Designation: D5631 – 21

Standard Practice for Handling, Transportation, and Storage of Halon 1301, Bromotrifluoromethane (CF_3Br)[1]

This standard is issued under the fixed designation D5631; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This practice covers guidance and direction to suppliers, recyclers, reclaimers, purchasers, and users in the handling, transportation, and storage of Halon 1301.

1.2 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and to determine the applicability of regulatory limitations prior to use.*

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standard:*[2]

D5632/D5632M Specification for Halon 1301, Bromotrifluoromethane (CF_3Br)

2.2 *CGA Standards:*[3]

C-1 Methods for Pressure Testing Compressed Gas Cylinders

C-6 Standards for Visual Inspection of Steel Compressed Gas Cylinders

C-7 Guide to Classification and Labeling of Compressed Gases

P-1 Standard for Safe Handling of Compressed Gases in Containers

SB-1 Hazards of Refilling or Reusing Compressed Refrigerant (Halogenated Hydrocarbon) Gas Cylinders

SB-5 Hazards of Reusing Disposable Refrigerant (Halogenated Hydrocarbon) Gas Cylinders

SB-18 Use of Refrigerant (Halogenated Hydrocarbons) Recovery Cylinders

2.3 *U.S. Government Standards:*[4]

40 CFR Part 82.106 Warning Statement Requirements

49 CFR Part 172 Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, Training Requirements, and Security Plans

49 CFR Part 172.101 Purpose and Use of Hazardous Materials Table

49 CFR Part 173 Shippers—General Requirements for Shipments and Packagings

49 CFR Part 178 Specifications for Packagings

49 CFR Part 180 Continuing Qualification and Maintenance of Packagings

2.4 *Other Document:*[5]

Safety Guide for Decommissioning Halon Systems Volume 2 of the U.S. Environmental Protection Agency Outreach Report: Moving Towards a World Without Halon

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *containers, n*—storage vessel for Halon 1301.

3.1.2 *cylinders, n*—containers of Halon 1301.

3.1.3 *Halon 1301, n*—bromotrifluoromethane, a compound used to inert or suppress a fire or explosion hazard.

3.1.4 *insulated, adj*—placed in an isolated situation to protect and prevent the transfer of damage.

[1] This practice is under the jurisdiction of ASTM Committee D26 on Halogenated Organic Solvents and Fire Extinguishing Agents and is the direct responsibility of Subcommittee D26.09 on Fire Extinguishing Agents.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] Available from Compressed Gas Association, 8484 Westpark Drive, Suite 220 McLean, VA 22102, http://www.cganet.com.

[4] Code of Federal Regulations (CFR) documents are available from U.S. Government Publishing Office (GPO), 732 N. Capitol St., NW, Washington, DC 20401, http://www.gpo.gov.

[5] Available from Halon Recycling Corporation, 1001 19th St., N, Suite 1200, Arlington, VA 22209, http://www.halon.org.

4. Significance and Use

4.1 This practice provides requirements for the handling, transportation, and storage of Halon 1301 encountered in distribution through both commercial and military channels. It is intended to ensure that Halon 1301 is handled, transported, and stored in such a way that its physical property values are not degraded. Transport may be by various means, such as, but not limited to, highway, rail, water, and air.

5. Practice

5.1 To ensure safe handling, loading, storing, and transporting of material, personnel shall be trained in the CGA publications, CFR regulations, and other documents, as listed in Sections 2.2, 2.3, and 2.4, respectively.

5.2 *Handling:*

5.2.1 Handling shall be in accordance with CGA Publication P-1 and as specified by the manufacturer.

5.2.1.1 Personnel who handle or store, or both, cylinders of Halon 1301 shall be trained properly to recognize and identify the characteristics of the product and the proper methods of safely handling full, partly full, and empty cylinders.

5.2.2 All Halon 1301 transfers between storage containers and recycling processes shall be performed by personnel trained in handling procedures.

5.2.3 The Halon 1301 recycling and transfer processes shall be in conjunction with the equipment requirements specified by the manufacturer.

5.2.4 The handling of Halon 1301 shall be in nonsmoking, heater-free, ventilated areas to preclude product accumulation. Provisions shall be made to ensure that service area Halon 1301 concentrations do not exceed 10 % by volume for 1 min and 0.1 % by volume for a time-weighted exposure of 8 h.

5.2.5 Cylinders shall not be over filled. The maximum permitted filling density for Type II product in accordance with Specification D5632/D5632M shall be 77 lb/ft^3 (1233 kg/m^3). The maximum permitted filling density for Type I product in accordance with Specification D5632/D5632M shall be 70 lb/ft^3 (1121 kg/m^3). The liquid portion of the liquefied gas shall not completely fill the container's internal volume and the pressure shall not exceed five fourths the service pressure of the container at any temperature up to and including 130 °F (54 °C). The filling density requirements for pure specification quality (Type II) product are specified in 49 CFR Parts 173.304 and 173.305.

5.2.6 Handling of materials should be done in a manner that prevents contamination or comingling of materials other than Halon 1301.

5.2.7 Cylinders shall be free of dirt and contamination that would contribute to or would cause deterioration of the product during shipment or storage. Precautions should be taken to prevent the entry of oil, water, or any other foreign matter into the container. Unique coatings or preservatives applied prior to shipment to protect the containers are not considered contamination.

5.3 *Transportation:*

5.3.1 Transportation shall be as specified in accordance with 49 CFR regulations.

5.3.1.1 Shipment of materials between distributors, collectors, recyclers, and reclaimers should be within approved Department of Transportation (DOT) guidelines for Class 2.2, regulated materials. Any further provisions for special transportation or packaging should be agreed upon between the collectors, recyclers, and reclaimers.

5.3.1.2 The minimum design pressure requirements shall be as stated in 49 CFR Part 173.304. The pressure inside the container at 70 °F (21 °C) shall not exceed the service pressure for which the container is marked. The pressure inside the container at 130 °F (54 °C) shall not exceed five fourths the service pressure for which the container is marked. Fig. 1 illustrates the effect of temperature on cylinders filled with mixtures of Halon 1301 and nitrogen.

5.3.2 Transportation shall be in suitable vehicles to preclude cylinder damage by excessive mechanical vibration, shock, freezing, or deleterious high temperatures throughout the entire transport route.

5.3.2.1 If cylinders are likely to be subject to unacceptable transport conditions, the cylinders should be placed under insulated conditions.

5.3.3 Compressed gas cylinder permanent marking requirements shall be in accordance with 49 CFR Part 178 and must be maintained in legible condition as required by 49 CFR Part 173. Warning labels shall be affixed to cylinders conforming to requirements of 40 CFR Part 82.106.

5.3.4 Containers used for the shipping of Halon 1301 conforming to Specification D5632/D5632M shall be marked in accordance with 49 CFR Part 172, Subpart D, Marking. The proper shipping name for Specification D5632/D5632M Type II (pure) Halon 1301 is "Bromotrifluoromethane or Refrigerant Gas R13B1" (do not list both), UN 1009, Hazard Class 2.2 (nonflammable gas). The proper shipping name for nitrogen superpressurized Halon 1301 is "Liquefied Gas, nonflammable charged with nitrogen," UN1058, Hazard Class 2.2 (nonflammable gas).

5.4 *Storage:*

5.4.1 Storage shall be in accordance with CGA Publication P-1 in qualified cylinders in accordance with 49 CFR Parts 173 and 178.

5.4.2 Cylinders should be stored in areas that will protect the vessels from physical and environmental damage, and tampering from unauthorized personnel.

5.4.2.1 Facilities should be constructed and oriented so that safety requirements are fulfilled for the storage of pressurized cylinders.

5.4.3 Storage containers shall be fitted with pressure-release mechanisms to limit vessel pressure to not more than the minimum required test pressure of the cylinder. Safety relief valves shall be set at no less than 75 %, nor more than 100 % of the minimum required test pressure of the cylinder. Safety relief valves shall be in contact with the vapor space of the cylinder.

5.4.3.1 Periodic hydrostatic testing and re-inspection of cylinders used for Halon 1301 shall comply with 49 CFR Part 180.

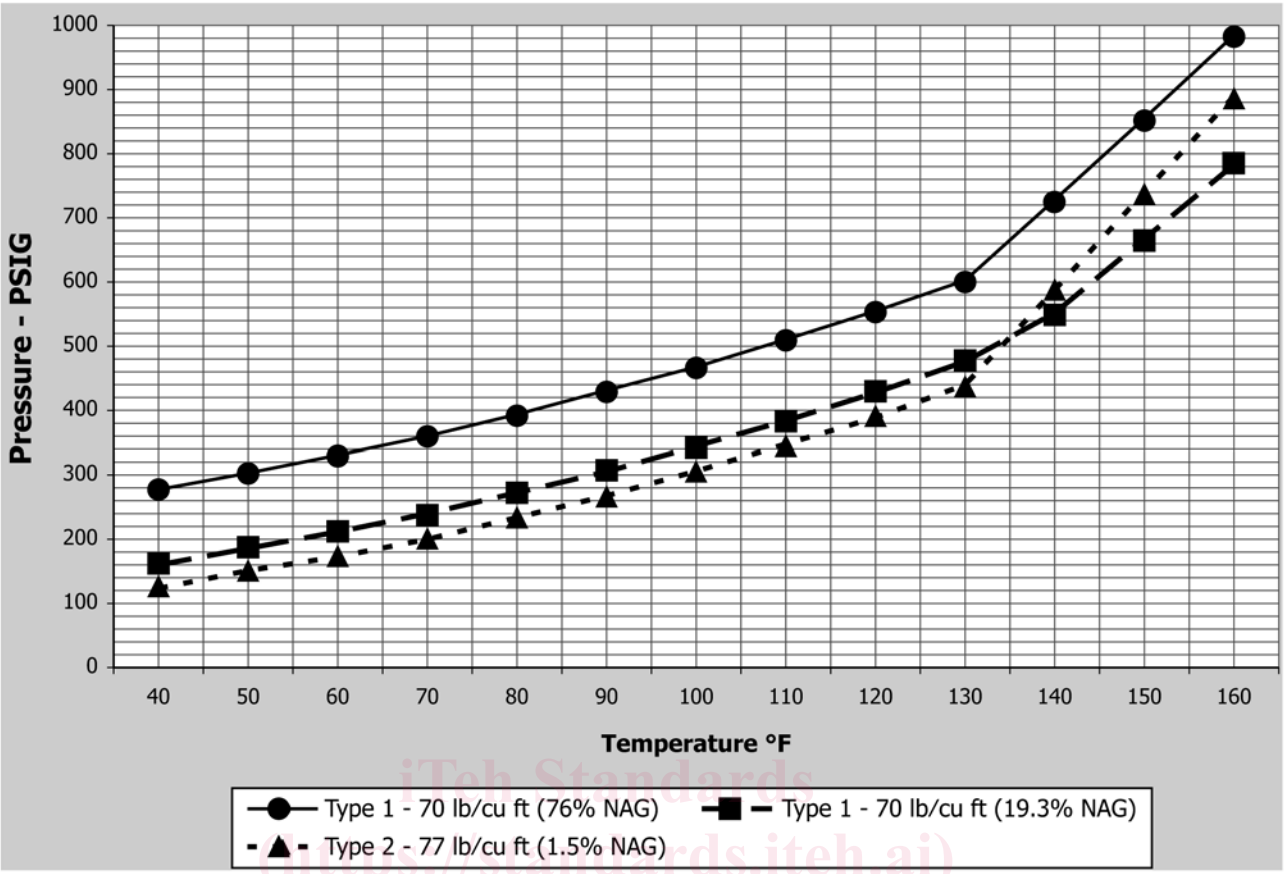

FIG. 1 Isometric Diagram for Bromotrifluoromethane

5.4.4 Containers shall be clearly marked and labeled to identify whether the Halon 1301 contained conforms to either Type I or Type II of Specification D5632/D5632M. The proper storage name for Specification D5632/D5632M Type II (pure) Halon 1301 is "Bromotrifluoromethane or Refrigerant Gas R13B1" (do not list both), UN 1009, Hazard Class 2.2 (nonflammable gas). The proper storage name for nitrogen superpressurized Halon 1301 is "Liquefied Gas, nonflammable charged with nitrogen," UN1058, Hazard Class 2.2 (nonflammable gas).

5.4.5 Insulation shall be placed on pallets or shoring and provisions should be made to prevent excessive shock or thermal fluctuations to cylinders.

5.4.6 Cylinders shall be stored in a manner that will prevent contamination from external sources.

5.4.6.1 If Halon 1301 in accordance with Specification D5632/D5632M is stored in the same area as material not in accordance with the Specification D5632/D5632M, storage shall be segregated or clearly identifiable as not being similar.

5.5 *Extreme Elevated Temperature Considerations*—When Type I or Type II mixtures of Halon 1301 and N_2 may be exposed to constant temperatures at or greater than 131 °F (55 °C) during transportation or storage, then higher container pressures will be encountered that require alternative fill in the container to that specified in 5.2.5. In this instance, limit container fill density to a maximum of 62.5 lb/ft^3 (1001 kg/m^3). A maximum fill density of 62.5 lb/ft^3 (1001 kg/m^3) and a maximum non-absorbable gases content of 19.3 % should be observed if it is desired to prevent a liquid full condition up to 149 °F (65 °C). The isometric diagram for nitrogen-superpressurized Bromotrifluoromethane is shown in Fig. 1.

6. Inspection

6.1 Halon 1301 that has been reclaimed or recycled using approved reclamation systems may be released for reissue, provided test examination to validate the material to specification is fulfilled.

6.1.1 Reclaimed or recycled Halon 1301 that cannot be proven to comply with Specification D5632/D5632M shall not be reissued. The material shall be processed by environmentally safe methods until conformance to product standard is achieved.

7. Keywords

7.1 Bromotrifluoromethane; CF_3Br; compressed gas; compressed liquefied gas; cylinders; explosion suppressant; fire suppressant; Halon 1301; handling; reclamation; recovery; recycling; storage; transport