Designation: D7326 – 17

Standard Practice for Handling, Transportation, and Storage of HFC Blend B (CH_2FCF_3, CHF_2CF_3, and CO_2)[1]

This standard is issued under the fixed designation D7326; 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, reclaimers, purchasers, and users in the handling, transportation, and storage of HFC Blend B.

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

2. Referenced Documents

2.1 *ASTM Standard:*[2]

D7327 Specification for HFC Blend B (CH_2FCF_3, CHF_2CF_3, and CO_2)

2.2 *CGA Standards:*[3]

C-1 Methods for Pressure Testing Compressed Gas Cylinders

C-6 Standard 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 Safety Bulletin: Hazards of Refilling or Reusing Compressed Refrigerant (Halogenated Hydrocarbon) Gas Cylinders

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

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

CFR Title 49, Part 172, U.S. Department of Transportation (DOT), Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements

CFR Title 49, Part 172.101, U.S. DOT, Tables of Hazardous Materials and Special Provisions

CFR Title 49, Part 173, U.S. DOT, Shippers-General Requirements for Shipping and Packagings

CFR Title 49, Part 178, U.S. DOT, Specifications for Packagings

CFR Title 49, Part 180, U.S. DOT, Continuing Qualification and Maintenance of Packagings

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *containers*—storage vessels for HFC Blend B.

3.1.2 *cylinders*—containers of HFC Blend B.

3.1.3 *HFC Blend B*—tertiary blend comprised of HFC-134a (1,1,1,2-tetrafluoroethane), HFC-125 (pentafluoroethane), and carbon dioxide (CO_2); a compound used to inert, extinguish, 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 HFC Blend B encountered in distribution through both commercial and military channels. It is intended to ensure that HFC Blend B is handled, transported, and stored in such a way that its physical property virtues 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, unloading, storing, and transporting of material, personnel shall be trained in the

[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 (CGA), 14501 George Carter Way, Suite 103, Chantilly, VA 20151, http://www.cganet.com.

[4] Available from U.S. Government Publishing Office (GPO), 732 N. Capitol Street, NW, Washington, DC 20401-0001, http://www.gpo.gov.

CGA publications and Title 49 CFR regulations as listed in Sections 2.2 and 2.3, respectively.

5.2 *Handling:*

5.2.1 Handling shall be in accordance with CGA P-1, *Safe Handling of Compressed Gases in Containers*.

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

5.2.2 All HFC Blend B transfers between storage containers and recycling processes shall be performed by personnel trained in handling procedures.

5.2.2.1 HFC Blend B recycling and transfer processes shall be in conjunction with the equipment specified by the manufacturer.

5.2.3 To preclude product accumulation and decomposition, HFC Blend B handling shall be performed in ventilated areas that are nonsmoking and free of portable heaters. Provisions shall be made to ensure that service areas limit HFC Blend B concentrations do not exceed 75 000 ppm (7.5 %) by volume for 1 min and 100 ppm by volume for a time weighted exposure of 8 h.

5.2.4 Cylinders shall not be overfilled. The liquid portion of the HFC Blend B must not completely fill the container's internal volume at any temperature up to and including 130 °F (54 °C). The maximum permitted filling density for HFC Blend B shall be 58 lb/ft^3 (930 kg/m^3). Filling density requirements are specified in Title 49 CFR, 173.304 and Title 49 CFR, 173.305.

5.2.5 Handling of materials should be done in a manner that prevents contamination or commingling of halocarbons other than HFC Blend B.

5.2.6 Cylinders shall be free of dirt and contamination that would contribute to or would cause deterioration of product during shipment or storage. Precautions should be taken to prevent the entry of oil, water, or any other foreign matter into containers. 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 DOT regulations of Title 49 CFR.

5.3.1.1 Shipment of materials between collectors, recyclers, and reclaimers should be within approved DOT guidelines for Class 2, Division 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 indicated in Title 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 ¾ times the service pressure for which the container is marked. Fig. 1 and Fig. 2 illustrate the effect of temperature on a typical storage cylinder filled with HFC Blend B. Extinguisher filters filled with HFC Blend B may be under additional nitrogen pressurization and isometric diagrams for these conditions are provided in Figs. 3-6.

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

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

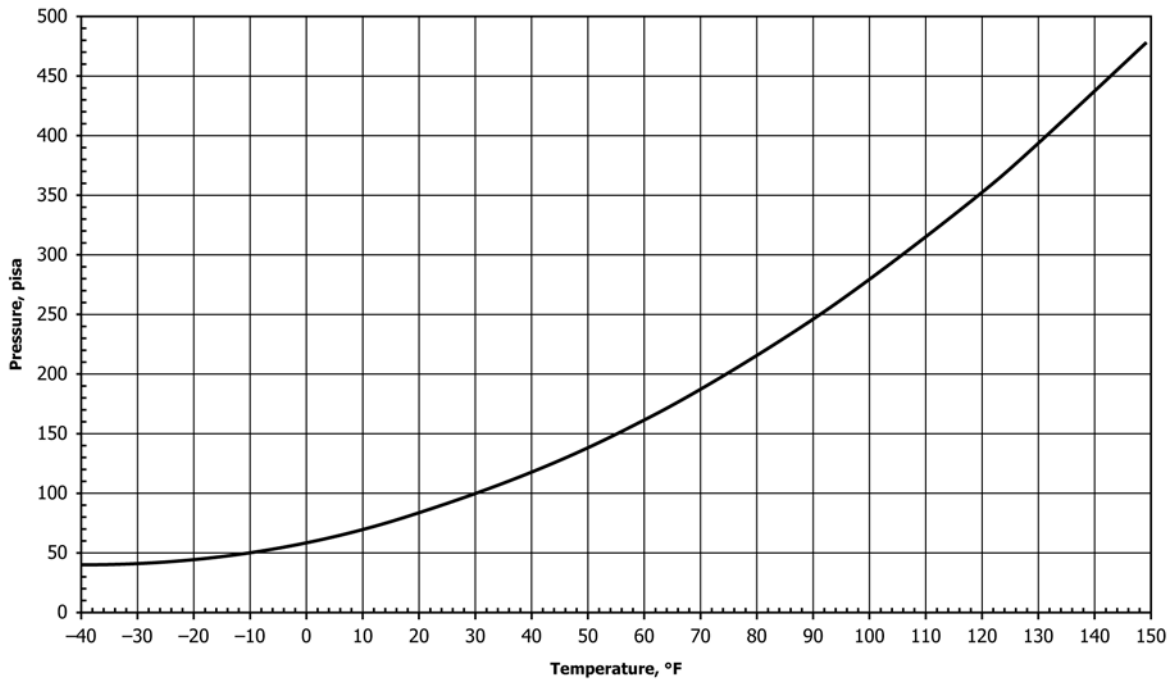

FIG. 1 Saturated Vapor Pressure of HFC Blend B–English Units

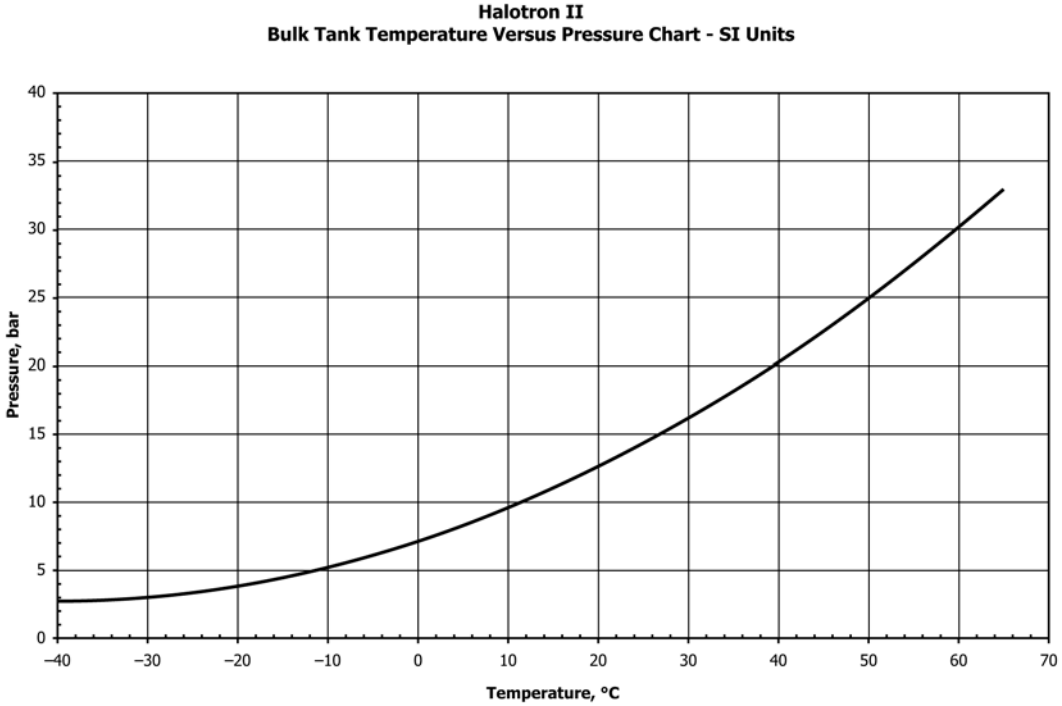

FIG. 2 Saturated Vapor Pressure of HFC Blend B–SI Units

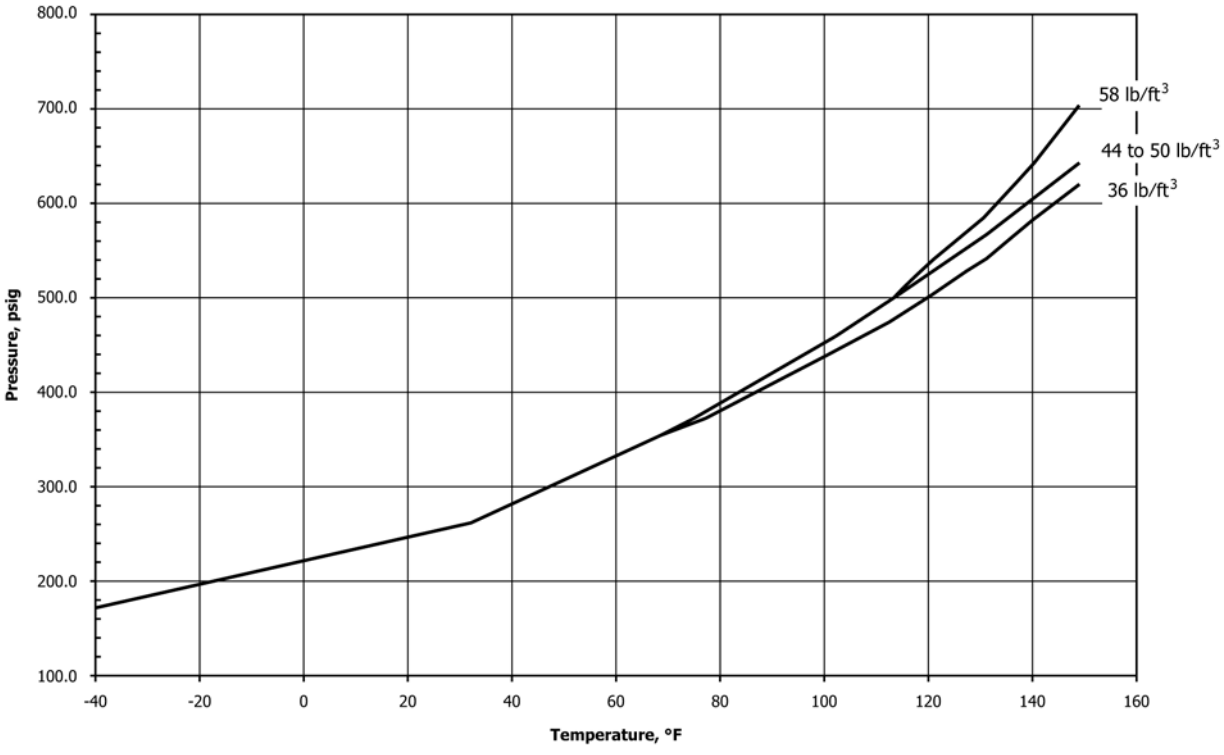

FIG. 3 Isometric Diagram of HFC Blend B Pressurized with Nitrogen to 360 psig at 70 °F–English Units

5.3.3 Compressed gas cylinder permanent marking requirements shall be as specified under Title 49 CFR Part 178 and must be maintained in legible condition as required by Title 49 CFR Part 173.

5.4 *Storage:*

5.4.1 Storage shall be in accordance with CGA P-1, *Safe Handling of Compressed Gases in Containers*, in qualified cylinders in accordance with Title 49 CFR Parts 173 and 178.

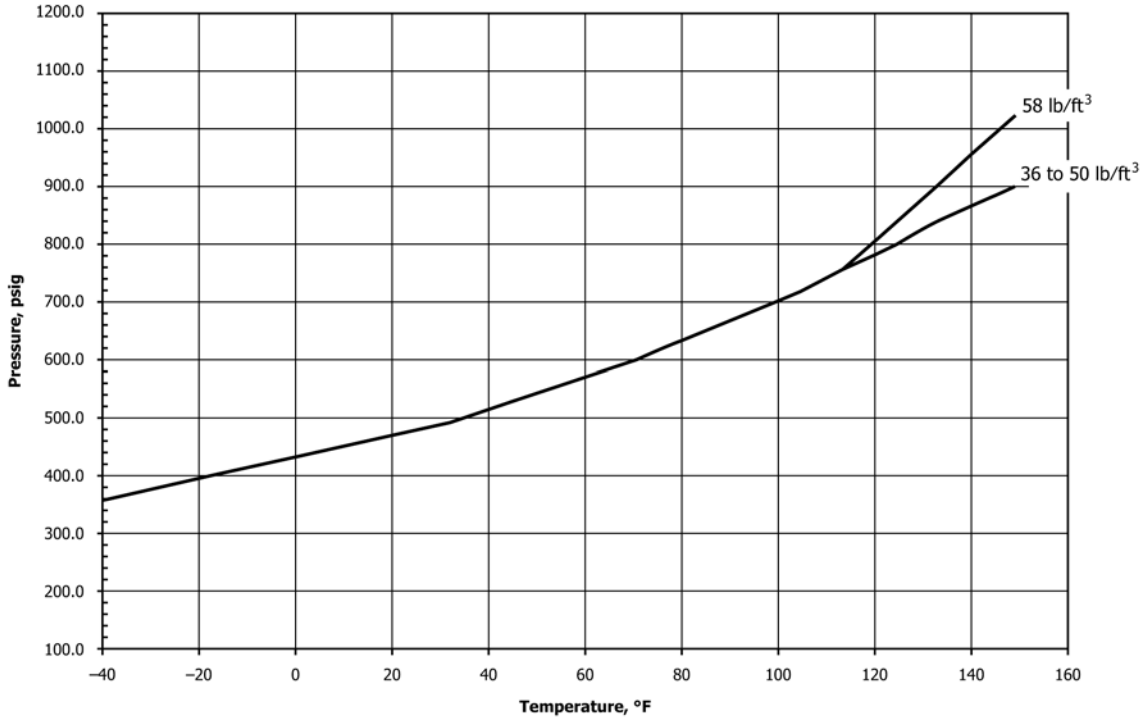

FIG. 4 Isometric Diagram of HFC Blend B Pressurized with Nitrogen to 600 psig at 70 °F–English Units

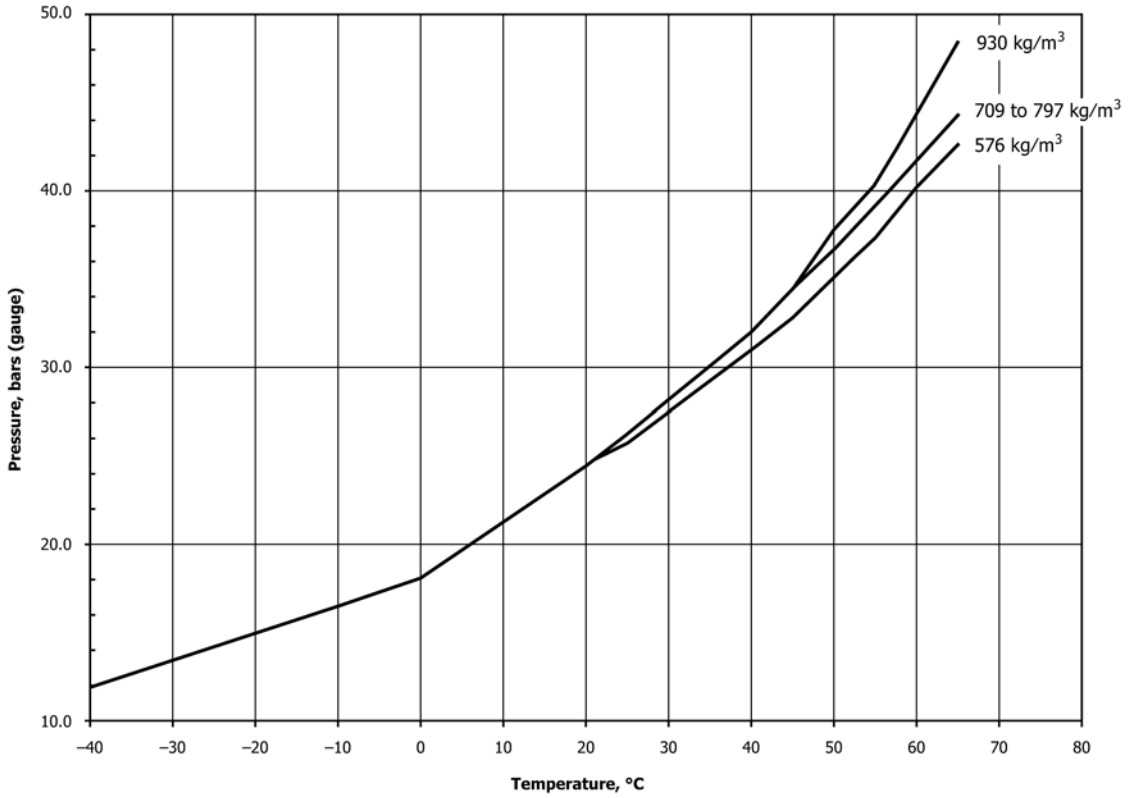

FIG. 5 Isometric Diagram of HFC Blend B Pressurized with Nitrogen to 25 bar at 21 °C–SI Units

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 of construction and orientation so that safety requirements are fulfilled for the storage of pressurized cylinders.

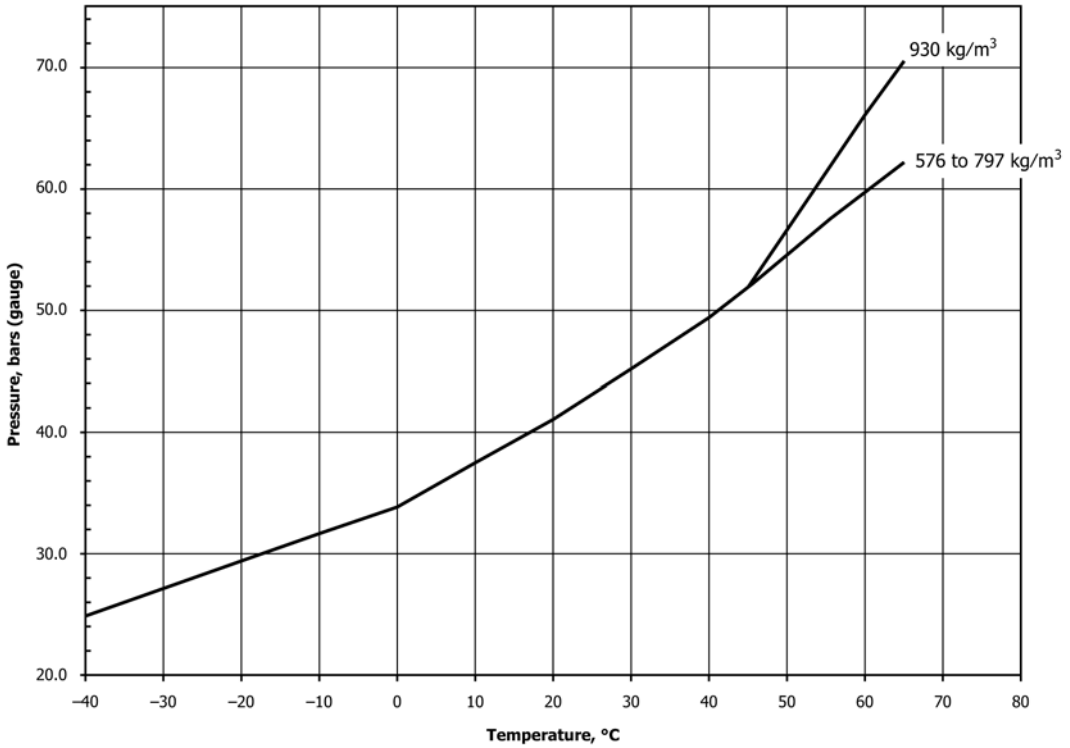

FIG. 6 Isometric Diagram of HFC Blend B Pressurized with Nitrogen to 42 bar at 21 °C–SI Units

5.4.3 Storage cylinders 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 should be set not less than 75 %, nor more than 100 % of the minimum required test pressure of the cylinder. Safety valves shall be in contact with the vapor space of the cylinder.

5.4.3.1 Periodic hydrostatic testing and reinspection of cylinders used for recycled HFC Blend B shall comply with CFR Title 49, Part 180.

5.4.4 Containers shall be clearly marked and labeled to identify whether the HFC Blend B contained does or does not conform to Specification D7327.

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 HFC Blend B meeting the standards of Specification D7327 is stored in the same area as material not meeting the standards, storage shall be segregated or clearly identifiable as not being similar.

6. Inspection

6.1 HFC Blend B that is reclaimed using HFC Blend B manufacturer-approved reclamation systems may be released for reissue, provided test examination to validate the material to specification is fulfilled.

6.1.1 Reclaimed HFC Blend B that cannot be proven to comply with Specification D7327 shall not be reissued. The material will be processed by environmentally safe methods until conformance to the product standard is achieved.

7. Container, Packaging, and Package Marking

7.1 Containers used for shipping and storage of HFC Blend B conforming to this specification shall be marked in accordance with Code of Federal Regulations (CFR) Title 49, Part 172, Subpart D. The proper shipping name is "UN3163, Liquefied Gas, N.O.S., 2.2 (contains 1,1,1,2-Tetrafluorethane, Pentafluoroethane, Carbon Dioxide)." In addition to DOT requirements, containers should be marked with the following information as a minimum:

7.1.1 Supplier's name and address, and

7.1.2 HFC Blend B.

7.1.3 Statement that material conforms to ASTM Specification D7327.

8. Keywords

8.1 1,1,1,2-tetrafluoroethane; carbon dioxide; CH_2FCFl_3; CHF_2CF_3; CO_2; HFC-134a; HFC Blend B; explosion suppressant; fire extinguishant; fire suppressant; Halotron[5] II; handling; pentafluoroethane; reclamation; recovery; recycling; storage; transport

[5] Halotron is a registered trademark of American Pacific Corporation.