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Standard Practice for Handling, Transportation, and Storage of Halon 1301, Bromotrifluoromethane (CF₃Br)¹

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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 for information only.

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 and health practices and to determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:²

D 5632 Specification for Halon 1301, Bromotrifluoromethane (CF₃Br) — Practice for Numbering Metals and Alloys in the Unified Numbering System (UNS)

2.2 CGA Standards:³

C-1 Methods for Hydrostatic Testing of Compressed Gas Cylinders

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

C-7 Guide to Preparation of Precautionary Labeling and Marking of Compressed Gas Containers

P-1 Safe Handling of Compressed Gases in Containers

S-1.1 Pressure Relief Device Standards— Part 1 – Cylinders for Compressed Gases

S-1.2 Pressure Relief Device Standards – Part 2 – Cargo and Portable Tanks for Compressed Gases

S-1.3 Pressure Relief Device Standards – Part 3 – Stationary Storage Containers for Compressed Gases

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

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

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

2.3 U.S. Government Standards:⁴

Code of Federal Regulations (CFR) Title 40, Part 82.106

Code of Federal Regulations (CFR) Title 49, Part 173, U.S. Department of Transportation (DOT) Specifications, Shippers-General Requirements for Shipping and Packagings

Code of Federal Regulations (CFR) Title 49, Part 178, U.S. DOT Specifications for Packagings

Code of Federal Regulations (CFR) Title 49, Part 180, U.S. DOT, Continuing Qualification and Maintenance of Packagings

2.4 Other Documents:

Safety Guide for Decommissioning Halon Systems, Volume 2 of the U.S. Environmental Protection Agency Outreach Report, Moving Towards a World Without Halon⁵

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *containers*—storage vessel for Halon 1301.

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 the Compressed Gas Association.

⁴ Available from Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20036.

⁵ Available by means of the Internet: <http://www.halon.org/pdfs/intro.pdf>

3.1.2 *cylinders*—containers of Halon 1301.

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

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

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 No P-1, Safe Handling of Compressed Gases in Containers 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 transfers between storage containers and recycling processes shall be performed by personnel trained in handling procedures.

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

5.2.4 Halon handling shall be in nonsmoking, heater-free, ventilated areas to preclude product accumulation. Provisions shall be made to ensure that service areas limit Halon 1301 concentrations to not exceed 10 % for 1 min and 0.1 % for 8 h.

5.2.5 Cylinders shall not be over filled. The maximum permitted filling density for Type II product in accordance with Specification D 5632 shall be 77 lb/ft³(1233 kg/m³). The maximum permitted filling density for Type I product in accordance with Specification D 5632 shall be 70 lb/ft³(1121 kg/m³). 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 Title 49 CFR 173.304 and 173.305.

5.2.6 Handling of materials should be done in a manner that prevents contamination of commingling 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 Shipment of materials between distributors, collectors, recyclers, and reclaimers shall be as specified in accordance with DOT regulations Title 49 CFR.

5.3.1.1 The minimum design pressure requirements shall be as stated in Title 49 CFR Part 173.301. 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 expected 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 Part 178 of Title 49 CFR and shall be maintained in legible condition as required by Part 173 of Title 49 CFR. Warning labels shall be affixed to the cylinders conforming to the requirements of 82.106 of Title 40 CFR.

5.4 Storage:

5.4.1 Storage shall be in accordance with CGA Publication No. P-1, in qualified cylinders in accordance with Parts 173 and 178 of Title 49 CFR.

5.4.2 Cylinders should be stored in areas that will protect 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 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.