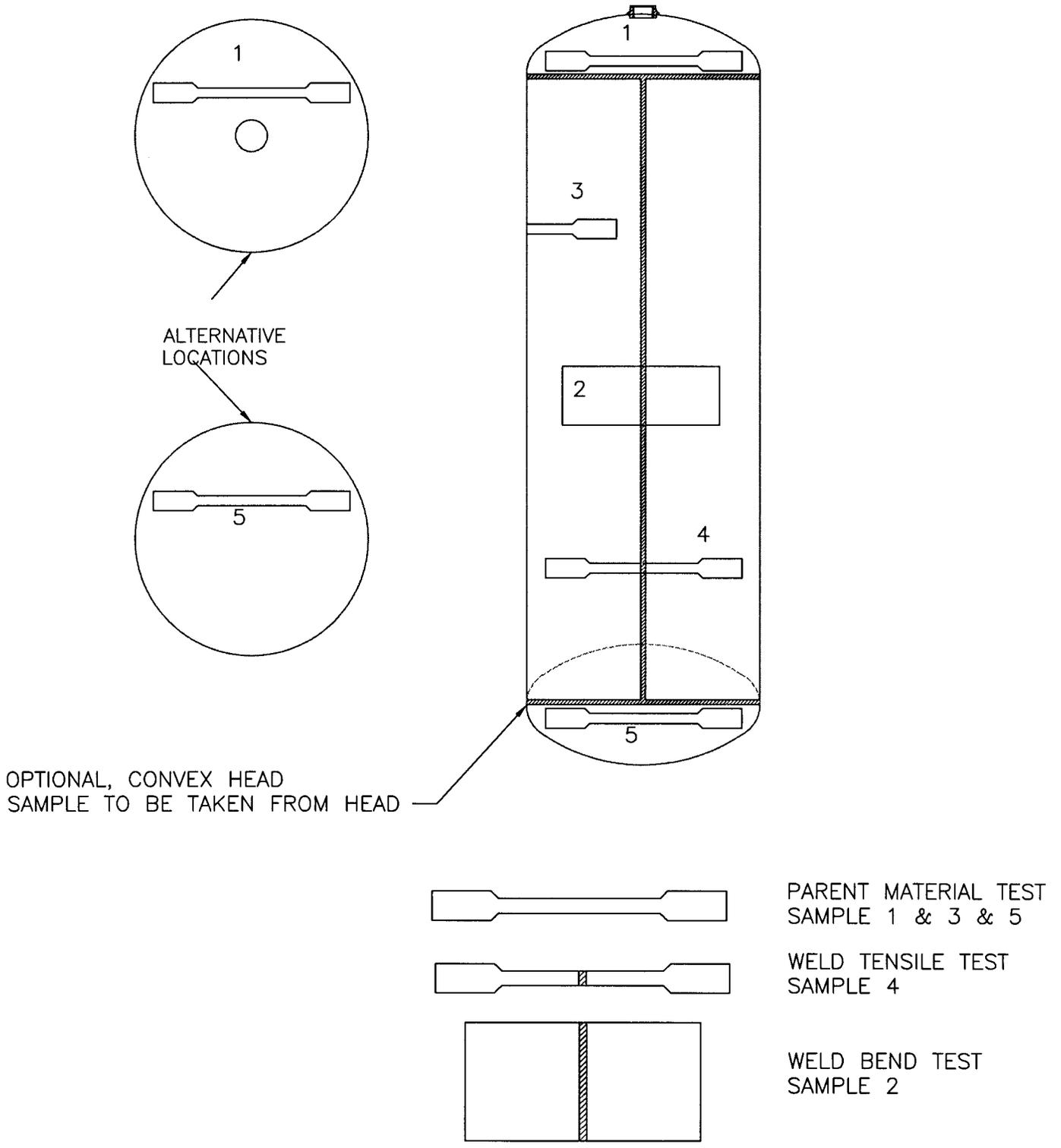
 PARENT MATERIAL TENSILE TEST SAMPLE 1 & 3

 WELD TENSILE TEST SAMPLE 4

 WELD BEND TEST SAMPLE 2

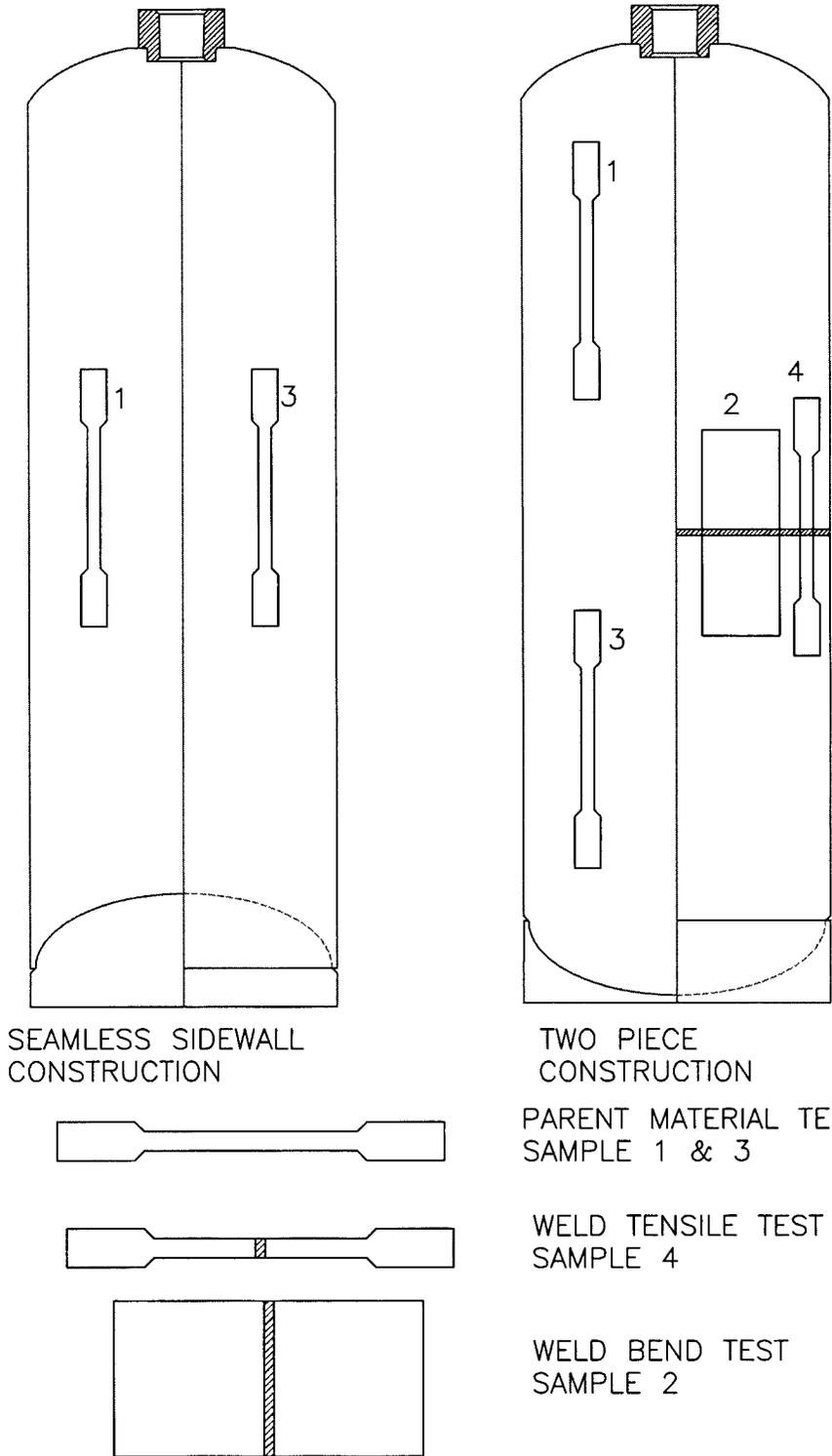
THIS FIGURE ILLUSTRATES THE PROPER TENSILE LOCATION FOR A 2 PIECE CYLINDER WITH THE HEADS HAVING STRAIGHT SIDEWALLS.

FIGURE #2



THIS FIGURE ILLUSTRATES THE PROPER TENSILE LOCATION FOR A 2 PIECE CYLINDER THAT HAVE DEEP DRAWN HEADS.

FIGURE #3



SEAMLESS SIDEWALL CONSTRUCTION

TWO PIECE CONSTRUCTION

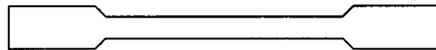
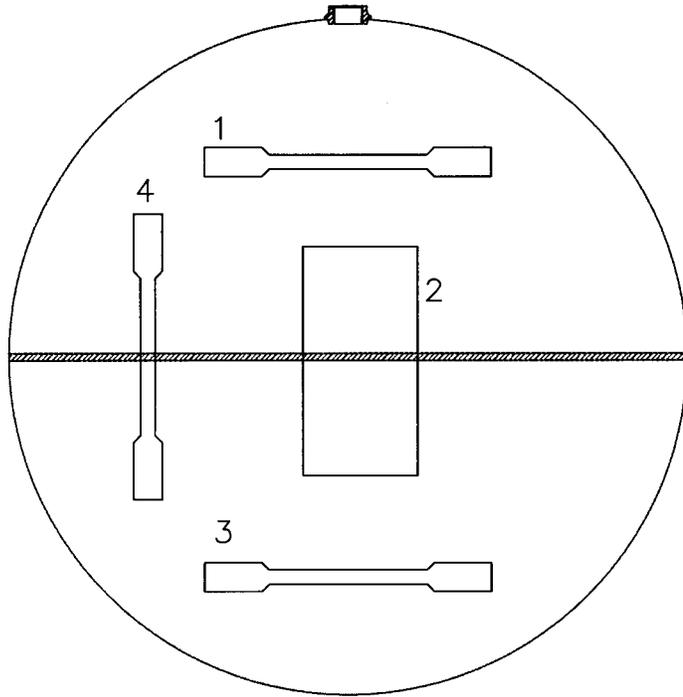
PARENT MATERIAL TEST SAMPLE 1 & 3

WELD TENSILE TEST SAMPLE 4

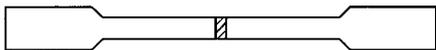
WELD BEND TEST SAMPLE 2

THIS FIGURE ILLUSTRATES THE PROPER TENSILE LOCATION FOR A 2 PIECE CYLINDER THAT HAVE DEEP DRAWN HEADS.

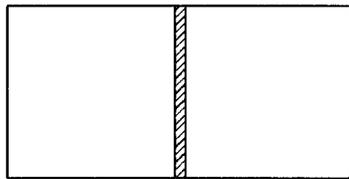
FIGURE #4



PARENT MATERIAL TEST  
SAMPLE 1 & 3



WELD TENSILE TEST  
SAMPLE 4



WELD BEND TEST  
SAMPLE 2

THIS FIGURE ILLUSTRATES THE PROPER TENSILE  
LOCATION FOR A 2 PIECE CYLINDER.

FIGURE #5

**§ 178.358-5 [Amended]**

63. In § 178.358-5, in paragraph (c), the wording “ASTM A-240, Type 304L” is revised to read “ASTM A 240/A 240M (incorporated by reference; see § 171.1 of this subchapter), Type 304L”.

**PART 179—SPECIFICATIONS FOR TANK CARS**

64. The authority citation for part 179 continues to read as follows:

**Authority:** 49 U.S.C. 5101-5127; 49 CFR 1.53.

**§ 179.100-7 [Amended]**

65. In § 179.100-7, in the table in paragraph (c)(1), the wording “ASTM A240,” is revised to read “ASTM A 240/A 240M (incorporated by reference; see § 171.7 of this subchapter),” each time it appears.

**§ 179.100-10 [Amended]**

66. In § 179.100-10, in paragraph (c), the wording “ASTM A 240” is revised to read “ASTM A 240/A 240M (incorporated by reference; see § 171.7 of this subchapter)”.

**§ 179.102-1 [Amended]**

67. In § 179.102-1, in paragraph (a)(1), in the last sentence, the wording “ASTM Specification A 240” is revised to read “ASTM A 240/A 240M (incorporated by reference; see § 171.7 of this subchapter)”.

**§ 179.102-4 [Amended]**

68. In § 179.102-4, in paragraph (a)(1), the wording “ASTM Specification A240” is revised to read “ASTM A 240/A 240M (incorporated by reference; see § 171.7 of this subchapter)”.

**§ 179.102-17 [Amended]**

69. In § 179.102-17, in paragraph (b)(1), the wording “ASTM Specification A240” is revised to read “ASTM A 240/A 240M (incorporated by reference; see § 171.7 of this subchapter)”.

**§ 179.200-7 [Amended]**

70. In § 179.200-7, in the table in paragraph (d), the wording “ASTM A 240” is revised to read “ASTM A 240/A 240M (incorporated by reference; see § 171.7 of this subchapter)” each time it appears.

**§ 179.201-5 [Amended]**

71. In § 179.201-5, the following revisions are made:

a. In paragraph (a), the wording “ASTM Specification A 240” is revised to read “ASTM A 240/A 240M (incorporated by reference; see § 171.7 of this subchapter)” each time it appears.

b. In paragraph (b), the wording “ASTM Specification A 240” is revised to read “ASTM A 240/A 240M (incorporated by reference; see § 171.7 of this subchapter)”.

**§ 179.220-7 [Amended]**

72. In § 179.220-7, in the table in paragraph (d), the wording “ASTM A 240,” is revised to read “ASTM A 240/A 240M (incorporated by reference; see § 171.7 of this subchapter),” each time it appears.

**§ 179.400-5 [Amended]**

73. In § 179.400-5, in paragraph (a) introductory text, the wording “ASTM Specification A240,” is revised to read “ASTM A 240/A 240M (incorporated by reference; see § 171.7 of this subchapter)”.

**PART 180—CONTINUING QUALIFICATION AND MAINTENANCE OF PACKAGINGS**

74. The authority citation for part 180 continues to read as follows:

**Authority:** 49 U.S.C. 5101-5127; 49 CFR 1.53.

75. Subpart C is added to part 180 to read as follows:

**Subpart C—Qualification, Maintenance and Use of Cylinders**

Sec.

- 180.201 Applicability.
- 180.203 Definitions.
- 180.205 General requirements for requalification of cylinders.
- 180.207 [Reserved]
- 180.209 Requirements for requalification of specification cylinders.
- 180.211 Repair, rebuilding and reheat treatment of DOT-4 series specification cylinders.
- 180.213 Requalification markings.
- 180.215 Reporting and record retention requirements.

**Subpart C—Qualification, Maintenance and Use of Cylinders****§ 180.201 Applicability.**

This subpart prescribes requirements, in addition to those contained in parts 107, 171, 172, 173, and 178 of this chapter, applicable to any person responsible for the continuing qualification, maintenance, or periodic requalification of DOT specification and exemption cylinders.

**§ 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.

*Non-corrosive service* means a hazardous material that, in the presence of moisture, is not corrosive to the materials of construction of a cylinder (including valve, pressure relief device, etc.).

*Over-heated* means a condition in which the temperature of any portion of an aluminum cylinder has reached 176° C (350° F) or higher, or in which the temperature of any portion of a steel or nickel cylinder has reached 343° C (650° F) or higher.

*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 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 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 compressibility 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 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 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 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 requalified in accordance with § 180.211; 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 DOT-3 series cylinder, at the first requalification due on and after October 1, 2002, the set pressure of a pressure relief device must be set at test pressure with a tolerance of plus zero and minus 10%.

(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—

(1) Visually inspected, internally and externally, in accordance with paragraph (f) of this section and the

inspection 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 (incorporated by reference; see § 171.7 of this subchapter); C-6.1 for seamless aluminum cylinders (incorporated by reference; see § 171.7 of this subchapter); C-6.2 for fiber reinforced composite exemption cylinders (incorporated by reference; see § 171.7 of this subchapter); C-6.3 for low pressure aluminum cylinders (incorporated by reference; see § 171.7 of this subchapter); C-8 for DOT 3HT cylinders (incorporated by reference; see § 171.7 of this subchapter); and C-13 for DOT 8 series cylinders (incorporated by reference; 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 DOT specification or exemption cylinder made of aluminum alloy 6351-T6 must be inspected for evidence of sustained load cracking in the neck and shoulder area in accordance with the cylinder manufacturer's written recommendations, which must be approved in writing by the Associate Administrator.

(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 the testing apparatus must permit reading of pressures to within 1% of the minimum prescribed test pressure of

each cylinder tested, except that for an analog device, interpolation to 1/2 of the marked gauge divisions is acceptable. The expansion-indicating device of the testing apparatus must also permit incremental reading of the cylinder expansion to 1% of the total expansion of each cylinder tested or 0.1 cm<sup>3</sup>, 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  $\pm 1.0\%$  of the prescribed test pressure of any cylinder tested that day. The pressure indicating device, itself, must be certified as having an accuracy of  $\pm 0.5\%$ , or better, of its full range, and must permit readings of pressure from 90%-110% of the minimum prescribed test pressure of the cylinder to be tested. The accuracy of the pressure indicating device within the test system can be demonstrated at any point within 500 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 stable reading of expansion and is accurate to  $\pm 1.0\%$  of the total expansion of any cylinder tested or 0.1 cubic centimeter, whichever is larger. The expansion-indicating device itself must have an accuracy of  $\pm 0.5\%$ , or better, of its full scale.

(4) The test equipment must be verified to be accurate within  $\pm 1.0\%$  of the calibrated cylinder's pressure and corresponding expansion values. This may be accomplished by bringing the pressure to a value shown on the calibration certificate for the calibrated cylinder used and verifying that the resulting total expansion is within  $\pm 1.0\%$  of the total expansion shown on the calibration certificate. Alternatively, calibration may be demonstrated by bringing the total expansion to a known value on the calibration certificate for the calibrated cylinder used and verifying that the resulting pressure is within  $\pm 1.0\%$  of the pressure shown on the calibration certificate. The calibrated cylinder must show no permanent expansion. The retester 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 cylinder has been rejected.

(3) Unless the cylinder is requalified in conformance with requirements in § 180.211, it may not be filled with a hazardous material and offered for transportation in commerce where use of a specification packaging is required.

(4) A rejected cylinder with a service pressure of less than 900 psig may be requalified and marked if the cylinder is repaired or rebuilt and subsequently inspected and tested in conformance with—

(i) The visual inspection requirements of paragraph (f) of this section;

(ii) Part 178 of this subchapter and this part;

(iii) Any exemption covering the manufacture, requalification, and/or use of that cylinder; and

(iv) Any approval required under § 180.211.

(i) *Cylinder condemnation.* (1) A cylinder must be condemned when—

(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 must be maintained by the cylinder owner or the owner's agent.

(vi) For a DOT 4E aluminum cylinder, permanent expansion exceeds 12 percent of total expansion.

(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.

(2) When a cylinder must be condemned, the requalifier must 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. Alternatively, at the direction of the owner, the requalifier may render the cylinder incapable of holding pressure. 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.

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

#### § 180.207 [Reserved]

#### § 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 <sup>1</sup>

Specification under which cylinder was made	Minimum test pressure (psig) <sup>2</sup>	Test period (years)
DOT 3 .....	3000 psig .....	5
DOT 3A, 3AA .....	5/3 times service pressure, except noncorrosive 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(i) 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(e)(14))
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(k) and 180.213(d)(iii))

<sup>1</sup> Any cylinder not exceeding 2 inches outside diameter and less than 2 feet in length is excepted from volumetric expansion test.

<sup>2</sup> For cylinders not marked with a service pressure, see § 173.301(e)(1) of this subchapter.

(b) *DOT 3A or 3AA cylinders.* (1) A cylinder conforming to specification DOT 3A or 3AA with a water capacity of 56.7 kg (125 lb) or less that is removed from any cluster, bank, group, rack, or vehicle each time it is filled, may be requalified every ten years instead of every five years, provided the cylinder conforms to all of the following conditions:

(i) The cylinder was manufactured after December 31, 1945.

(ii) The cylinder is used exclusively for air; argon; cyclopropane; ethylene; helium; hydrogen; krypton; neon; nitrogen; nitrous oxide; oxygen; sulfur hexafluoride; xenon; fluorinated hydrocarbons, liquefied hydrocarbons, and mixtures thereof that are commercially free from corroding components; permitted mixtures of these gases (see § 173.301(d) of this subchapter); and permitted mixtures of these gases with up to 30 percent by volume of carbon dioxide, provided the gas has a dew point at or below minus (52° F) at 1 atmosphere.

(iii) Before each refill, the cylinder is removed from any cluster, bank, group, rack or vehicle and passes the hammer test specified in CGA Pamphlet C-6 (incorporated by reference; see § 171.7 of this subchapter).

(iv) The cylinder is dried immediately after hydrostatic testing to remove all traces of water.

(v) The cylinder is not used for underwater breathing.

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

(2) If, since the last required requalification, a cylinder has not been used exclusively for the gases specifically identified in paragraph (b)(1)(ii) of this section, but currently conforms with all other provisions of paragraph (b)(1) of this section, it may be requalified every 10 years instead of every five years, provided it is first requalified and examined as prescribed by § 173.302a(b) (2), (3) and (4) of this subchapter.

(3) Except as specified in paragraph (b)(2) of this section, if a cylinder, marked with a star, is filled with a compressed gas other than as specified in paragraph (b)(1)(ii) of this section, the star following the most recent test date must be obliterated. The cylinder must be requalified five years from the marked test date, or prior to the first filling with a compressed gas, if the required five-year requalification period has passed.

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

(d) *Cylinders 5.44 kg (12 lb) or less with service pressures of 300 psig or less.* A cylinder of 5.44 (12 lb) or less water capacity authorized for service

pressure of 300 psig or less must be given a complete external visual inspection at the time periodic requalification becomes due. External visual inspection must be in accordance with CGA Pamphlet C-6 or C-6.1 (incorporated by reference; see § 171.7 of this subchapter). The cylinder may be proof pressure tested. The test is successful if the cylinder, when examined under test pressure, does not display a defect described in § 180.205(i)(1) (ii) or (iii). Upon successful completion of the test and inspection, the cylinder must be marked in accordance with § 180.213.

(e) *Proof pressure test.* A cylinder made in conformance with specifications DOT 4B, 4BA, 4BW, or 4E used exclusively for: liquefied petroleum gas that meets the requirements in Table I of ASTM D 1835, Standard Specification for Liquefied Petroleum (LP) Gases (incorporated by reference; see § 171.7 of this subchapter); anhydrous dimethylamine; anhydrous methylamine; anhydrous trimethylamine; methyl chloride; methylacetylene-propadiene stabilized; or dichlorodifluoromethane, difluoroethane, difluorochloroethane, chlorodifluoromethane, chlorotetrafluoroethane, trifluorochloroethylene, or mixture thereof, or mixtures of one or more with trichlorofluoromethane; and commercially free from corroding components and protected externally by a suitable corrosion-resistant coating (such as galvanizing or painting) may be requalified by volumetric expansion

testing every 12 years instead of every five years. As an alternative, the cylinder may be subjected to a proof pressure test at least two times the marked service pressure, but this latter type of test must be repeated every seven years after expiration of the first 12-year period. When subjected to a proof pressure test, the cylinder must be carefully examined under test pressure and removed from service if a leak or defect is found.

(f) *Poisonous materials.* A cylinder conforming to specification DOT 3A, 3AA, 3B, 4BA, or 4BW having a service pressure of 300 psig or less and used exclusively for methyl bromide, liquid; mixtures of methyl bromide and ethylene dibromide, liquid; mixtures of methyl bromide and chlorpicrin, liquid; mixtures of methyl bromide and petroleum solvents, liquid; or methyl bromide and nonflammable, nonliquefied compressed gas mixtures, liquid; commercially free of corroding components, and protected externally by a suitable corrosion resistant coating

(such as galvanizing or painting) and internally by a suitable corrosion resistant lining (such as galvanizing) may be tested every 10 years instead of every five years, provided a visual internal and external examination of the cylinder is conducted every five years in accordance with CGA Pamphlet C-6 (incorporated by reference; see § 171.7 of this subchapter). The cylinder must be examined at each filling, and rejected if a dent, corroded area, leak or other condition indicates possible weakness.

(g) *Visual inspections.* A cylinder conforming to a specification listed in the table in this paragraph and used exclusively in the service indicated may, instead of a periodic hydrostatic test, be given a complete external visual inspection at the time periodic requalification becomes due. External visual inspection must be in accordance with CGA Pamphlet C-6 or C-6.3, as applicable (incorporated by reference; see § 171.7 of this subchapter). When this inspection is used instead of hydrostatic pressure testing, subsequent

inspections are required at five-year intervals after the first inspection. After September 30, 2003, inspections must be made only by persons holding a current RIN and the results recorded and maintained in accordance with § 180.215. Records must include: date of inspection (month and year); DOT specification number; cylinder identification (registered symbol and serial number, date of manufacture, and owner); type of cylinder protective coating (including statement as to need of refinishing or recoating); conditions checked (e.g., leakage, corrosion, gouges, dents or digs in shell or heads, broken or damaged footing or protective ring or fire damage); disposition of cylinder (returned to service, returned to cylinder manufacturer for repairs or condemned). A cylinder passing requalification by the external visual inspection must be marked in accordance with § 180.213. Specification cylinders must be in exclusive service as shown in the following table:

Cylinders conforming to—	Used exclusively for—
DOT 3A, DOT 3AA, DOT 3A480X, DOT 4AA480 .....	Anhydrous ammonia of at least 99.95% purity.
DOT 3A, DOT 3AA, DOT 3A480X, DOT 3B, DOT 4B, DOT 4BA, DOT 4BW.	Butadiene, inhibited, that is commercially free from corroding components.
DOT 3A, DOT 3A480X, DOT 3AA, DOT 3B, DOT 4AA480, DOT 4B, DOT 4BA, DOT 4BW.	Cyclopropane that is commercially free from corroding components.
DOT 3A, DOT 3AA, DOT 3A480X, DOT 4B, DOT 4BA, DOT 4BW, DOT 4E.	Fluorinated hydrocarbons and mixtures thereof that are commercially free from corroding components.
DOT 3A, DOT 3AA, DOT 3A480X, DOT 3B, DOT 4B, DOT 4BA, DOT 4BW, DOT 4E.	Liquefied hydrocarbon gas that is commercially free from corroding components.
DOT 3A, DOT 3AA, DOT 3A480X, DOT 3B, DOT 4B, DOT 4BA, DOT 4BW, DOT 4E.	Liquefied petroleum gas that meets the requirements in Table I of ASTM D 1835, Standard Specification for Liquefied Petroleum (LP) Gases (incorporated by reference; see § 171.7 of this subchapter).
DOT 3A, DOT 3AA, DOT 3B, DOT 4B, DOT 4BA, DOT 4BW, DOT 4E	Methylacetylene-propadiene, stabilized, that is commercially free from corroding components.
DOT 3A, DOT 3AA, DOT 3B, DOT 4B, DOT 4BA, DOT 4BW .....	Anhydrous mono, di, trimethylamines that are commercially free from corroding components.
DOT 4B240, DOT 4BW240 .....	Ethyleneimine, inhibited.

(h) *Cylinders containing anhydrous ammonia.* A cylinder conforming to specification DOT 3A, 3A480X, or 4AA480 used exclusively for anhydrous ammonia, commercially free from corroding components, and protected externally by a suitable corrosion-

resistant coating (such as paint) may be requalified every 10 years instead of every five years.

(i) *Requalification of DOT-8 series cylinders.* (1) Each owner of a DOT-8 series cylinder used to transport acetylene must have the cylinder shell

and the porous filler requalified in accordance with CGA Pamphlet C-13 (incorporated by reference; see § 171.7 of this subchapter). Requalification must be performed in accordance with the following schedule:

Date of cylinder manufacture	Shell (visual inspection) requalification		Porous filler requalification	
	Initial	Subsequent	Initial	Subsequent
Before January 1, 1991 .....	Before January 1, 2001 ....	10 years .....	Before January 1, 2011 ....	Not required.
On or after January 1, 1991.	10 years <sup>1</sup> .....	10 years .....	3 to 20 years <sup>2</sup> .....	Not required.

<sup>1</sup> Years from date of cylinder manufacture.

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

(2) Unless requalified and marked in accordance with CGA Pamphlet C-13 (incorporated by reference; see § 171.7 of this subchapter) before October 1, 1994, an acetylene cylinder must be requalified by a person who holds a current RIN.

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

(4) The person performing a visual inspection or requalification must record the results as specified in § 180.215.

(5) The person performing a visual inspection or requalification must mark the cylinder as specified in § 180.213.

(j) *Cylinder used as a fire extinguisher.* Only a DOT specification cylinder used as a fire extinguisher and meeting Special Provision 18 in § 172.102(c)(1) of this subchapter may be requalified in accordance with this paragraph (j).

(1) A DOT 4B, 4BA, 4B240ET or 4BW cylinder may be tested as follows:

(i) For a cylinder with a water capacity of 5.44 kg (12 lb) or less, by volumetric expansion test using the water 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) *Requalification of foreign cylinders filled for export.* A cylinder manufactured outside the United States, other than as provided in § 171.12a of this subchapter, that has not been manufactured, inspected, tested and marked in accordance with part 178 of this subchapter may be filled with compressed gas in the United States, and shipped solely for export if it meets the following requirements, in addition to other requirements of this subchapter:

(1) It has been inspected, tested and marked (with only the month and year of test) in conformance with the

procedures and requirements of this subpart or the Associate Administrator has authorized the filling company to fill foreign cylinders under an alternative method of qualification; and

(2) It is offered for transportation in conformance with the requirements of § 173.301(l) of this subchapter.

**§ 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 performed on an area free from contaminants.

(4) A weld defect, such as porosity in a pressure retaining seam, must be completely removed before re-welding. Puddling may be used to remove a weld defect only by the tungsten inert gas shielded arc process.

(5) After removal of a non-pressure attachment and before its replacement, the cylinder must be given a visual inspection in accordance with § 180.205(f).

(6) Reheat treatment of DOT 4B, 4BA or 4BW specification cylinders after replacement of non-pressure attachments is not required when the total weld material does not exceed 20.3 cm (8 inches). Individual welds must be at least 7.6 cm (3 inches) apart.

(7) After repair of a DOT 4B, 4BA or 4BW cylinder, the weld area must be leak tested at the service pressure of the cylinder.

(8) Repair of weld defects must be free of cracks.

(9) When a non-pressure attachment with the original cylinder specification

markings is replaced, all markings must be transferred to the attachment on the repaired cylinder.

(10) Walls, heads or bottoms of cylinders with defects or leaks in base metal may not be repaired, but may be replaced as provided for in paragraph (d) of this section.

(c) *Additional repair requirements for 4L cylinders.* (1) Repairs to a DOT 4L cylinder must be performed in accordance with paragraphs (a) and (b) of this section and are limited to the following:

(i) The removal of either end of the insulation jacket to permit access to the cylinder, piping system, or neck tube.

(ii) The replacement of the neck tube. At least a 13 mm (0.51 inch) piece of the original neck tube must be protruding above the cylinder's top end. The original weld attaching the neck tube to the cylinder must be sound and the replacement neck tube must be welded to this remaining piece of the original neck tube.

(iii) The replacement of material such as, but not limited to, the insulating material and the piping system within the insulation space is authorized. The replacement material must be equivalent to that used at the time of original manufacture.

(iv) Other welding procedures that are permitted by CGA Pamphlet C-3 (incorporated by reference; see § 171.7 of this subchapter), and not excluded by the definition of "rebuild," are authorized.

(2) After repair, the cylinder must be—

(i) Pressure tested in accordance with the specifications under which the cylinder was originally manufactured;

(ii) Leak tested before and after assembly of the insulation jacket using a mass spectrometer detection system; and

(iii) Tested for heat conductivity requirements.

(d) *General rebuilding requirements.* (1) The rebuilding of a DOT 4-series cylinder must be made in accordance with the following requirements:

(i) The person rebuilding the cylinder must use the procedures and equipment as authorized by the approval issued under § 107.805 of this chapter.

(ii) After removal of a non-pressure component and before replacement of any non-pressure component, the cylinder must be visually inspected in accordance with CGA Pamphlet C-6 (incorporated by reference; see § 171.7 of this subchapter).

(iii) The rebuild must rebuild a DOT 4B, 4BA or 4BW cylinder having a water capacity of 9.07 kg (20 lb) or greater by replacing a head of the cylinder using a

circumferential joint. When this weld joint is located at other than an original welded joint, a notation of this modification must be shown on the Manufacturer's Report of Rebuilding in § 180.215(d)(2). The weld joint must be on the cylindrical section of the cylinder.

(iv) Any welding and the inspection of the rebuilt cylinder must be in accordance with the requirements of the applicable cylinder specification and the following requirements:

(A) Rebuilding of any cylinder involving a joint subject to internal pressure may only be performed by fusion welding;

(B) Welding must be performed on an area free from contaminants; and

(C) A weld defect, such as porosity in a pressure retaining seam, must be completely removed before re-welding. Puddling may be used to remove a weld defect only by using the tungsten inert gas shielded arc process.

(2) Any rebuilt cylinder must be—

(i) Heat treated in accordance with paragraph (f) of this section;

(ii) Subjected to a volumetric expansion test on each cylinder. The results of the tests must conform to the applicable cylinder specification;

(iii) Inspected and have test data reviewed to determine conformance with the applicable cylinder specification; and

(iv) Made of material conforming to the specification. Determination of conformance shall include chemical analysis, verification, inspection and tensile testing of the replaced part. Tensile tests must be performed on the replaced part after heat treatment by lots defined in the applicable specification.

(3) For each rebuilt cylinder, an inspector's report must be prepared to include the information listed in § 180.215(d).

(4) Rebuilding a cylinder with brazed seams is prohibited.

(5) When an end with the original cylinder specification markings is replaced, all markings must be transferred to the rebuilt cylinder.

(e) *Additional rebuilding requirements for DOT 4L cylinders.* (1) The rebuilding of a DOT 4L cylinder must be performed in accordance with paragraph (d) of this section. Rebuilding of a DOT 4L cylinder is:

(i) Substituting or adding material in the insulation space not identical to that used in the original manufacture of that cylinder;

(ii) Making a weld repair not to exceed 150 mm (5.9 inches) in length on the longitudinal seam of the cylinder or 300 mm (11.8 inches) in length on a circumferential weld joint of the cylinder; or

(iii) Replacing the outer jacket.

(2) Reheat treatment of cylinders is prohibited.

(3) After rebuilding, each inner containment vessel must be proof pressure tested at 2 times its service pressure. Each completed assembly must be leak-tested using a mass spectrometer detection system.

(f) *Reheat treatment.* (1) Prior to reheat treatment, each cylinder must be given a visual inspection, internally and externally, in accordance with § 180.205(f).

(2) Cylinders must be segregated in lots for reheat treatment. The reheat treatment and visual inspection must be performed in accordance with the specification for the cylinders except as provided in paragraph (f)(4) of this section.

(3) After reheat treatment, each cylinder in the lot must be subjected to a volumetric expansion test and meet the acceptance criteria in the applicable specification or be scrapped.

(4) After all welding and heat treatment, a test of the new weld must be performed as required by the original specification. The test results must be recorded in accordance with § 180.215.

#### § 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 as to be readily visible at all times. Illegible specification markings may be remarked on the cylinder as provided by the original specification.

Requalification markings may be placed on any portion of the upper end of the cylinder excluding the sidewall, as provided in this section. Requalification and required specification markings that are illegible may be reproduced on 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 footing, additional dates may be marked on the external surface of the footing.

(c) *Requalification marking method.* The depth of requalification markings may not be greater than specified in 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. Example: A cylinder requalified in September 1998, and approved by a person who has been issued RIN "A123", would be marked plainly and permanently into the metal of the cylinder in accordance with location requirements of the cylinder specification or on a metal plate permanently secured to the cylinder in accordance with paragraph (b) of this section. An example of the markings prescribed in this paragraph (d) is as follows:

$$\begin{array}{r} A1 \\ 9 \quad 98 \times \\ 32 \end{array}$$

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 ( $\frac{1}{4}$  in.) high, except RIN characters must be at least 3.18 mm ( $\frac{1}{8}$  in.) high.

(f) *Marking illustrations.* Examples of required requalification markings for DOT specification and exemption cylinders are illustrated as follows:

(1) For designation of the 5-year volumetric expansion test, 10-year volumetric expansion test for cylinders conforming to § 180.209(f) and (h), or 12-year volumetric expansion test for fire extinguishers conforming to § 173.309(b) of this subchapter and cylinders conforming to § 180.209(e) and § 180.209(g), the marking is as illustrated in paragraph (d) of this section.

(2) For designation of the 10-year volumetric expansion test for cylinders conforming to § 180.209(b), the marking is as illustrated in paragraph (d) of this section, except that the "X" is replaced with a five-point star.

(3) For designation of special filling limits up to 10% in excess of the marked service pressure for cylinders conforming to § 173.302a(b) of this subchapter, the marking is as illustrated in paragraph (d) of this section, except that the "X" is replaced with a plus sign "+".

(4) For designation of the proof pressure test, the marking is as illustrated in paragraph (d) of this section, except that the "X" is replaced with the letter "S".

(5) For designation of the 5-year external visual inspection for cylinders conforming to § 180.209(g), the marking is as illustrated in paragraph (d) of this section, except that the "X" is replaced with the letter "E".

(6) For designation of DOT 8 series cylinder shell requalification only, the marking is as illustrated in paragraph (d) of this section, except that the "X" is replaced with the letter "S".

(7) For designation of DOT 8 series cylinder shell and porous filler requalification, the marking is as illustrated in paragraph (d) of this section, except that the "X" is replaced with the letters "FS".

#### **§ 180.215 Reporting and record retention requirements.**

(a) *Facility records.* A person who requalifies, repairs or rebuilds cylinders must maintain the following records where the requalification is performed:

(1) Current RIN issuance letter;

(2) If the RIN has expired and renewal is pending, a copy of the renewal request;

(3) Copies of notifications to Associate Administrator required under § 107.805 of this chapter;

(4) Current copies of those portions of this subchapter applicable to its cylinder requalification and marking activities at that location;

(5) Current copies of all exemptions governing exemption cylinders requalified or marked by the requalifier at that location; and

(6) The information contained in each applicable CGA or ASTM standard incorporated by reference in § 171.7 of this subchapter applicable to the requalifier's activities. This information must be the same as contained in the edition incorporated by reference in § 171.7 of this subchapter.

(b) *Requalification records.* Daily records of visual inspection, pressure test, and ultrasonic examination if permitted under an exemption, as applicable, must be maintained by the person who performs the requalification until either the expiration of the requalification period or until the cylinder is again requalified, whichever occurs first. A single date may be used for each test sheet, provided each test on the sheet was conducted on that date. Ditto marks or a solid vertical line may be used to indicate repetition of the preceding entry for the following entries only: date; actual dimensions; manufacturer's name or symbol, if present; owner's name or symbol, if present; and test operator. Blank spaces may not be used to indicate repetition of a prior entry. The records must include the following information:

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

(2) *Pressure test and visual inspection records.* The date of requalification; serial number; DOT specification or exemption number; marked pressure; actual dimensions; manufacturer's name or symbol; owner's name or symbol, if present; result of visual inspection; actual test pressure; total, elastic and permanent expansions; percent permanent expansion; disposition, with reason for any repeated test, rejection or condemnation; and legible identification of test operator. For each cylinder marked pursuant to § 173.302a(b)(5) of this subchapter, the

test sheet must indicate the method by which any average or maximum wall stress was computed. Records must be kept for all completed, as well as unsuccessful tests. The entry for a second test after a failure to hold test pressure must indicate the date of the earlier test.

(3) *Wall stress.* Calculations of average and maximum wall stress pursuant to § 173.302a(b)(3) of this subchapter, if performed.

(4) *Calibration certificates.* The most recent certificate of calibration must be maintained for each calibrated cylinder.

(c) *Repair, rebuilding or reheat treatment records.* (1) Records covering welding or brazing repairs, rebuilding or reheat treating shall be retained for a minimum of fifteen years by the approved facility.

(2) A record of rebuilding, in accordance with § 180.211(d), must be completed for each cylinder rebuilt. The record must be clear, legible, and contain the following information:

(i) Name and address of test facility, date of test report, and name of original manufacturer;

(ii) Marks stamped on cylinder to include specification number, service pressure, serial number, symbol of manufacturer, inspector's mark, and other marks, if any;

(iii) Cylinder outside diameter and length in inches;

(iv) Rebuild process (welded, brazed, type seams, etc.);

(v) Description of assembly and any attachments replaced (e.g., neckrings, footrings);

(vi) Chemical analysis of material for the cylinder, including seat and Code No., type of analysis (ladle, check), chemical components (Carbon (C), Phosphorous (P), Sulfur (S), Silicon (Si), Manganese (Mn), Nickel (Ni), Chromium (Cr), Molybdenum (Mo), Copper (Cu), Aluminum (Al), Zinc (Zn)), material manufacturer, name of person performing the analysis, results of physical tests of material for cylinder (yield strength (psi), tensile strength (psi), elongation percentage (inches), reduction in area percentage, weld bend, tensile bend, name of inspector);

(vii) Results of proof pressure test on cylinder, including test method, test pressure, total expansion, permanent expansion, elastic expansion, percent permanent expansion (permanent expansion may not exceed ten percent (10%) of total expansion), and volumetric capacity (volumetric capacity of a rebuilt cylinder must be within  $\pm 3\%$  of the calculated capacity);

(viii) Each report must include the following certification statement: "I certify that this rebuilt cylinder is

accurately represented by the data above and conforms to all of the requirements in Subchapter C of Chapter I of Title 49 of the Code of Federal Regulations.”. The certification must be signed by the

rebuild technician and principal, officer, or partner of the rebuild facility.

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**Elaine E. Joost,**  
*Acting Administrator, Research and Special Programs Administration.*

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