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NAVSUPINST
4440.128D
AFJMAN 23-227(I)
MCO 10330.2D

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STORAGE AND HANDLING OF LIQUEFIED AND GASEOUS COMPRESSED GASSES AND THEIR FULL AND EMPTY CYLINDERS

[This publication has been revised significantly
and must be reviewed in its entirety.]

A. REFERENCES

1. DLAR 4145.25/AR-700-68/NAVSUPINST 4440.128C/MCO 10330.2C/AFR 67-12, 16 JAN 90.

2. DoD 4140.1-R, DOD Material Management Regulation

B. PURPOSE. This instruction:

1. Supersedes DLAR 4145.25/AR-700-68/NAVSUPINST 4440.128C/MCO 0330.2C/AFR67-12

2. Prescribes procedures and responsibilities for the receipt, storage, use, inspection, transportation, and handling of compressed gases and their cylinders for all DoD components, installations and activities. These procedures are designed to assure optimum use of both the gases and the cylinders by all DoD and DLA activities.

C. APPLICABILITY AND SCOPE

1. The provisions of this Instruction are applicable to the Department of the Army (DA), the Department of the Air Force, the Department of the Navy, the Marine Corps, and the Defense Logistics Agency (DLA) which will be referred to collectively as "DoD Components". This instruction applies to all world wide DoD locations that receive, store, issue, use, maintain, recondition, and perform associated services with or on the compressed gases and their cylinders managed by the Defense Supply Center Richmond (DSCR) and the Defense Supply Center Philadelphia (DSCP). When there is a conflict between the provisions of this instruction and the host nation, the more stringent requirements shall apply.

2. Aerosol-type containers currently in the supply system are not considered in this Instruction. When transporting aerosol containers refer to Title 49 Code of Federal Regulations (CFR). Flammable aerosols should be stored as Class 1 flammable liquids as stated in NFPA 30, Flammable and Combustible Liquids Code.

3. DLAI 4145.25/ AR 700-68/NAVSUPINST 4440.128D/AFJMAN 23-227(I)/MCO 10330.2D has been coordinated with, and approved by, the Army, Navy, Air Force, and Marine Corps.

4. This Instruction may be supplemented at the major command, installation, and activity levels.

D. DEFINITIONS

1. Compressed Gas. The term "compressed gas" is described as follows:

a. Any material or mixture having, in the container, an absolute pressure exceeding 40 pounds per square inch (40 PSIA)(25 pounds per square inch gauge (25 PSIG)) at 70 deg F.
b. Regardless of the pressure at 70 deg F, having an absolute pressure exceeding 104 PSIA (89 PSIG) at 130 deg F.
c. Any liquid flammable material having a vapor pressure exceeding 40 PSIA (25 PSIG at 100 deg F as determined by American Society for Testing Materials (ASTM) D-323, Test for Vapor Pressure of Petroleum Products (Reid Method), latest edition.

2. Cylinder. A compressed gas cylinder is a pressure vessel designed for the storage and transportation of a compressed gas at pressures higher than 40 PSIA (25 PSIG), with a tubular shape and circular cross section. This does not include a portable tank, a multi-unit tank car tank, a cargo tank, or a tank car (Title 49 CFR, Section 171.8).

3. Additional definitions are provided in enclosure 1 of this Instruction.

E. PROCEDURES

1. The compressed gases used by DLA and DoD activities are manufactured by both commercial production plants and military field activities. The manufacturing and quality requirements for each gas product are provided in Military, Federal, and commercial specifications. All DLA and DoD activities located in the continental United States (CONUS) are required to purchase their gas products from commercial sources. Each contractor is to provide the desired gas product and the necessary services to retest and recondition the applicable cylinders to ensure they remain in safe and serviceable condition. Overseas military requirements are satisfied by shipment of the desired products from CONUS, by local manufacture of the product onsite by the military activity,

or by purchasing the desired products and services from the host country commercial suppliers.

2. Verification of the quality of the purchased or manufactured product is conducted at the site of manufacture or at the product distributor's warehouse. Necessary testing is performed by the supplier's personnel under the surveillance of a Government representative, or records of the examination and tests are maintained by the supplier and made available to the Government upon request. Inspection and/or supplier verification testing is conducted under the surveillance of a Government Quality Assurance Representative (QAR). The quality of the gas product contained under pressure in a compressed gas cylinder will not change under normal storage and handling conditions; however, the condition of the cylinder may deteriorate and render the cylinder unsafe for further use. Procedures for the prevention and/or detection of these conditions are provided and defined in enclosures 1 and 2 to this document.

3. Gas cylinders purchased for the storage and shipment of compressed gas products for DLA and DoD activities are procured in accordance with Military and/or Federal specifications. These specifications supplement United States Department of Transportation (DOT) manufacturing requirements with the necessary military design and marking requirements. The basic cylinder is manufactured to the desired DOT specification (e.g., 3AA, 4BA, 8A), then assembled into a complete cylinder with the desired Mil Spec valve, color code, and product identification designating its specific use. The fabrication of the cylinder by the manufacturer and the initial hydrostatic testing and recording of data by an independent inspection agency are under the surveillance of a Government QAR. Cylinders may be purchased and sent directly to a compressed gas filling installation for immediate use, or they may be shipped directly to a stock or depot storage facility where they may remain for an undetermined length of time. During any storage period, whether the cylinder is full or empty, its condition may deteriorate, causing it to become unsafe for further use. All persons who handle, use, and fill cylinders must be able to recognize these deteriorating conditions and initiate action to have the cylinders reconditioned or removed from service. Any person offering a compressed gas for shipment must assure that the cylinder being used for that shipment meets all design and manufacturing requirements of the applicable Federal, Military, and DOT specifications and that it has been requalified (retested) and reconditioned in accordance with MIL-STD-1411, Inspection and Maintenance of Compressed Gas Cylinders, and DOT Title 49 CFR, Transportation. These documents and procedures are discussed in detail in enclosure 1 of this Instruction.

4. Certain safety precautions must be exercised in the storage, handling, and use of compressed gases and of the cylinders in which they are contained. The primary precautions for compressed gases used by DoD activities are provided in enclosure 1 of this document. In addition to written precautions, the DoD has established a color-coding system that identifies the primary and secondary safety hazards presented by each compressed gas or mixture of compressed gases. This system is outlined in MIL-STD-101B, Color Codes for Pipelines and Compressed Gas Cylinders. The system enables the

gas user or cylinder handler to immediately identify the type of gas and the hazardous nature of the material contained in each cylinder (e.g., flammable, nonflammable, corrosive, poisonous, oxidizing). Additional information and further guidance may be obtained from the preparing and coordinating activities of this regulation, the local safety office or fire department, the manufacturer of the specific compressed gas, the Compressed Gas Association, the Hazardous Materials Technical Center (HMTC), or the DOT.

5. Cleaning, internal and external, is performed by the commercial supplier and/or vendor at the time of retesting and reconditioning or at the time the cylinder is filled. Should external cleaning become necessary during storage, materials used to clean the cylinders must be compatible with the gas or liquid to be put into the cylinders, or the gas previously in the empty cylinders. For instance, 1,1, trichloroethylene can explode.

F. RESPONSIBILITIES

1. Headquarters Defense Logistics Agency, Defense Logistics Support Command (DLSC-LD) will be responsible for monitoring and staff supervision of the DLA program for storage, handling, and use of compressed gases (liquefied and non-liquefied) in cylinders and for the overseas program for hydrostatic testing and reconditioning of U. S. Government-owned cylinder at locations throughout the world.

2. Field Activities

a. The Commanders of DGSC and DSCP will:

(1) Ensure the quality of the compressed gases and gas cylinders that are procured or managed.

(2) Provide guidance as needed to all DLA and DoD activities that use, handle, maintain, retest, recondition, and or store compressed gases to maintain an adequate and constant safety and quality control program.

(3) Review the quality control and related technical aspects of this Instruction and it's 2 enclosures annually and, in collaboration with HQ DLA, maintain appropriate constituent parts current.

b. The Commanders of DLA and DoD Storage and Using Activities that Furnish Special Support to DLA will:

(1) Implement the requirements of this Instruction and it's 2 enclosures.

(2) Ensure that all persons who use, handle, maintain, recondition, and/or store compressed gases (liquefied and non-liquefied) contained in cylinders are aware of and comply with the provisions of this joint Instruction and its 2 enclosures.

(3) Conduct inspections as required herein, and maintain concise records of such inspections.

(4) Assign condition codes, and report in accordance with the requirements of this Instruction and its 2 enclosures.

(5) Maintain and segregate all full and empty serviceable, Supply Condition Code A cylinders in a safe and usable condition and ensure that all cylinders coded other than Supply Condition Code A are handled properly according to their condition.

(6) Assure the use of Government-owned cylinders for the purchase of all compressed gases when a an approved dedicated government owned cylinder can be identified and can be made available.

(7) Develop and maintain an accountability system for all commercially-owned cylinders used to supply compressed gases from local distributors using their ownership symbols and serial numbers.

(8) Identify and return all non-Government-owned cylinders to their rightful owners, and ensure they are not returned to a Defense Depot or DoD storage activity or reported to a DLA Supply Center as excess personal property. Assistance in identifying the commercial ownership symbols found on the shoulders of commercially-owned cylinders will be provided by the DSCR, DSCR-JDTA, upon request. When ownership of a non-Government-owned cylinder cannot be determined, it shall be processed by the holder as lost, abandoned, or unclaimed privately-owned personal property in accordance with DoD 4160.21-M, Defense Materiel Disposition Manual, and section 8 of enclosure 1 of this Instruction.

c. The Commanders of Department of Defense (DoD) Using Activities will:

(1) Ensure that all personnel who use, handle, maintain, recondition, and/or store compressed gases (liquefied or non-liquefied) contained in cylinders are aware of and comply with the provisions of this joint Instruction and it's 2 enclosures.

(2) Maintain all Condition Code A compressed gas cylinders in a safe and usable condition and ensure that all compressed gas cylinders coded other than Condition Code A are handled properly according to their condition.

(3) Report by the correct National Stock Number (NSN) which will provide the DOT Spec (3AA), the service pressure (2265), the capacity (252 CF), the dimensions (9 by 51 inches) and the product (oxygen), and the correct Condition Code all excess Government-owned industrial compressed gas cylinders to DSCR and all excess Government-owned medical compressed gas cylinders to DPSC for disposition instructions.

(4) Identify and return all contractor-owned, leased, or rented cylinders to their rightful owners and ensure they are not reported to a DLA Center as excess. When a cylinder cannot be identified to a valid NSN or its ownership cannot be determined, disposition instructions shall be requested from the appropriate managing activity.

d. The Commander, Defense Reutilization and Marketing Service (DRMS) will:

(1) Receive serviceable, unserviceable and condemned, compressed gas cylinders from authorized activities in accordance with DoD 4160.21-M, and section 8 of enclosure 1 of this Instruction.

(2) Maintain all fully serviceable cylinders (Supply Condition Code A) in a safe and usable condition.

(3) Dispose of serviceable, unserviceable, and condemned compressed gas cylinders in accordance with DoD 4160.21-M.

(4) Ensure that all DRMS personnel who use, handle, maintain, and/or store gas cylinders are aware of and comply with the provisions of this joint Instruction and its 2 enclosures.

G. EFFECTIVE DATE. This publication is effective immediately.

H. INFORMATION REQUIREMENTS. (Reserved for future use.)

BY ORDER OF THE DIRECTOR, DEFENSE LOGISTICS AGENCY, AND THE SECRETARIES OF THE ARMY, THE AIR FORCE, THE NAVY, AND THE COMMANDANT OF THE MARINE CORPS

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SECTION 1

DEFINITIONS

1-1. GENERAL. This document and its two enclosures have been developed to provide guidance and direction in the storage and handling of compressed gas cylinders and their contents, normally procured, stocked, and used within the Department of Defense (DoD). There are several more compressed gases used in the commercial industry that are not addressed in this document. Some of those may find their way into the military system, some of which may be extremely hazardous. Should cylinders of such gases be identified, they should be isolated in a protected location away from any noncompatible materials until specific direction on their safe handling and storage can be established. The Department of Transportation (DOT), in 1967, assumed from the Interstate Commerce Commission (ICC) all regulatory functions for compressed gases and gas cylinders. Reference is made to DOT with the understanding that ICC cylinders with their markings now in the DoD system will retain their ICC identification.

1-2. DEFINITIONS

A. Compressed Gas. Class 2, Divisions 2.1, 2.2, and 2.3

1. Division 2.1, Flammable Gas. Flammable gas means any material which is a gas at 20 C (68 F) or less and 101.3 kPa (14.7 psia) of presssure (a material which has a boiling point of 20 C (68 F) or less at 101.3 kPa (14.7 psia)) which—

a. Is ignitabale at 101.3 kPa (14.7 psia) when in a mixture of 13 percent or less by volume:

b. Has a flammable range at 101.3 kPa (14.7 psia) with air of at least 12 percent regardless of the lower limit. The limits specified in A1a and b shall be determined at 101.3 KPa (14.7 psia) of pressure and 20 C (68 F) in accordance with ASTM E681-85, Standard Test Method for Concentration Limits of Flammability of Chemicals. Other methods of determination approved be the Associate Administrator for Hazardouis Materials Safety, U.S. Department of Transoprtation as acceptable.

2. Division 2.2, Non-Flammable, Non-poisonous compressed gas, (including compressed gas, liquefied gas, pressurized cryogenic gas, compressed gas in solution, asphyriant gas and oxidizing gas). A non-flammable, non-poisonous compressed gas means any material which—

a. exerts in the packaging an absolute presssure of 180 kPa (40.6 psia) or greater at 20 C (68 F), and

b. Does not meet the definition of Division 2.1 or 2.3.

3. Division 2.3, Gas Poisonous by Inhalation. A gas poisonous by inhalation means a material which is a gas at 20 C (68 F) or less and 101.3 kPa (14.7 psia) of pressure (a material which has a boiling point af 20 C (68 F) or less at 101.3 kPa (14.7 psia) which

a. Is known to be so toxic to humans as to pose a hazard to health during transportation, or

b. In the abscence of adequate data on human toxicity, is presumed to be toxic to humans because when tested on laboratory animals it has an LC50 value of not more than 5000 ml per cubic meter. LC50 values may be determined using the formula found in CFR 49, 173.133(b)(1)(i).

4. Compressed Gas In Solution. The term @compressed gas in solution" identifies a nonliquefied compressed gas that is dissolved in a solvent. In this case we are speaking of acetylene which is dissolved into acetone.

5. Cryogenic Liquid. A cryogenic liquid means a refrigerated liquefied gas having a boiling point colder that –90 C (-130 F) at 101.3 kPa (14.7 psia). It must be super cooled (refrigerated) for it to condense into the liquid state. It is therefore sometimes referred to as a refrigerated liquid. A material meeting this definition is subject to the requirements of Title 49 CFR, regardless of whether it meets the definition of a compressed gas in subparagraph 1 above. An example of this type of material is partially described as "oxygen, refrigerated liquid" (cryogenic liquid) in Title 49 CFR, Paragraph 172.101. Gases meeting these characteristics would be gases such as oxygen, nitrogen, argon, helium, and hydrogen.

6. Liquefied Compressed Gas. The term "liquefied compressed gas" means a gas which in a packaging under the charged pressure, is partially liquid at a temperature of 20 C (68 F). Gases meeting these characteristics would be the Liquefied Petroleum Gases (Butane and Propane), all of the refrigerant gases, ammonia, chlorine, and the fire fighting halons 1202, 1211, and 1301.

7. Non-liquefied Compressed Gas. The term "non-liquefied compressed gas" means a gas, other than in solution, which in a packaging under the charged pressure is entirely gaseous at a temperature of 20 C (68 F). These are sometimes referred to as the permanent gases. They will also (when super cooled or refrigerated) meet the characteristics of a cryogenic liquid or a refrigerated gas. Gases meeting these characteristics would be oxygen, nitrogen, argon, helium, and hydrogen.

B. Cylinder. A compressed gas cylinder is a pressure vessel designed for the storage and transportation of a compressed gas at pressures higher than 40 pounds per square inch absolute (psia), 25 pounds per square inch gage (psig) with a tubular shape and circular cross section. This does not include a portable tank, a multi-unit tank car tank, a cargo tank, or a tank car. (Title 49 CFR, Section 171.8).

1. Empty Cylinder. A cylinder may be considered empty by the user at any time when the remaining contents (usually pressure) in the cylinder is below an acceptable level for the designated application however under all circumstances the following regulatory requirements apply:

a. Any cylinder containing the residue of a DOT regulated hazardous material (HAZMAT) must be offered for transportation and transported in the same manner as when it contained a greater quantity of that HAZMAT. This includes classification, marking, labeling, identification, shipping papers etc.

b. A cylinder is not subject to the requirements of the hazardous materials regulations if it:
(1). Is unused;
(2). Is sufficiently cleaned of residue and purged of vapors to remove any potential hazard;
(3). Contains only the residue of a non-flammable gas with no subsidiary hazard at an absolute pressure less than 280 kPa (40.6 psia) at 20 C (68F) and any material in the cylinder does not meet the definition for a hazardous substance, hazardous waste, or a marine pollutant.

c. Empty New Procurement - Except for DOT 8 or 8AL cylinders, cylinders received as a result of procurement action should be pressurized with not less than 5 psi of nitrogen and should be tagged "PRESERVED WITH NITROGEN GAS." A DOT "Empty" label is not required.

d. Acetylene New Procurement - DOT 8 or 8AL cylinders received as a result of procurement action will have a flammable solvent in its porous core. These cylinders are not required to be labeled "Flammable" or "Empty" by the U.S. DOT.

2. Cleaned and Purged Cylinder. Any cylinder cleaned and purged of all hazardous residue in accordance with Title 49 CFR, Paragraph 173.29, and charged with a positive pressure of an inert gas (e.g., nitrogen), or dry, oil-free air, not to exceed 24 psig (39 psia) at 70øF and properly tagged "cleaned and purged." Under no circumstances shall standard oil tolerant shop air (air that has been compressed with an oil lubricated compressor without adequate filtration and cleaning be used to purge and pressurize a "cleaned and purged" cylinder.

C. Flammable Range. As defined in Paragraph 173.115 of Title 49 CFR, the term "flammable range" shall be used to describe the values of the volume percentage of the material in air between the minimum, Lower

Flammable Limit (LFL), and the maximum, Upper Flammable Limit (UFL), which forms a flammable compressed gas.

D. Explosive Range. The term "explosive range" shall be used to describe the values of the volume percentage of the material in air between the minimum, Lower Explosive Limit (LEL), and the maximum, Upper Explosive Limit (UEL), which can be detonated.

E. Inert. Inert defines the type of a compressed gas that is not flammable, corrosive, oxidizable, or poisonous and is essentially chemically inactive. Gases such as helium, neon, argon, and nitrogen are considered inert.

F. Mixture. Mixture defines a material that is composed of more than one compound or element. (Title 49 CFR, Paragraph 171.8)

G. Oil Free. For applications that cannot tolerate hydrocarbon contamination, the term "oil free" shall be used to identify use restrictions when applied to air, helium, and nitrogen. Applications that cannot tolerate hydrocarbon contamination include the purging of oxygen systems or components, delicate instruments, human respiration systems and equipment, heavy artillery recoil mechanisms, etc. Such gases shall not be used on or with any system in which feedback of oil or other hydrocarbon contaminants into the cylinder is possible. This term has replaced the term "water pumped," which originally indicated that the gas was charged into the cylinder with the use of a water-and-soap lubricated compressor. This type of compression, no longer in general use, has been replaced with systems using a diaphragm-type compressor or a system by which the gas is pumped as a cryogenic liquid, then passed through a vaporizer to convert it into a gas as it is charged into cylinders. The need to identify the type of compression has thus changed to a need to identify the type of application. It has been found that hydrocarbon contamination can migrate back into a cylinder from a system with which it is used by pressure feedback. It is, therefore, necessary to continue the distinct separate applications of inert gases with systems that demand a hydrocarbon free gas and systems that can tolerate, or that do contain, hydrocarbon products such as oil or hydraulic fluids. The purpose in making a distinction between these two applications was to enhance user safety. Consequently, different cylinder valve outlet connections are now employed, and adaptors are not authorized for noncompatible applications.

H. Oil Tolerant. The term, "oil tolerant," when applied to air, helium, and nitrogen, indicates that the gas can be used in applications that can tolerate or contain a hydrocarbon material such as oil or similar fluids. Such applications would be for purging or pressurizing hydraulic or pneumatic systems, leak testing of refrigerant systems, pressurizing aircraft struts, and general use by maintenance and automotive shops, etc. This term has replaced the term "oil pumped," which originally designated that the gas was charged into the cylinder with the use of an oil-lubricated compressor. This type of compression system is still available and is still used for some gases; however, some gas systems are using a diaphragm compressor, and still others, such as nitrogen systems, are now charging nitrogen into cylinders by pumping the gas as a cryogenic liquid and then passing it through a vaporizer to convert it to a gas as it is charged into cylinders. Even though the gas is now charged from an "oil free" source from the cryogenic fluid, it has been found that the cylinders can become contaminated with feedback from a system using hydrocarbon products such as oil or other hydraulic fluids. It was, therefore, necessary to continue the separate and distinct application of certain inert gases (air, helium, nitrogen). The term "oil tolerant" is now used to designate the type of applications with which the gases shall be used. The separation of this type of application has been further enhanced by the use of a specific cylinder valve outlet connection. Inert gases identified as oil tolerant must not be used to purge or pressurize oxygen or air for human respiration systems. They shall only be used with systems that do or can tolerate hydrocarbon contamination. Contamination of an oxygen system with an oil-tolerant gas could result in a fire or explosion with loss of life or of a complete weapons system.

I. Oxidizer. The term oxidizer defines a compressed gas that readily yields oxygen to stimulate the combustion of organic matter and when contained in a cylinder, the cylinder will be so labeled in accordance with Title 49 CFR Section 173.127.

J. Pressure-Relief Device. This is a device that is employed to prevent the rupture of a charged compressed gas cylinder under abnormal conditions(over filling, over pressurization, engulfed in a fire etc). The device can be designed to be activated by either pressure or temperature and will relieve all or partial pressure sufficiently to prevent the rupture of the cylinder. Such a device must be subjected to a fire test as required by Section 173.34(d) of Title 49 CFR. Pressure relief devices are prohibited on cylinders charged with a poison A gas or liquid and fluorine.

K. PSI or psi. PSI or psi is the abbreviation for pounds per square inch when defining pressure.

L. PSIA or psia. PSIA or psia is the abbreviation for pounds per square inch absolute. This is gage pressure plus the atmospheric pressure of 14.7 psi.

M. PSIG or psig. PSIG or psig is the abbreviation for pounds per square inch gauge. The pressure indicated on the pressure gauge which represents the pressure above atmospheric. This is the pressure read on a pressure gage where A0" is the absence of pressure or vacuum.

N. Residue. Residue is the material (compressed gas) remaining in a cylinder after its contents have been exhausted to the maximum extent practicable and before the cylinder is either refilled or cleaned of hazardous material and purged to remove any hazardous vapors. (Title 49 CFR, Section 171.8)

O. Service Pressure. The term "service pressure" (sometimes referred to as working pressure) is defined as the authorized (designed) fill pressure of the compressed gas cylinder. This will be a numeric value immediately following the DOT specification stamped into the shoulder, head ring or foot ring of the cylinder. For example, for cylinders marked "DOT 3AA2265," the service pressure is 2265 psig. This is the predetermined pressure to which the cylinder is authorized to be charged at a stabilized temperature of 70øF.

P. Temperature Limits. The temperature of 130øF is cited in the Title 49 CFR as the upper temperature limit to be used for calculating when a cylinder will become liquid full, and in the definition of a compressed gas. This temperature has been determined to be the maximum temperature normally encountered during the transportation and storage of compressed gases. For the purposes of this regulation, 130øF is cited in text when it relates directly to a citation in Title 49 CFR. To provide an extra margin of safety, temperature limits cited in other parts of this regulation have been lowered to 125øF for DoD and DLA activities.

Q. USP. USP means Pharmacopoeia of the United States. This is a document published by the medical profession that contains a list of drugs and medicines and describes their preparation, properties, uses, etc.

SECTION 2

CHARACTERISTICS OF GASES

2-1. GENERAL. Personnel having the responsibility of storing, handling, and/or using compressed gases and gas cylinders must have a working knowledge of the characteristics and hazards associated with each individual gas. Specific and detailed information on the properties and/or hazards of any gas is best obtained from the manufacturer or supplier of the product through Material Safety Data Sheets (MSDS) or brochures. Additional information to that provided in this document is available in other reference material from commercial sources. The following commercial publications are recommended as sources for additional information pertaining to technical data and to first aid and medical treatment for exposure to gases:

A. Effects of Exposure to Toxic Gases/First Aid and Medical Treatment, available from Matheson Gas Products.

B. Gas Data Book, available from Matheson Gas Products. This document contains technical information about the various compressed gases and provides such information as the chemical characteristics, how a gas is manufactured, how it is used, how it is transported, safety and health information and how to dispose of it.

C. Methods for Hydrostatic Testing of Compressed Gas Cylinders, CGA Pamphlet C-1, available from the Compressed Gas Association (CGA). This pamphlet provides the detailed information on the retesting (requalification) of compressed gas cylinders.

D. Handbook of Compressed Gases, available from the CGA. This document is a compilation of technical information similar to that of the Matheson Gas Data Book but also contain much of the specific information found in the individual CGA pamphlets.

E. Chlorine Manual, available from The Chlorine Institute. This document provides detailed information on the manufacture, transporting, safety and health and other critical information on the chlorine industry.

F. Cylinder Service Life Seamless, High-Pressure Cylinder Specification ICC/DOT-3, ICC/DOT-3A, ICC/DOT-3AA, CGA Pamphlet C-5, available from the CGA. This document provides detailed information on the manufacture of cylinders and when used with the results of the hydrostatic test outlined in Pamphlet C-1, a person can determine the expected life of a high pressure steel cylinder.

G. Standards for Visual Inspection of Compressed Gas Cylinders, CGA Pamphlets C-6, C-6.1, C-6.2 and C-6.3 available from the CGA. These documents provide direction and guidance in performing a visual inspection of a compressed gas cylinder to visually determine the integrity of the structure of the cylinder.

2-2. GASES AND THEIR CHARACTERISTICS. The gases most likely to be found in the DLA and DOD storage and support facilities inventories are listed below. The label requirements for each gas are indicated. For special handling and transportation, refer to the specific label requirements found in Para 172.101 of the Code of Federal Regulations, Title 49 and part 82 of CFR Title 40 (EPA).

A. Acetylene, Dissolved (Hazard Class 2.1, I.D. No. UN 1001, Flammable Gas Label). Acetylene is a compound of carbon and hydrogen in proportions by weight of about 12 parts carbon to 1 part hydrogen (92.3 to 7.7 percent). Pure acetylene is a colorless, highly flammable gas of agreeable ethereal odor. Acetylene of ordinary commercial purity has a distinctive garlic-like odor. It is very soluble in acetone, 1 volume of acetone will dissolve 300 volumes of acetylene at 160 psig. It is slightly lighter than air. Acetylene is shipped dissolved in acetone. Full cylinder pressure is 250 psig. Acetylene is a simple asphyxiant and an anesthetic. Low concentrations of vapors has an anesthetic effect, and vapors in high concentrations or in enclosed spaces may cause asphyxiation. Acetylene in its free state under pressure, may decompose violently. The higher the pressure, the smaller the initial force required to cause an explosion. Therefore, NEVER use the free gas outside the

cylinder at pressures in excess of 15 psig. Acetylene is highly flammable over a wide range and forms explosive mixtures with air (LFL 2.5 percent and UFL 100 percent). Acetylene cylinders should always be stored, transported, and used in an upright position to avoid loss of solvent (acetone) during use and to provide a safe position of the cylinder should a pressure relief device be activated during a fire. The vertical position of the cylinder will let the 15 foot spout of flame that can develop to harmlessly release the contents of the cylinder without cutting into another cylinder. If a cylinder had to be positioned in a horizontal position for any reason, it must be positioned in an upright position for a minimum of at least 2 hours prior to its use. Some grades of commercial acetylene have toxic impurities; therefore, breathing of acetylene vapors in any concentration must be avoided. Acetylene can cause cardiac irritability.

B. Air, Compressed (Hazard Class 2.2, I.D. NO. UN1002, Nonflammable Gas Label) Air, Refrigerated liquid (Cryogenic Liquid) (Hazard Class 2.2, I.D. No. UN1003, Nonflammable Gas (primary) and Oxidizer (subsidiary) Labels). Air is the natural atmosphere of the earth--a nonflammable, colorless, odorless gas that consists of a mixture of gaseous elements (with water vapor, a small amount of carbon dioxide, and traces of many other constituents). Synthesized air is produced by combining pure oxygen and nitrogen and contains between 19.5 and 23.5 percent oxygen, with the balance nitrogen and with a major portion of the other components eliminated. Dry air is noncorrosive. Liquefied air is transparent with a bluish cast and has a milky color when it contains carbon dioxide. Because air is a mixture, not a compound, it can be separated into its components. The most common method is the liquefaction of air by reducing its temperature to approximately -320 deg F (-195.6 deg C), then fractionally distilling to remove each of the constituents as fractions. Compressed air is nontoxic. It may act as an oxidizing material. Direct contact with the releasing high pressure gas or the cryogenic liquid may cause frostbite.

C. Ammonia, Anhydrous (Hazard Class 2.3, I.D. NO. UN1005, Poison Gas (primary) and corosive (subsidiary) Labels). Ammonia is the compound formed by the chemical combination of the two gaseous elements, nitrogen and hydrogen, in the molar proportion of one part nitrogen to three parts hydrogen. This relationship is shown in the chemical symbol for ammonia, NH3. On a weight basis the ratio is 14 parts nitrogen to 3 parts hydrogen or approximately 82 percent nitrogen to 18 percent hydrogen. The term ammonia is the name of the chemical compound, NH3, which is commonly called anhydrous ammonia. ANHYDROUS means without water and when used with ammonia indicates the water content is less than 0.2 percent. This differentiates it from the various widely used aqueous solutions of ammonia. At room temperature and atmospheric pressure, ammonia is a pungent, colorless gas. It may be compressed and cooled to a colorless liquid. Between the melting and critical point, liquid ammonia exerts a vapor pressure which increases with rising temperature. When anhydrous ammonia in a closed container is in equilibrium with anhydrous ammonia vapor, the pressure with the container bears a definite relationship to the temperature. Anhydrous ammonia vapors are extremely imitating to the eyes and respiratory tract, and in high concentrations can be fatal; however, persons will not willingly remain in an atmosphere of ammonia long enough to incur permanent physical damage. Ammonia vapors can form flammable and explosive mixtures in air (LFL 15.5 percent, UFL 27 percent, LED 16 percent, and UEL 25 percent), however, these concentrations are seldom encountered. Liquid anhydrous ammonia is extremely cold, -28øF, and contact with skin may cause severe frostbite and serious eye damage.

D. Argon, Compressed (Hazard Class 2.2, I.D. NO. UN1006, Nonflammable Gas Label). Argon, Refrigerated Liquid (Cryogenic Liquid)(Hazard Class 2.2, I.D. NO. UN1951, Nonflammable Gas Label) Argon is nonflammable and nontoxic and will not support combustion. It is manufactured as a cryogenic liquid with a normal boiling point of -302.6øF. As a cryogenic fluid, it is stored and transported in special insulated and vacuum-jacketed cylinders (DOT 4L) with a water capacity of not over 1000 pounds (454.6 liters or 120 gallons) or in insulated tanks and cargo tank trucks. It is also vaporized into its gaseous state and charged into high-pressure cylinders (DOT 3A or 3AA) of 1800 psig or greater. Argon, in its cryogenic liquid state, is normally stored in large insulated storage tanks at the manufacturing facility and is delivered in small quantities directly to the point of use or to a special storage facility designed for cryogenic liquids. Argon, as a cryogenic liquid, cannot be stored in a closed container because the liquid is continuously boiling (vaporizing) and building up pressure; therefore, it is stored in a container with an open vent or a vent that incorporates a controlled pressure relief device. The storage and handling of argon, as addressed in this regulation, will be in its vapor or gaseous state in high-pressure DOT 3A, 3AA, or 3AL cylinders. Due to its ability to displace air, argon is a simple

asphyxiant. Contact with the cryogenic liquid or its cold vapors and the escaping high pressure from a cylinder may cause frostbite and serious eye damage.

E. Carbon Dioxide (Hazard Class 2.2, I.D. NO. UN1013, Nonflammable Gas Label).
Carbon dioxide in cylinders is in the form of a gas over liquid and at 70øF exerts a pressure of 838 psig. Humans cannot breath air containing more than 10 percent carbon dioxide (by volume) without losing consciousness. The gas is about 1.5 times heavier than air and is nontoxic, nonreactive, slightly acidic, and will not burn or support combustion or human life. Carbon dioxide gas interferes with proper mentation at 1.9 percent and is not tolerable at 3.5 percent - 5.0 percent. Carbon dioxide cylinders become extremely dangerous when heated to a temperature approximating 125øF and should never be placed near furnaces, radiators, or any other source of heat. Contact with the liquid or high-pressure gas may cause frostbite and serious eye damage.

F. Carbon Monoxide, Compressed (Hazard Class 2.3, I.D. NO. UN1016, Poison Gas (primary) and Flammable Gas (subsidiary) Labels) Carbon monoxide is an extremely flammable gas (LFL 12.5 percent and UFL 74 percent). When pure, it is odorless and colorless and does not give warning of its presence; therefore, cylinders must always be placed in a well-ventilated area away from sources of ignition or oxidizing gases. Prolonged breathing of low concentrations may cause headaches. Angina and heart attacks can result from exposure to people with cardiac problems. Breathing high concentrations of carbon monoxide may be fatal.

G. Chlorine (Hazard Class 2.3, I.D. NO. UN1017, Poison Gas (primary) and corrosive (sibsidiary) Labels).
Chlorine is charged into cylinders as an amber liquid that turns to a nonflammable greenish-yellow gas at -29øF. Chlorine must not be confused with swimming pool chemicals, such as calcium hypochlorite or sodium dichloroisocyanurate, that are sometimes erroneously called chlorine. Although chlorine is nonflammable, most combustible materials will burn in a chlorine atmosphere as they do in an oxygen atmosphere, and flammable gases and vapors will form explosive mixtures with chlorine. Chlorine reacts explosively or forms explosive compounds with many common chemicals, especially acetylene, turpentine, ether, anhydrous ammonia, fuel gas, hydrocarbons, hydrogen, and finely divided metals. Chlorine gas is primarily a respiratory irritant; in high concentrations, it could cause serious physical damage. However, persons will not willingly remain in an atmosphere of chlorine long enough to incur permanent damage. Liquid chlorine or high-pressure gas may cause frostbite and serious eye damage.

H. Chlorine Trifluoride (Hazard Class 2.3, I.D. NO. UN1749, Poison Gas (primary), Oxidizer (subsidiary) and Corrosive (subsidiary) Labels). Chlorine trifluoride is a greenish-yellow liquid which turns to a nearly colorless gas at its boiling point of 53øF. It is dangerously reactive. It will ignite most combustible materials. It reacts violently with water to form hydrogen fluoride and chlorine. It also reacts strongly with sand, silicon-containing compounds, glass, and asbestos. The liquid is extremely toxic and corrosive. Contact with skin or eyes will cause deep, painful burns. Vapors will cause severe damage to the eyes, skin, respiratory tract and mucous membranes, and may cause pulmonary edema.

I. Chlorofluorocarbons, Flammable (Hazard Class 2.1, I.D. NO. See below, Flammable Gas Label).
Flammable chlorofluorocarbons, such as chlorodifluoroethanes R-142b, (UN2517) a refrigerant and low-temperature solvent, and difluoroethane R-152a, (UN1030) an intermediate, should never be confused with or mistaken for nonflammable, chlorofluoro- carbons. These materials are highly flammable and, in some cases, highly reactive. Health hazards are the same as for nonflammable chlorofluorocarbons.

J. Chlorofluorocarbons, Nonflammable (Hazard Class 2.2, I.D. NO. See below, Nonflammable Gas Label)
Chlorofluorocarbon gases are most commonly used in refrigeration and air conditioning applications. Although classed as nonflammable, chlorofluorocarbons mixed with flammable liquids or gases may be flammable and should be handled with caution. Partially halogenated compounds may also be flammable and must be individually examined. Although the toxicity of chlorofluorocarbons is low, the possibility of injury or death exists in unusual situations or if the material is deliberately misused. The vapors are several times heavier than air, and under static conditions, uniform distribution in an enclosed space might be quite slow. Good ventilation should be provided in areas where high concentrations of the heavy vapors might accumulate and exclude oxygen. Chlorofluorocarbons coming into contact with hot surfaces or open flames will produce fumes of

extremely irritating and toxic hydrogen chloride and/or hydrogen fluoride. Inhalation of the chlorofluorocarbons in high concentration is dangerous and can be fatal. When treating persons suffering toxic effects from exposure to chlorofluorocarbons, the use of epinephrine or similar drugs should be avoided because they may produce cardiac arrhythmias, including ventricular fibrillation.

Chlorofluorocarbons identified as the following have been determined to be ozone depleting substances and have been banned from further production. These compressed gases must now be captured (Recovered) and returned to the DOD reserve now being managed by DSCR. These products will be reissued to qualified activities for use in critical applications where an alternate has yet to be found. Instructions for the operation of the program and the procedures to be used for the turn in of these products can be found in Section 12 of this enclosure. (This list contains only those compressed gases now in use by the DOD) The total list of products have been identified as Class I or Class II substances. The class I substances have been banned from further production, the Class II substances will be banned at a later date.

Group I	Group II
Trichlorofluoromethane R-11	Bromochlorodifluoromethane :(Halon 1211)
Dichlorodifluoromethane R-12	Bromotrifluoroethane (Halon 1301)
Trichlorotrifluoroethane R-113	Dibromotetrafluoroethane (Halon 2402)
Dichlorotetrafluoroethane R-114	
Monochloropentafluoroethane R-115	

K. Cyclopropane (Hazard Class 2.1, I.D. NO. UN1027, Flammable Gas Label).
Cyclopropane is a colorless, flammable (LFL 2.4 percent and UFL 10.3 percent) gas with a sweet, distinctive odor resembling that of petroleum naphtha. For its major use as an anesthetic medical gas, it must be supplied according to USP purity standards. Concentrations (by volume) of 6 percent result in unconsciousness, and as the concentration increases to 23 percent, moderate to deep anesthesia results. Concentrations in excess of 23 percent are fatal, causing respiratory failure. The principal hazard of cyclopropane is its flammability.

L. Ethylene Oxide, Pure or with nitrogen (Hazard Class 2.3, I.D. NO. UN1040, Poison Gas and Flammable Gas Labels) Ethylene oxide is a highly reactive colorless gas that condenses to a colorless liquid boiling at 50.7 deg F (10.4 deg C) and 14.7 psia. It is miscible in all proportions with water, alcohol, ether, and most organic solvents. The vapors of ethylene oxide are flammable and explosive. It is generally noncorrosive to metals and leaves no residual odor or taste. The major use of ethylene oxide is as a chemical intermediate for the manufacture of ethylene glycol and higher glycols. These glycols are used as drying agents, antifreezes, and raw materials for the manufacture of other chemical derivatives. Ethylene oxide, both pure and ;mixed with carbon dioxide or halocarbons, is also used as a sterilant and fumigant for heat-sensitive materials. AEthylene oxide is a toxic liquid and gas. The vapors from Ethylene oxide form flammable mixtures with air over a wide range (LFL 3 percent and UFL 100 percent). The vapor is heavier than air (vapor density 1.5) and may travel a considerable distance to a source of ignition and flash back. Ethylene oxide is dangerously reactive; it may rearrange chemically and/or polymerize violently with evolution of heat when in contact with highly active catalytic surfaces such as anhydrous chlorides of iron, tin, aluminum, and pure oxides of iron and aluminum, and alkali metal hydroxides. Although soluble in water, solutions will continue to burn until diluted to approximately 22 volumes of water to one volume of ethylene oxide. Ethylene oxide is moderately toxic by inhalation, and breathing and high concentrations may cause pulmonary edema. It is a severe, eye, skin, and respiratory irritant, and effects may be delayed. For specific health hazards refer to the MSDS, the DoD Hazardous Materials Information System, or the manufacturer, supplier, or vendor for information.

M. Ethylene Oxide and Nonflammable Gas Mixtures (Labeled According to
Mixture). Due to the high flammability and explosive hazards of pure ethylene oxide and the need for its use as a sterilizer for medical equipment and material, a mixture of nonflammable gases is added to the material to reduce its hazard. The mixtures are usually 20 to 90 percent carbon dioxide or dichlorodifluoromethane by volume. The mixtures are less toxic than pure ethylene oxide, but do pose a health threat when inhaled or when in direct contact with skin or eyes. For specific health hazards refer to the MSDS, the DoD Hazardous Materials Information System, or the manufacturer, supplier, or vendor for information.

N. Helium, Compressed (Hazard Class 2.2, I.D. NO. UN1046, Nonflammable Gas) Helium, Refrigerated Liquid (Cryogenic Liquid)(Hazard Class 2.2, I.D. NO. UN1963, Nonflammable Gas Label) Helium is a colorless, odorless, and tasteless gas at room temperature and atmospheric pressure. Its principal source in the United States is from certain natural gas wells in which the natural gas may contain up to 9 percent helium. It is normally supplied as a nonliquefied compressed gas in high-pressure DOT 3A or 3AA cylinders at or above a pressure of 1800 psig at 70øF. Helium can be condensed into a cryogenic liquid when refrigerated to below its normal boiling point of -452.1øF, the lowest boiling point of any substance known. As a cryogenic liquid, it is stored and transported in special insulated and vacuum-jacketed cylinders (DOT 4L) with a water capacity of not over 1,000 pounds (454.6 liters or 120 gallons) or in larger insulated and vacuum-jacketed tanks and cargo tank trucks. Helium, as a cryogenic liquid, is like argon and cannot be stored in a closed container because the liquid is continuously boiling (vaporizing) and building up pressure; therefore, it is stored in a container with an open vent or a vent that incorporates a controlled pressure relief device. The storage and handling of helium, as addressed in this regulation, will be in its vapor or gas state in high-pressure cylinders. In high concentrations, helium acts as a simple asphyxiant, causing suffocation due to oxygen deficiency. Contact with the liquid or cold vapors may cause frostbite and serious eye damage.

O. Hydrogen (Hazard Class 2.1, I.D. NO. UN1049, Flammable Gas Label). Hydrogen is a colorless, odorless, flammable gas at room temperature and atmospheric pressure. It is the lightest gas known. It is usually shipped as a nonliquefied compressed gas in high-pressure DOT 3A or 3AA cylinders at a pressure greater than 1800 psig at 70øF. Hydrogen can be condensed into a cryogenic liquid when refrigerated below its normal boiling point of -423.0øF. As a cryogenic liquid, it is stored and transported in special insulated and vacuum-jacketed cylinders (DOT 4L) with a water capacity of not over 1000 pounds (454.6 liters or 120 gallons) or in larger insulated and vacuum-jacketed tanks and cargo tank trucks. Hydrogen, as a cryogenic liquid, is like argon and helium and cannot be stored in a closed container because the liquid is continuously boiling (vaporizing) and building up pressure; therefore, it is stored in a container with an open vent or a vent that incorporates a controlled pressure relief device. The storage and handling of hydrogen, as addressed in this regulation, will be in its vapor or gaseous state in high-pressure cylinders. Hydrogen burns in air with a pale blue, almost invisible, flame. Hydrogen will form flammable and explosive mixtures over a wide range with air (LFL 4 percent, UFL 74 percent, LED 4.1 percent, and UEL 74.2 percent) and oxygen (LFL 4 percent, UFL 95 percent, LED 4.7 percent, and UEL 93.9 percent). Unlike hydrogen at normal ambient temperatures when it is lighter than air, the cold gas as it is vented or released from the container is slightly heavier than air and may remain near ground level until it warms up. Fog formed when the cold gas comes in contact with the moisture in the air will indicate where the gas is spreading. However, explosive mixtures can exist outside the visible fog. Hydrogen is nontoxic but can cause asphyxiation. Contact with the cryogenic liquid or cold vapor can cause frostbite and serious eye damage.

P. Liquefied Petroleum Gases (LPG) (Hazard Class 2.1, I.D. NO. UN1075, Flammable Gas Label). The liquefied petroleum gases are butane, isobutane, propane, propylene (propene), butylenes (butenes) and any mixtures of these hydrocarbons as defined by the National Fire Protection Association (NFPA), DOT, or other authority. They are flammable (butane LFL 1.8 percent and UFL 8.4 percent, butylene LFL 1.6 percent and UFL 10 percent, propane LFL 2.2 percent and UFL 9.5 percent, and propylene LFL 2 percent and UFL 11.1 percent), colorless, and noncorrosive. Most are odorless, so an odorant such as ethyl mercaptan is added to warn of the presence of the gas. (Propylene and butylenes have a foul odor.) High concentrations of LPG in air may cause central nervous system depression with symptoms including light-headedness, drowsiness, unconsciousness, and possibly death.

Q. Methyl Acetylene and Propadiene. Mixtures, Stabilized, :(MAPP) (Hazard Class 2.1, I.D. NO. UN1060, Flammable Gas Label). MAPP is a registered trademark of AIRCO, a division of BOC Group, Inc., Montvale, NJ, which is the sole source of MAPP gas. The proper name is methyl acetylene and propadiene mixtures, stabilized, and the gas is a stabilized mixture of methyl-acetylene (CH2CCH) and propadiene (CH2CCH2). It is a flammable gas whose vapors form flammable mixtures in air over a narrow range (LFL 3.4 percent and UFL 10.8 percent). Its penetrating, foul, and persistent odor gives a good warning of its presence.

R. Methyl Bromide (Hazard Class 2.3, NO. UN1062, Poison Gas Label).
Methyl Bromide is a colorless liquid or gas with practically no odor. It is a poisonous gas at room temperature and atmospheric pressure. At high concentrations, it has a chloroform like odor. Detection of lower

concentrations is often facilitated by a warning odorant, chloropicrin, which is added by the manufacturer. Methyl bromide is flammable only when in the presence of a high energy source and in the narrow flammability range of 10 to 16 percent by volume in air. Its physical properties do not meet the definition of a flammable gas as defined by the U.S. Department of Transportation. The onset of thermal decomposition occurs at approximately 752 deg F (400 deg C). Methyl bromide is used primarily as a fumigant to control insects infesting various grains and non-food material. It is also used in small quantities in organic synthesis for methylations. Although methyl bromide is not a compressed gas, it is routinely encountered in gas cylinders. Inhalation of the vapor is harmful and can be fatal. Contact with the liquid can cause severe damage to the skin, eyes, or mucous membranes. Methyl bromide has a chloroform-like odor.

S. Methyl Chloride (Hazard Class 2.1, I.D. No. UN1063, Flammable Gas Label)
Methyl chloride is a colorless, flammable gas with a faintly sweet, nonirritating odor at room temperatures. It is shipped as a transparent liquid under its vapor pressure of about 59 psig at 70 deg F(407 kPa at 21.1 deg C). Methyl chloride burns feebly in air but forms mixtures with air that can be explosive within its flammability range. Dry methyl chloride is very stable at normal temperatures and in contact with air. In the presence of moisture, it hydrolyzes slowly, which results in the formation of corrosive hydrochloric acid. At temperatures above 700 deg F(371 deg C), methyl chloride may decompose into toxic end products (hydrochloric acid, phosgene, chlorine, and carbon monoxide). It is slightly soluble in water and very soluble in alcohol, mineral oils, chloroform, and most organic liquids. Methyl chloride is both flammable (LFL 8.1 percent and UFL 18.7 percent) and toxic in high concentrations. The recommended Threshold Limit Value for methyl chloride in air is 100 ppm. Because of its mild odor and narcotic effect, persons may be exposed to considerable concentrations without being aware of the danger. The symptoms of poisoning include dizziness, headache, optical difficulties, nausea, and vomiting, and may be delayed for several hours.

T. Nitrogen, Compressed (Hazard Class 2.2, I.D. NO. UN1066, Nonflammable Gas Label) Nitrogen, Refrigerated Liquid (Cryogenic Liquid)(Hazard Class 2.2, I.D. No. UN1977, Nonflammable Gas Label).
Nitrogen is an odorless, colorless, tasteless, nontoxic, and almost totally inert gas that makes up 78 percent of the earth's atmosphere. It is colorless as a cryogenic liquid. It is not flammable and will not support combustion or human life. It is manufactured as a cryogenic liquid with a normal boiling point of -320øF. As a cryogenic liquid, it is stored and transported in either special insulated and vacuum-jacketed cylinders (DOT 4L) with a water capacity of not over 1,000 pounds (454.6 liters or 120 gallons) or in insulated and vacuum-jacketed tanks or cargo tank trucks. It is also vaporized into the gaseous state and charged into high-pressure cylinders (DOT 3A, 3AA, or 3AL) 1800 psig or greater. Nitrogen in its cryogenic liquid state is normally stored in large storage tanks at the manufacturing facility and is delivered in small quantities directly to the point of use or to a special storage facility designed for cryogenic liquids. Nitrogen, as a cryogenic liquid like other cryogenic liquids, cannot be stored in a closed container because the liquid is continuously boiling (vaporizing) and building up pressure; therefore, it is stored in containers with an open vent or with a vent that incorporates a controlled pressure relief device. Alternate methods of producing nitrogen gas conforming to the physical characteristics of Fed Spec BB-N-411 may be produced utilizing the pressure swing adsorption cycle or the use of membrane technology. The storage and handling of nitrogen as addressed in this regulation will be in its vapor or gas state in high-pressure DOT 3A, 3AA, or 3AL cylinders. Unlike nitrogen at normal ambient temperatures when it is lighter than air, the cold gas as it is vented or released from the cryogenic container is slightly heavier than air and may remain near ground level until it warms up. In this case, nitrogen can act as an asphyxiant, displacing air and causing suffocation due to oxygen deficiency. Fog formed when the cold gas comes in contact with the moisture in the air will indicate where the gas is spreading. Contact with the liquid or cold gas can cause frostbite and serious eye damage.

U. Nitrous Oxide, Compressed (Hazard Class 2.2, I.D. NO. 1070) and Nitrous Oxide, Refrigerated Liquid (Hazard Class 2.2, I.D. NO. 2201) , Nonflammable Gas Label)
Nitrous oxide at normal temperatures and pressures is a colorless, practically odorless and tasteless, nontoxic gas. It is shipped as nitrous oxide, compressed, or nitrous oxide, refrigerated liquid. Nitrous oxide is nonflammable, but, being a mild oxidizing agent, will support combustion of flammable materials. It is used as an inhalant type of anesthetic or analgesic gas. When inhaled in high concentrations for a few seconds, it affects the central nervous system and may induce symptoms closely resembling alcoholic intoxication. Its colloquial name,

"laughing gas," stems from the fact that some persons exhibit hilarity after inhaling nitrous oxide. Continued inhalation without an ample supply of oxygen results in simple asphyxia.

V. Oxygen, Compressed (Hazard Class 2.2, I.D. NO. UN1072, Nonflammable Gas (primary) and Oxidizer (subsidiary) Labels) Oxygen, Refrigerated Liquid (Cryogenic Liquid)(Hazard Class 2.2, I.D. No. UN1073, Nonflammable Gas (primary) and Oxidizer (subsidiary) Labels). Oxygen in the gaseous state is colorless, odorless, tasteless, nontoxic, and nonflammable but supports combustion vigorously. It is necessary to sustain life, and it constitutes about 20 percent, by volume, of the earth's atmosphere. As a cryogenic liquid, it is pale blue in color and, at its normal boiling point of -297øF, is slightly heavier than water. It is manufactured as a cryogenic fluid by fractional distillation of liquefied air, or is manufactured as a gas using an electrolytic generator. Oxygen produced by the pressure swing adsorption cycle is a maximum of 94% oxygen with the remainder consisting of Argon. This process does not meet Mil-O-27210 procurement for gaseous aviators breathing oxygen. Therefore it should not be stored in a high pressure cylinder designated as aviators breathing oxygen. As a cryogenic liquid, it can be stored or transported in special insulated and vacuum-jacketed cylinders (DOT 4L) with a water capacity of not over 1,000 pounds (454.6 liter or 120 gallons) or in insulated and vacuum-jacketed tanks or cargo tank trucks. It is also vaporized into the gas state and charged into high-pressure cylinders (DOT 3A, 3AA, or 3AL) of 1800 psig or greater. Oxygen, in its cryogenic liquid state, is normally stored in large storage tanks at the manufacturing facility and is delivered in small quantities directly to the point of use or to a special storage facility designed for cryogenic liquids. As with other cryogenic fluids, it cannot be stored in a closed container because the liquid is continuously boiling (vaporizing) and building up pressure; therefore, it is stored in containers with an open vent or with a vent that incorporates a controlled pressure relief device. The storage and handling of oxygen as addressed in this regulation will be in its vapor or gas state in high-pressure DOT 3A, 3AA, or 3AL cylinders. Contact with the cryogenic liquid or the cold vapor may cause frostbite and serious eye damage. The cold gas, as it is vented or released from the cryogenic container, is slightly heavier than air and will remain near ground level until it warms up. Fog formed when the cold gas comes in contact with the moisture in the air will indicate where the gas is spreading. All materials that are flammable in air burn much more vigorously in oxygen. Some combustibles, such as oil and grease, burn with nearly explosive violence in an oxygen atmosphere, if ignited. Oxygen itself is nonflammable. Containers must be kept free of oil, grease, and any other organic or hydrocarbon contamination and shall not be handled with oily hands, gloves, or greasy equipment. Use of perchloroethylene, trichloroethylene, or 1,1,1,-trichloroethane to clean cylinders is prohibited and may create an explosive atmosphere with a resulting fire or explosion.

W. Sulfur Dioxide, Liquefied (Hazardous Class 2.3, I.D. NO. UN1079, Poison Gas Label)
Sulfur dioxide is a colorless nonflammable gas with a sharp pungent odor. It liquefies at temperatures below 14øF. The gas is extremely irritating to the eyes and respiratory tract. Its irritant properties are attributed to the rapidity with which it forms sulfurous acid on contact with moist membranes. Sulfur dioxide is on the National Primary and Secondary Ambient Air Quality Pollution Standard List. Any leak must be immediately reported to proper authorities.

X. Sulfur Hexafluoride (Hazard Class 2.2, I.D. NO. UN1080, Nonflammable Gas Label)(domestic)/Sulphur Hexafluoride (international)
Sulfur hexafluoride (domestic)/sulphur Hexafluoride (international) is colorless, odorless, nontoxic, nonflammable, and is one of the most chemically inert gases known. It is shipped as a liquefied compressed gas at a pressure of 310 psig. Sulfur hexafluoride (domestic)/sulphur Hexafluoride (international) is nontoxic; however, it can act as a simple asphyxiant by displacing air in enclosed spaces. Lower fluorides of sulfur are produced when sulfur hexafluoride (domestic)/sulphur hexafluoride (international) is subjected to electrical discharge, and gases produced are toxic by inhalation.

2-3. OTHER GASES. Many other gases, such as the ones listed below, are less likely to be encountered in DoD. For further information refer to paragraph 2-1.

A. Dimethylamine, Anhydrous (Hazardous Class 2.1, I.D. NO. UN1032, Flammable Gas Label)
Dimethylamine is a flammable, alkaline, colorless gas at room temperature and atmospheric pressure. It has a characteristic fishy odor in lower concentrations. In higher concentrations (100 to 500 ppm) the fishy odor is no

longer detectable and the odor is more like that of ammonia. It is readily liquefied is shipped in steel cylinders as liquefied gas under its own vapor pressure of 11.3 psig at 21.1 deg C.

B. Ethyl Chloride (Hazardous Class 2.1, I.D. NO. 1037, Flammable Gas Label)
Ethyl Chloride, at room temperature and atmosphere pressure, is a flammable gas with a pungent, ethereal odor. Ethyl chloride has narcotic properties, but over-exposure can cause toxic effects. It is readily liquefied and is shipped in steel cylinders and drums as a liquid under its own vapor pressure of 37 kPa (5.36 PSIG) at 21.1 deg C. Flammable range (LFL 3.6 percent and UFL 15.4 percent).

C. Hydrogen Chloride, anhydrous (Hazardous Class 2.3, I.D. No. UN1050 Poison Gas (primary) and corrosive (subsidiary) labels). Hydrogen Chloride, Refrigerated Liquid (Hazard Class2.3, ID No. UN2186, Poison Gas (primary) and Corrosive (subsidiary) labels).
Hydrogen chloride is a pungent, toxic, corrosive gas having a suffocation odor. It is heavier than air, and fumes strongly in moist air. It is very soluble in water and ethyl alcohol and also soluble in ethyl ether. It is shipped in cylinders as a liquefied gas under its own vapor pressure of 4 230 kPa (613 psig) at 21.1 deg C.

D. Hydrogen Sulfide, (Hazard Class 2.3, I.D. NO. UN1053, Poison Gas (primary) and Flammable Gas (subsidiary) Labels). Hydrogen Sulfide, at room temperature and atmospheric pressure, is a color less, flammable, toxic gas having an offensive odor described as that of rotten eggs. It is shipped in steel cylinders as a liquefied gas under its own vapor pressure of 1 737 kPa (252 psig) at 21.1 deg C. Flammable range (LFL 4.0 percent and UFL 44 percent).

E. Neon, compressed (Hazardous Class 2.2, I.D. NO. UN1065 for gaseous, UN1913 for refrigerated liquid (cryogenic liquid), Nonflammable Gas Label). Neon is a member of Group VIIIA elements, which have been called noble gases, inert gases, and aerogens. Neon is a colorless, odorless, and tasteless monatomic gas. It exists in very minute traces in the atmosphere (18.18 ppm by volume). Neon is normally available compressed in cylinders at varying pressures depending on the cylinder size, and also in 1 liter quantities in glass flasks at atmospheric pressure.

F. Phosgene (Hazardous Class 2.3, I.D. NO. UN1076, Poison Gas and corrosive Labels) Phosgene, at ordinary temperatures and pressures, is a colorless, nonflammable, highly toxic gas with an odor like that of musty hay. It is readily liquefied to a colorless to light yellow liquid and is shipped in steel cylinders as a liquefied gas under it own vapor pressure of 74 kPa (10.7 psig) at 21.1 deg C.Phosgene is a lung irritant and causes sever damage to the alveoli of the lungs. This is followed by edema, resulting in asphyxiation. Inhalation of the gas produces catching of the breath, choking, immediate coughing, tightness of the chest, lacrimation, difficulty and pain in breathing, and cyanosis. Serious symptoms may not develop until several hours after exposure, for the immediate symptoms produced by even a fatal dose may be relatively mild since phosgene elicits no marked respiratory reflexes; thus, a person who appears to be but slightly gassed immediately after exposure may become a casualty several hours later. The most pronounced symptoms of phosgene poisoning are coughing with bloody sputum and weakness which may last for months.

SECTION 3

CHARACTERISTICS OF CYLINDERS

3-1. GENERAL. In the absence of a standardization program, the type and size of compressed gas cylinders has varied in past procurements. The type, design, size, and capacity normally depend on the commodity of gas and the amount to be shipped in one cylinder. It may be necessary to occasionally identify a cylinder to exact specifications for a specific application in or with an end item or weapon system. The current method of procurement stipulates that all cylinders be purchased using military or Federal specifications and standards to provide a standardization in the cylinder program. These documents are continuously updated to reflect the new requirements of state-of-the-art applications. However, since the cylinder is a nonexpendable item and is continually cycled into and out of various applications, methods must be established for its accountability and reconditioning. The procedures outlined in section 4 have been developed to simplify this process.

3-2. BASIC CYLINDER TYPES. Compressed gas cylinders in use by DoD activities and other Government activities are of three basic types: high pressure, low pressure, and low pressure for gas in solution. High-pressure cylinders are those marked with a service pressure of 900 psig (6200 kilopascal (kPa) or greater and low pressure cylinders are marked with a service pressure of less than 900 psig (6200 kPa). The differentiating pressure types of cylinders are identified as DOT designations 3, 4, or 8 with an applicable suffix to identify the particular specification that was used in manufacturing the cylinder. All cylinders purchased and/or requalified for use by DoD and other Government activities must be manufactured, inspected, and tested in accordance with Title 49 CFR, Parts 173 and 178 or to its designated Military or Federal Specification. Each person who represents that he manufactures or performs retesting as outlined in Title 49 CFR must be approved by, and have a registration number issued by, DOT. Instructions for obtaining such a registration number are contained in section 11.

A. Cylinder Types. The cylinders used throughout DoD that are managed by DSCR are cylinders identified by DOT specifications 3, 3A, 3AA, 3AL, 4, 4A, 4AA, 4B, 4BA, 4BW, 8, and 8AL. The markings of a typical cylinder might be arranged on one side of the shoulder or head of the cylinder as follows:

DOT 3AA2265
CX428813TW
US GOVT

In this case, the DOT specification is 3AA, the service pressure is 2265 psig at 70øF, the purchasing agency is CX (DSCR), the serial number is 428813, the manufacturer is TW (Taylor-Wharton), and the owner is the United States Government. These same markings could be arranged in a horizontal line around the shoulder and might appear as follows: DOT 3AA2265 CX428813TW US GOVT. Complete requirements for markings on cylinders are contained in the applicable cylinder specification in Title 49 CFR, Part 178, and in the Government procurement specification.

B. Cylinder Interchangeability. In most instances, depending on product and application, cylinders of a given basic type are interchangeable. For instance, DOT 3A and 3AA cylinders are interchangeable when the shatterproof characteristic is not a prime factor in their use. DOT 4B, 4BA, and 4BW are also interchangeable when the materials of construction are compatible with the product used. In the military supply system, the DOT 4A and 4AA cylinders are used exclusively for anhydrous ammonia and should not be substituted for or by any other specification 4 cylinder unless such use is approved by DOT. The specification 8 and 8AL cylinders are packed with a porous material that, even when the cylinders are empty, makes them much heavier than would normally be expected. These cylinders are used exclusively for acetylene; no other product may be used with these cylinders. When newly manufactured, the porous material in these cylinders is filled with acetone.

C. Cylinder Sizes. The physical dimensions (e.g., diameter and height) of the cylinders in the DoD inventory are continuously changing to meet new design and application requirements. The Government, over the past several years, has thus accumulated various size and capacity cylinders for each of the compressed gas applications. This is more predominant in the DOT 4 and 8 specification cylinders. A variation of the cylinder dimensions to + 2 inches in diameter and + 6 inches in height is found with some refrigerant and acetylene

cylinders having a common volumetric capacity. In such instances, the cylinders have been grouped together based on the common capacity under one or more designated National Stock Numbers (NSNs). This grouping is available for cylinders that are not within the dimensional criteria but are within the capacity criteria of the established NSNs. When an NSN has been established for a cylinder with critical dimensions, or for a critical end item application such as where the cylinder must fit in a retaining fixture aboard a ship or aircraft, the cylinders must be within the specified tolerances. The variation of cylinder size is not as prevalent with the DOT 3 series cylinders. Tolerances of these cylinders shall not exceed +1/4 inch diameter and + 1 inch in height from the established NSN description. As with the low-pressure DOT 4 and 8 cylinders, there are specific requirements for dot 3 series cylinders that must be mounted in retaining fixtures; the designated tolerances must be considered for proper cylinder identification or cylinder procurement. Most of the DOT 4 and 8 cylinders that are not designated for a specific end use in which the size is critical may be identified only as cylinders with the same capacity for a given gas under one NSN.

D. Cylinder Pressures. Compressed gas cylinders are designed and constructed to meet the specific needs of storing, using, and transporting compressed gases safely. All cylinder designs and/or types are regulated and manufactured in accordance with DOT specifications. Each cylinder has been marked with a DOT specification and working (service) pressure, which is stamped (not stenciled) into the shoulder of the cylinder as cited in subparagraph A, above. The cylinder selected for use with a product is based on the stabilized pressure of the product at an ambient temperature of 130øF, which shall not exceed 5/4 times the service pressure (at ambient temperatures) of the cylinder; the materials used in the construction of the cylinder also must be compatible with the product. Exceptions apply for certain charged cylinders depending on the product, such as acetylene, liquefied nitrous oxide, or liquefied carbon dioxide.

E. Cylinder Pressure Substitutions. Cylinders of the same type manufactured to the same specification (3A, 3AA, 3AL, 4B, 4BA, or 4BW) with a greater service pressure than is necessary for the designated product may be substituted for the specified cylinder of lower pressure provided the prescribed valve and cylinder characteristic requirements for the product and application are met. The minimum service pressure of a cylinder for a compressed gas that is filled by weight (gas in the liquid state) is determined by the vapor pressure of the gas product at a temperature of 130øF. The approved cylinders and the regulated service pressures are found in Title 49 CFR and in the product and cylinder description listings for Federal Supply Classes (FSCs) 6505, 6830, and 8120. High-pressure cylinders DOT 3A and 3AA with service pressures of 1800 psig or greater will vary in capacity based on the service pressure and the product. DOT cylinders 3A2000, 3AA2000, 3A2260, and 3AA2260 were purchased in the past for helium service, and NSNs were assigned as necessary. It has been necessary to convert some of these cylinders to other services where a specific NSN does not apply. The following cylinders have been consolidated: DOT 3A2000 with 3A2015, 3AA2000 with 3AA2015, 3A2260 with 3A2265, and 3AA2260 with 3AA2265. New NSNs were not established for this consolidation.

F. Nonshatterable/Shatterproof Cylinders. The term "nonshatterable" as used herein refers only to specification 3A and 3AA high pressure cylinders. This designation is not considered applicable to specification 4 or 8 cylinders. This type of cylinder is required in all aircraft and shipboard applications where fragmentation must be controlled to minimize loss of life and damage to vital systems. The designation is applied to high-pressure DOT 3A or 3AA cylinders made of a high grade of steel that will not separate into more than two pieces when ruptured by a .50 caliber projectile when the cylinder is filled to its service pressure. Cylinders meeting this requirement have been specifically identified by item description in FSC 8120. Many nonshatterable cylinders are identified by the words "NONSHATTERABLE," "NON-SHAT," or "SHATTERPROOF" stamped, not stenciled, into the shoulder of the cylinder. In other instances, nonshatterable cylinders can be identified as follows:

1. All cylinders stamped DOT 3AA that are made of 4130x steel.

2. All cylinders stamped DOT 3A with one of the following specification numbers on the shoulder:

SPS 843 (INT)
SPS 1022 (INT)

51-C-26 and 51-C-26 (INT)
51-C-41 and 51-C-41 (INT)

3. Cylinders that are marked with specification 51-C-31 or 51-C-31 (INT) are also nonshatterable if the initial (earliest) hydrostatic test date is 6-44 or later. Cylinders manufactured prior to 6-44 are nonshatterable only if they are so indicated by the manufacturer. Cylinders that are not identified by any of the above markings will not be classed and identified by NSN as nonshatterable. Changes in NSNs or Condition Codes that result from reidentifying cylinders from shatterable to nonshatterable as stated above will be reported to DSCR in accordance with DOD 4000,25-2-M. Military Standard Transaction Reporting and Accounting Procedures (MILSTRAP), except that DD Form 1225, Storage Quality Control Report, is not required.

3-3. CYLINDER REQUALIFICATION. (**NOTE**: When there is a conflict between DoD cylinder specifications and the specifications required by the host nation, the more stringent requirements shall apply.) Compressed gas cylinders will not be refilled if the prescribed service period between cylinder requalifications has expired. Each time a cylinder is requalified, the date of test or inspection, indicating the month and year, is stamped into the shoulder, collar, or foot ring of the cylinder with a steel stamp. This date is used to determine the next scheduled requalification date. The DOT registration identification number of the requalification facility shall be stamped between the month and year. This marking will provide traceability to the last facility that performed a requalification on the cylinder.

A. The service period for each type of cylinder is considered to have expired if the latest marked requalification date stamped on the shoulder, valve guard, or foot ring of the cylinder precedes the current date by more than the period indicated below. The referenced paragraph entries all refer to the CFR Title 49. The requirements of CFR Title 29, Paragraph 1910.157f have been incorporated into the test period data based on the type (specification) of the cylinder used in the fire extinguisher. Only the types that qualify as compressed gas cylinders have been incorporated.

DOT Cylinder Specification			Retest Period
DOT 3			5 years
DOT 3A, DOT 3AA			
Specific Applications	173.34e(12)	w/5 year internal and external visual	10 years
Specific Applications	173.34e(13)	non-corrosive—external visual only	5 years
Specific Applications	173.34e(14)	Anhydrous Ammonia	10 years
Specific Applications	173.34e(16)	Dry Gas Applications	10 years
Specific Applications	173.34e(19)	Extinguishers	12 years
General Applications			5 years
DOT 3AL			
Specific Applications	173.34e(19)	Extinguishers	12 years
General Applications			5 years
DOT 4A			
Specific Applications	173.34e(12)	With 5 year internal and external visual	10 years
Specific Applications	173.34e(13)	Non-corrosive---external visual only	5 years
General Applications			5 years
DOT 4AA			
Specific Applications	173.34e(13)	Non-corrosive---external visual only	5 years
Specific Applications	173.34e(14)	Anhydrous Ammonia	10 years
General Applications			5 years
DOT 4B, 4BA, 4BW			
Specific Applications	173.34e(11)	With water jacket hydrostatic test	12 years

Specific Applications	173.34e(11)	With modified hydrostatic test	5 years
Specific Applications	173.34e(12)	With 5 year internal and external visual	10 years
Specific Applications	173.34e(13)	Non-corrosive---external visual only	5 years
Specific Applications	173.34e(19)	Extinguishers	12 years
General Applications			5 years
DOT 8, 8AL			
Specific Applications	173.34e(18)	Acetylene cylinder shell inspection	10 years
Specific Applications	173.34e(18)	Acetylene cylinder filler inspection	20 years

Paragraph Applications

173.34e(11) Anhydrous dimethylamine; anhydrous methylamine; anhydrous trimethylamine; methyl chloride; liquefied petroleum gas; methylacetylene-propadiene stabilized; dichlorodifluoromethane; difluorethane; difluorochloroethane; chlorodifluoromethane; chlorotetrafluoroethane; trifluorochloroethylene; or mixtures thereof or mixtures of one or more with trichlorofluoromethane.
All gases must be free of corroding components.

173.34e(13) Anhydrous ammonia; Butadiene, inhibited; cyclopropane; fluorinated hydrocarbons and mixtures thereof; liquefied hydrocarbon gas; liquefied petroleum gas; methylacetylene-propadiene, stabilized; anhydrous mono, di, trimethylamines; ethyleneimine, inhibited. All gases must be free of corroding components.

173.34e(16) Air, argon, cyclopropane, ethylene, helium, hydrogen, krypton, neon, nitrogen, nitrous oxide, oxygen, sulfur hexafluoride (domestic)/sulphur hexafluoride (international) , xenon, permitted mixtures of these gases and permitted mixtures of these gases with up to 30 percent by volume of carbon dioxide. All additional requirements of paragraph 173.34e(16) must be met.

B. Requalification Identification. Each cylinder passing the requalification test and inspection must be marked with the facilities assigned identification number set in a square pattern, between the month and year of the requalification date. This number shall be stamped in characters not less than 1/8-inch high with the first character occupying the upper left corner of the square pattern. The second character must be in the upper right, the third in the lower right, and the fourth in the lower left. Example: A cylinder requalified in May 1984 and approved by a facility that has been issued identification number A123 would be stamped:

A	1
5	84
3	2

Variations from the marking requirements may be permitted upon written request to, and approval issued by, the Director, OHMT (see section 11). Stamping must be in accordance with the location requirements of the cylinder specification. Date of previous requalifications must not be obliterated. Cylinders subject to a modified requalification and cylinders that are exempt from requalification are not required to be marked with a registration identification number.

C. Requalification Exemptions. All cylinders not exceeding an outside diameter of 2 inches and a length of 2 feet, and all cylinders designated 3E and 4C are exempted from hydrostatic requalification.

D. Requalification Requirements. The requirement for a cylinder to be retested after the expiration of a specific service period is further clarified to indicate that after the expiration of the service period, the cylinder shall not be recharged until the requalification is performed. This is to imply that a visually serviceable full cylinder is considered fully serviceable until the product is exhausted, and then it cannot be refilled until a requalification test and inspection is performed. An exception to this extension of the retest period for cylinders still full of product is the specific requirements for cylinders used as fire extinguishers. Such cylinders (extinguishers) must be removed from service, emptied, and requalified at intervals not to exceed those intervals specified in Table L-1, Paragraph 1910.157f, CFR Title 29."

All periods cited herein meet or exceed the requalification requirements outlined in Title 49 CFR. DoD activities will requalify cylinders as cited herein. IMPORTANT: All cylinders m
ust be requalified by a facility that has been inspected and registered with DOT (see section 11).

E. Acetylene Cylinder Requalification (8 or 8AL).

1. The owner of a DOT 8 or 8AL cylinder used in the transport of flammable acetylene must have the cylinder(s) shell and porous filler requalified in accordance with CGA Pamphlet C-13. The requalification must be performed by an approved requalification facility and in accordance with the following schedule:

SHELL
REQUALIFICATION

Date of cylinder manufacture	Initial Inspection	Subsequent Inspection
Before 1 Jan 1991	Before 1 Jan 2001	Every 10 years thereafter
On or after 1 Jan 1991	10 years from Date of manufacture	Every 10 years thereafter

POROUS FILLER
REQUALIFICATION

Date of cylinder manufacture	Initial Inspection	Subsequent Inspection
Before 1 Jan 1991	Before 1 Jan 2011	Not required
On or after 1 Jan 1991	3 to 20 years*	Not required

*For cylinders manufactured on or after 1 Jan 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. Acetylene cylinders must be requalified by a person who holds a valid retesters identification number in conformance with paragraph 173.34e(2) of Title 49 CFR. Each cylinder successfully passing a shell or filler requalification must be marked with the testers identification number in accordance with the referenced paragraph of Title 49 CFR and paragraph 3-3B of this document. In addition, the cylinder must be appropriately marked to identify the type of requalification performed in accordance with paragraph 4.8 of CGA Pamphlet C-13. For example, the letter AS@ for a shell requalification and the letter AF@ for a porous filler requalification.

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 the valve weight differential.

3-4. CYLINDERS VALVES. The physical and functional design of the compressed gas cylinder valve is critical to its designated application with a specific gas product. Each valve is designed with an outlet connection that will prevent the cylinder from being coupled to a system that is not compatible with the gas product. Examples would be to prevent an oxidizing gas cylinder, such as one containing oxygen, to be connected to a flammable gas system such as a system containing acetylene, or to prevent a life-threatening gas from being connected to a medical, dental, or veterinary gas system for respiratory use. Cylinder valve outlet connection adapters must only be used within the same commodity group with compatible applications. All valves procured for use on Government-owned cylinders shall meet all requirements of MIL-DLT-2 Series, Valves, Cylinder Gas (For Compressed or Liquefied Gases), General Specifications (and the specific specification sheets within the MIL-DTL-2 series). Information on the various cylinder valve outlet designs and their specific assigned gas applications is provided in Federal Standard (FED STD) H28, Screw-Thread Standards for Federal Services, and FED STD H28/9, Gas Cylinder Valve Outlet and Inlet Threads. These documents incorporate the detailed

design and manufacturing requirements published in the industry standard identified as the Compressed Gas Association (CGA) Pamphlet V-1, Compressed Gas Cylinder Valve Outlet and Inlet Connections.

A. Valve Procurement. MIL-DTL-2 and all of its supplementary specification sheets have been developed to provide all necessary data to competitively procure cylinder valves for each gas product used by the Government. A type designator has been assigned to each valve that identifies the specification sheet, the assigned valve outlet connection number, and, if applicable, the standard pressure relief device. Valves installed on Government-owned cylinders may not always conform to the latest issue of MIL-DTL-2; however, they must have an outlet connection compatible with the product contained in the cylinder. Replacement of nonconforming valves is only required if the valve is defective, is not properly marked, does not have the proper outlet connection, or has an improper pressure relief device that cannot be changed. Several of the compressed gas cylinders used by DoD have valve outlet connections that are common for several different gases based on the properties of the gases. To determine a suitable outlet connection when one cannot be identified by visual inspection, it is recommended that a valve outlet connection nipple and a nut from a regulator of a known compatible application be tried in or on the outlet. This method is preferred over using an outlet plug or cap because some connections employ the same size thread but the bore depth to accept the connection nipple is different to prevent cross connection. Valve design and outlet connection number assignments have not been accomplished on all gases or gas mixtures. If a valve and its specific design has not been identified in MIL-DTL-2, the proper valve and cylinder assembly identification will be obtained from DSCR-JDT.

B. Medical Valves. Materials sanctioned by the National Aeronautics and Space Administration (NASA) are specified for medical cylinder valves. Materials routinely used in the commercial market place, such as neoprene, have been found to be detrimental in high-pressure oxygen systems. Valves that are chromium plated should possess approved materials, as recommended by NASA, and as specified for valves managed by the Defense Supply Center Philadelphia(DSCP). Cylinder valves on refillable medical gas cylinders that are not chromium plated shall be replaced.

C. Fire Extinguishing System Cylinder Valves. Fire extinguishing system cylinder valves for carbon dioxide and bromotrifluoromethane (Halon 1301) will be different. Navy fire extinguishing system cylinder valves, as prescribed by MIL-V-17360 for carbon dioxide, and MIL-E-24572 for Halon 1301, will be used.

3-5. COLOR CODING. All personnel who handle or use compressed gas cylinders must be familiar with the purpose of color coding cylinders to the requirements of MIL-STD-101B, Color Code for Pipelines and for Compressed Gas Cylinders. Color coding is provided as a hazard warning and should be used with other characteristics such as physical size, valve outlet connection, nomenclature stamped on the valve, nomenclature stenciled on the cylinder, the type, and the service pressure of the cylinder to identify the contents of the cylinder. The appearance of any of the following six colors on the body or top or as a band(s) on compressed gas cylinders shall serve as a hazard warning: yellow (flammable), brown (toxic and poisonous), blue (anesthetic and harmful), green (oxidizers), gray (dangerously high pressure and an asphyxiant), and red (fire protection). If there is any doubt as to the contents of the cylinder, DSCR should be contacted immediately and the cylinder should be stored as a poison gas until the contents are verified.

SECTION 4

INSPECTION OF CYLINDERS

4-1. GENERAL. A thorough and accurate inspection system is essential to the safe handling and storage of both filled and empty compressed gas cylinders. The inspection system imposed by this regulation has been divided into five separate inspections. These inspections are identified as: Receiving Inspection (Contractor Receipts), Receiving Inspection (Customer Returns), Receiving Inspection (Redistribution), Periodic Inspection, and Shipping Inspection. Criteria of the various inspection elements are presented in paragraph 4-2 below, and the inspection elements as they apply to the various inspections are outlined in paragraphs 4-3 through 4-6 below.

4-2. CRITERIA OF INSPECTION ELEMENTS

A. Cylinder Identification. The assignment or identification of cylinders to an NSN will be accomplished by considering the following characteristics:

Shatterable, nonshatterable, and/or impact resistant.
ICC/DOT Specification.
Service Pressure.
Color Code.
Valve Outlet Connection
Cylinder Dimensions (see paragraph 3-2C).
Chemical designation of the gas

To assist in the proper identification of compressed gas cylinders, DSCR has developed a method of establishing a specific reference number (P/N) that will aid in the search for the assigned NSN. Using the characteristics listed above and the table of approved item name codes (INC) found in the Federal Item Identification Guide No. T-162, a reference number can be developed.

Example: 3AA2265/49502/9.25X51-540-252CF

3AA	Represents the ICC or DOT Manufacturing Spec.
2265	Represents the Service Pressure of the Cylinder
49502	Represents the Item Name Code for Aviators Breathing Oxygen
9.25x51	Represents the physical dimensions of the cylinder
540	Represents the valve outlet connection no. for oxygen Mil-DTL-2, and CGA Pamphlet V-1)
252CF	Represents the capacity of the cylinder is cubic feet, This can also expressed pounds (lb) for liquid filled cylinders and gallons (gl) for medical gases expressed in gallons of gaseous products.

B. Cylinder Count. Verify cylinder count to make sure the quantity agrees with the shipping documentation.

C. Government Ownership. Over the years and before the central management of compressed gases and their cylinders, each government agency managed and purchased their own cylinders. To identify the purchasing activity and the owner of the cylinder, each agency obtained from the then Interstate Commerce Commission (ICC), an ownership designation in the form of a number and a designated code. The code could be either a trade mark or a series of letters representing an acronym of the activity. Some of the agencies, when purchasing cylinders had their designated code combined in the serial number. It usually appeared as a prefix with the letters running horizontal in line with the serial number. In others, the letters were put vertically at the beginning of the serial number. And still others, the code was just stamped on the shoulder of the cylinder to show ownership.

Each cylinder which is now purchased centrally by the DSCR will have a serial number that is prefixed with the letters "CX" to identify the purchasing agency and the letters "U S GOVT" stamped into the shoulder of the cylinder below the serial number to show government ownership. The following list provides all of the known codes that have been used over the years to purchase cylinders for the various government agencies. Since all cylinders are now circulated to all DOD and other government agencies, each code now only represents that the cylinder is a government owned cylinder.

1. Cylinder ownership symbols that have been used over the years by various government agencies are as follows:

AF	U.S. AIR FORCE
CWSUSA	CHEMICAL WARFARE SERVICE
DA	DEPT OF THE ARMY
EAD-O	CORP OF ENG. U.S. ARMY
FBVE	TREASURY DEPT.
LH	DEPT OF COMMERCE, LIGHTHOUSE DIST.
LHS	U.S. DEPT FOR COMMERCE, LIGHTHOUSE DIST
MDSFGP	DEFENSE LOGISTICS AGENCY
MDUSA	DEFENSE LOGISTICS AGENCY
NFBC	U.S. ENGINEER CORPS.
TP&USA	TREASURY DEPT
TPSUSA	TREASURY DEPT
USA	U S ARMY
USAF	U S AIR FORCE
USARMY	U S ARMY
USBM	U.S. BUREAU OF MINES
USBOM	U.S. BUREAU OF MINES
USBR	DEPT OF INTERIOR, BUREAU OF RECLAMATION
USCEC	U.S. CORPS OF ENGS, DEPT OF ARMY
USCG	U.S. COAST GUARD
USDA	U.S. DEPT OF AGRICULTURE
USDA-NU	U.S. DEPT OF AGRICULTURE
USDAARC	U.S. DEPT OF AGRICULTURE AGRICULTURE RESEARCH CENTER
USDABACE	U.S. DEPT OF AGRICULTURE, BUREAU OF AGRICULTURE CHEM.&ENG
USDABEPB	U.S. DEPT OF AGRICULTURE BUREAU OF ENTOMOLOGY & PLANT QUARANTINE
USDAFS	U.S. DEPT OF AGRICULTURE BUREAU OF SOILS
USDANRRL	U.S. DEPT OF AGRICULTURE AGRICULTURE RES. ADMINISTRATION
USDASCS	U.S. DEPT OF AGRICULTURE SOIL CONSERVATION SERVICES
USECP	ENG. CORP, U S ARMY.
USED	U.S. ENG CORPS.
USGOVT	DEFENSE LOGISTICS AGENCY
USLHS	U.S.DEPT OF COMMERCE, LIGHTHOUSE DIST.
USN	U.S. NAVY
USNAVY	U.S. NAVY

USSIGC	U.S. SIGNAL CORPS.
WD	WAR DEPT U.S. ARMY
WDE	U.S. ENG. OFFICE

2. The total name of a DoD or other government agency may be stamped into the shoulder of the cylinder or embossed on the neck ring of the cylinder.

3. A military or Federal specification number may be stamped into the shoulder of the cylinder when the cylinder is manufactured to a specific Mil or Fed Specification in addition to or in lieu of a DOT specification. (See Paragraph 3-2a)

4. Cylinders that are not identified by one of the above criteria will be placed in Condition Code J, and the proper ownership will be determined. DSCR-JDTA (DSN 695-3230) has a data base of approximately 10,000 military and commercial ownership symbols that have been compiled by the DOT. These codes represent the ownership codes that have been recorded from the very first assigned code through the year 1969, when DOT no longer recorded the codes. Newly assigned codes from that point in time on are now recorded by the Compressed Gas Association. These codes are recorded and published in the CGA Pamphlets C-16 and C-16.1. If the person having custody of the cylinder can identify all of the marking on the shoulder of the cylinder, usually the rightful owner of the cylinder can be found. It will be up to the person having custody of the cylinder to notify the owner for the return of the cylinder.

D. Obsolete, Unserviceable, and Unauthorized Cylinders. The following cylinders will be considered unserviceable regardless of their physical appearance and shall be removed from service:

1. All cylinders manufactured by Taylor Division, Cuneo Press. These cylinders may be identified by the symbol "cTd" stamped under or near the serial number or hydrostatic test date.

2. Cylinders manufactured by the Taylor-Wharton Iron and Steel Company during the period 1942 to 1944, with a service pressure that has been increased from 1800 to 2015 psig. These cylinders will have the manufacturer's symbol of "TW" stamped near the serial number on the shoulder of the cylinder and there will be evidence that the service pressure has been restamped to 2015. The date of manufacture is identified as the earliest hydrostatic test date found on the cylinder.

3. Cylinders not manufactured, inspected, and tested in accordance with the applicable DOT specifications as set forth in Title 49 CFR, Part 178, Subpart C, and requalified (retested) in accordance with Title 49 CFR, Section 173.34 (see paragraph 3-2). A cylinder that has been manufactured by an approved source will contain at least the permanent markings required by Title 49 CFR. These markings must include: (1) a DOT specification number followed by the service pressure, (2) a serial number followed by an identifying symbol of the maker or purchaser, and (3) an approved inspector's official mark and the date of test. An exception to this will be cylinders that have been manufactured to a Military Specification for a specific military application. In such cases the Mil Spec will be stamped on the cylinder in lieu of the DOT specification. The retest criteria shall be based on the cylinder design and its application as cited in the design specification.

E. Physical Condition. All cylinders shall be visually inspected for physical defects as outlined in CGA Pamphlets C-6, Standards for Visual Inspection of Compressed Gas Cylinders; C-6.1, Standards for Visual Inspection of High Pressure Aluminum Compressed Gas Cylinders; C-6.2, Guidelines for Visual Inspection and Requalification of Fiber Reinforced High Pressure Cylinders; C-6.3, Guidelines for Visual inspection and Requalification of Low Pressure Aluminum Compressed Gas Cylinders; and C-13, Guidelines for Visual Inspection and Requalification of Acetylene Cylinders. Cylinders with defects equal to or greater than the limits imposed by the CGA Pamphlets shall be condemned and a DD Form 1577, Unserviceable (Condemned) Tag - Materiel, attached to the cylinder. The visual inspection requirements cited above and referenced in CGA pamphlet C-6 are also found in detail in Air Force Technical Order TO 42B5-1-2, Gas Cylinders (Storage Type), Use, Handling, and Maintenance (also NAVAIR 06-20-2). Either document may be used by DoD activities when performing a visual inspection.

F. Permanent Markings. The permanent marking requirements for compressed gas cylinders are found in the applicable DOT specification in Part 178 of Title 49 CFR and in the Government procurement specification. These markings must be maintained in legible condition as required by Part 173 of Title 49 CFR.

G. Exterior Finish. The quality of the exterior finish shall be based on the following criteria:

1. Rust, scale, caked paint, and all remnants of adhesive labels or decals will be removed prior to painting as outlined in MIL-STD-1411, Notice 1, Inspection and Maintenance of Compressed Gas Cylinders.

2. The correct primer and paint will be properly and uniformly applied in accordance with MIL-STD-1411, Notice 1.

3. The proper color code and chemical designation for the product contained in the cylinder shall be in accordance with MIL-STD-101B, Color Code for Pipelines and for Compressed Gas Cylinders.

4. The color bands and stenciling are sharp and distinct, of proper size, and in the correct location.

H. Requalification Inspection and Test. Requirements are as follows:

1. Requalification requirements shall be determined using the criteria cited in paragraph 3-3D.

2. Requalification shall be accomplished in accordance with Title 49 CFR and CGA Pamphlet C-1, Methods for Hydrostatic Testing of Compressed Gas Cylinders and C-13 Guidelines for Visual Inspection and Requalification of Acetylene Cylinders.

3. The requalification must be performed by facilities that have been approved and registered with DOT.

4. Cylinders shall be requalified, modified, and marked to permit charging to a pressure 10 percent in excess of their marked service pressure only when specified in the contract or delivery order and when all data necessary to satisfy the requirements of Title 49 CFR, Section 173.3028 are available and the cylinder is equipped with a frangible type pressure relief device rated for use with the service pressure of the cylinder. The rupture pressure rating for the frangible disk is stamped on the cap, which holds the disk in place.

5. The requalification date represented by the month and year must be stamped into the shoulder of the cylinder. The DOT approved registration designation of the requalifying facility must be stamped between the month and year.

I. Valves or Plugs. Requirements are as follows:

1. Valves installed in Government-owned cylinders will be considered acceptable for further use provided:

a. They are serviceable and functionally equal to new valves in operation and cleanliness.

b. They are equipped with a fully serviceable and properly rated pressure relief device for the cylinder in which they are or will be installed.

c. They are equipped with the proper CGA valve outlet connection for the MIL-DTL-2 valve type specified for the cylinder assembly (specific gas application).

d. Their identification (if any) on the side of the valve is that of the designated compressed gas application and is compatible with the outlet connection. If the valve is otherwise acceptable but unmarked, the name of the gas (see MIL-DTL-2) shall be applied by means of a decal. Fire extinguishing system cylinders, CO2 and Halon, do not have MIL-DTL-2 type valves.

2. The use of a combination frangible disk-fusible plug type pressure-relief device with a stamped bursting pressure of 3000 psig and a temperature of 165øF (Type S-4) or 212øF (Type S-5) is authorized for cylinders with service pressures of 1800 through 2400 psig. This device meets all requirements of both DOT and CGA for high-pressure gas applications (see MIL-DTL-2 for authorized applications). It is noted that this device cannot be used for any cryogenic application or with any cylinder that has been requalified and stamped (+ mark after the last retest date) for 10 percent over pressurization. Type 1 pressure relief devices must be used with such cylinders. (NOTE: Certain gases must be charged into cylinders without a pressure relief device and must have valve protection caps, e.g., phosgene.)

3. Valves shall be free of insects, insect webs, dirt, corrosion, oil, or grease. The bore, the throat and the threads of the valve outlet shall be free of any paint splatter or over spray caused by lack of protection when painting the cylinder. There shall be minimal concern for paint on other parts of the valve unless it effects its operation. Do not mistake thread compound as oil or grease or vice versa.

4. Metal valve outlet caps or plugs as specified in MIL-DTL-2, designed to form a secondary seal, are required on full chlorine and phosgene cylinders. Valve outlet caps/plugs designed to prevent contamination of the valve outlet port are required on cylinders of aviator's breathing and medical oxygen, medical carbon dioxide, medical oxygen-helium mixtures, nitrous oxide, and air for respiration (human or veterinary). Valve outlet caps/plugs are not mandatory on certain empty cylinders; however, if a cap/plug is attached to the cylinder, it shall be securely installed on the valve outlet. Additional requirements for caps and plugs are at the discretion of the using DoD activity.

5. A valve designed for a handwheel shall have the handwheel in place and it shall not be broken, cracked, or otherwise defective.

6. A valve designed for a pressure relief device shall be equipped with the proper type and pressure-rating for the cylinder in which it is installed.

7. All cylinder valves (except oxygen) shall be installed using an approved grade antiseize thread compound or tape that is compatible with the gas that is charged into the cylinder. Oxygen cylinder valves shall be installed using "Teflon" tape equivalent to that described in MIL-T-27730A, Tape, Antiseize, Tetra-fluoroethylene, with Dispenser, and/or "Teflon" paint. (Teflon is a registered trademark of E.I. DuPont de Nemours & Co.)

8. New valves shall be installed with a maximum of five and a minimum of three threads showing. New valves installed with less than three threads showing (necessary to provide a seal) shall be removed and the cause determined.

9. Cylinder valves shall be replaced when the following conditions exist:

a. When less than one inlet thread is exposed on valves installed in cylinders requiring internal maintenance or requalification inspection and testing.

b. When less than one-half inlet thread is exposed on valves installed in cylinders not requiring internal maintenance or requalification inspection and testing.

c. Cylinder valves on refillable medical gas cylinders that are not chromium plated shall be replaced.

10. A used and/or reconditioned serviceable cylinder valve shall be reinstalled in the cylinder from which it was removed with a maximum of five and a minimum of one thread showing.

11. Lead thimble inserts, sometimes used to compensate for thread wear, are prohibited and shall be removed.

12. Plugs, when installed instead of valves, shall be steel plugs with 3/8-18NGT, 2-14NGT, 3/4-14NGT, or 1-11 1/2NGT, as required. The plugs shall be equipped with wrench flats. Plugs shall be installed wrench tight, using thread compounds referenced in subparagraph 7, above.

J. Neck Rings (Flanges) and Foot Rings. Requirements are as follows:

1. Rings will be in place and secure.

2. Neck ring threads shall be in serviceable condition, capable of securely holding the valve protection cap with the cap installed to full thread engagement.

3. Foot rings shall be securely welded to the bottom of the cylinder and not fractured or bent.

K. Valve Protection Caps. Requirements are as follows:

1. Valve protection caps shall be installed on all cylinders designed with neck rings or flanges.

2. Protection caps shall be of correct size and installed hand tight with full thread engagement.

3. Caps shall be painted to comply with the color code of the cylinder on which they are installed as outlined in paragraph 3-5.

L. Cleanliness. Cylinders shall be free of oil, grease, and all foreign matter. Antiseize compound may be found where the valve is inserted into the cylinder; this is not considered foreign matter. All excess thread compound shall be removed and the area wiped clean.

M. Labels and Tags. **NOTE**: When there is a conflict between DoD label and tag specifications required by the host nation, the more stringent requirements shall apply.

Cylinders shall be labeled or tagged and shipping documents annotated in accordance with the requirements of the contract/delivery order to comply with Title 49 CFR, Part 173, Subpart E, Title 40 CFR, Part 82 and with MIL-STD-129, Marking For Shipment and Storage, latest edition. Cylinders shall also have a label or tag attached with the statement "Dangerous - Compressed Gas Cylinder - Only Trained Personnel Should Handle." All cylinders containing a Chlorinated Fluorocarbon :(CFC) refrigerant gas must also contain a label with the following warning: WARNING; CONTAINS A SUBSTANCE WHICH HARMS PUBLIC HEALTH AND ENVIRONMENT BY DESTROYING OZONE IN THE UPPER ATMOSPHERE

N. Condition Codes. Condition Codes A, D, F, H, J, K, or L, as defined in section 9, will be assigned as applicable.

O. Leakage Test. A leakage test shall be performed on all cylinders that have been filled with a compressed gas in accordance with the fill contract/delivery order. Each cylinder shall be tested at all points that may provide a point of escape for the cylinder contents. Points to inspect are the pressure relief devices in the head and bottom of acetylene cylinders; points on each cylinder valve, such as the stem; the pressure relief device; the valve inlet threads; and the valve outlet. Tests shall be performed in accordance with paragraph 5.4.4 of MIL-STD-1411.

4-3. RECEIVING INSPECTION (Receipts From Procurement). A receiving inspection shall be performed on all new, reconditioned, or filled cylinders received from a commercial contractor. Discrepancies shall be reported on Standard Form (SF) 364, Report of Discrepancy, in accordance with paragraph 10-2B. Applicable inspection elements are indicated within the following paragraphs:

Inspection Element	Paragraph
a. Cylinder Identification	4-2A
b. Cylinder Count	4-2B
c. Government-Owned Cylinders	4-2C

d. Obsolete Cylinders	4-2D
e. Physical Condition (Internal Inspection Not Required)	4-2E
f. Permanent Markings	4-2F
g. Exterior Finish	4-2G
h. Requalification Inspection and Test	4-2H
I. Valves or Plugs	4-2I
j. Neck Rings (Flanges) and Foot Rings	4-2J
k. Valve Protection Caps	4-2K
l. Cleanliness	4-2L
m. Labels and Tags	4-2M
n. Condition Codes	4-2N
o. Leakage Test	4-2O

4-4. RECEIVING INSPECTION (Customer Returns). All cylinders received as customer returns will be handled, segregated, and stored in the same manner as filled cylinders (described in section 5). Personnel must at all times recognize the potential of varying amounts of residual gas, up to and including full pressure in a cylinder received as "EMPTY."

A. Empty Cylinders. Customer-returned cylinders identified as "EMPTY" shall be picked up on the records and reported to DSCR or Defense Supply Center Philadelphia (DSCP) as Federal Supply Code (FSC) 8120 cylinders. SF 364 will be used to report the receipt of empty customer returns that have been identified as FSC 6830 or 6505 on DD Form 1348-1, DoD Single Line Item Release/Receipt Document, by the shipping activity. This report will indicate the FSC 6830 or 6505 NSN cited on the DD Form 1348-1 in Block 9 and the correct FSC 8120 with which the cylinder should be identified in Block 12. Even though the cylinders are considered empty for accounting purposes, they must be labeled and tagged for shipment as required by Title 49 CFR. If the cylinder is in fact empty according to the DOT definition of an empty cylinder (cleaned and purged of all poisonous or flammable contents, less than 25 psig nonflammable, nonhazardous material), the cylinder shall be identified as AEMPTY@ and the previous label(s) removed or obliterated (including the "EMPTY" label). If the cylinder contains poisonous or flammable residue, or if the pressure is greater than 25 psig, the cylinder will be identified in the same manner as a full cylinder.

B. Full Cylinders. Customer-returned cylinders identified as "FULL" shall be picked up on the records and reported to DSCR or DSCP as FSC 6830 or 6505. The return of full cylinders is not normally authorized because the contents of the cylinder cannot be verified (DLAR 7000.4, Reporting and Return of Excess Material to the DLA Distribution System); however, extenuating circumstances will at times require return of such cylinders. Cylinders received as full shall be thoroughly inspected to ensure that the shipping description and the cylinder contents are in agreement. Inspection requirements for this inspection are outlined in paragraph 4-3.

C. Receiving Inspection (Redistribution). Inspection elements for this type of receipt are the same as those outlined in paragraph 4-3.

4-5. PERIODIC INSPECTION. Evaluation of the cylinder contents with respect to either quality or quantity is not required unless requested by the managing activity. All empty cylinders in Condition Code A shall be inspected every 6 months to determine their serviceability status with respect to the requalification date and physical condition. The Condition Codes shall be changed as required. If the contents must be emptied to perform necessary maintenance, the contents of the cylinder will be handled and disposed of as outlined in section 7. All cylinders that have been reclassified shall be reported to indicate the change in Condition Codes. Applicable inspection elements are indicated within the following paragraphs:

Inspection Element	Paragraph
a. Cylinder Identification	4-2A
b. Physical Condition (Internal	

Inspection Not Required)	4-2E
c. Permanent Markings	4-2F
d. Exterior Finish	4-2G
e. Requalification Inspection and Test	4-2H
f. Cleanliness	4-2L
g. Labels and Tags	4-2M
h. Condition Code	4-2N

4-6. SHIPPING INSPECTION. Empty cylinders in Condition Code A shall not be shipped from Defense Depots to continental United States (CONUS) activities if their requalification date is due within 3 months. Empty cylinders whose requalification date is due within 2 years or less shall not be shipped to overseas activities. Cylinders that are due for retest within 3 months will be reclassified to Condition Code D or F (see section 9) and reported to DSCR or DSCP.

A. Full cylinders that are in satisfactory physical condition are considered serviceable for local and CONUS use regardless of their last requalification date.

B. Full cylinders for which the requalification date is overdue or due within 2 years shall not be shipped to overseas customers. These cylinders shall be shipped only to CONUS activities or shall be assigned Condition Code D or F. If the contents must be emptied to perform necessary maintenance, the contents of the cylinder will be handled and disposed of as outlined in section 7.

C. Empty propane cylinders, with the exception of new or contractually reconditioned cylinders that are being transported via military airlift, require special preparation prior to delivery to the CONUS shipping point. All such cylinders shall be emptied of their contents in accordance with section 7, the valves removed, the cylinders rinsed first with denatured ethyl alcohol and then with water, then dried with oil-free compressed air or nitrogen, and revalved. A tag or label with the notation "PREPARED FOR AIR SHIPMENT IN ACCORDANCE WITH AFJMAN 24-204/TM 38-250/NAVSUP PUB 505/MCO P4030.19G/DLAM 4145.3" will be attached to each cylinder.

D. In-storage maintenance, as defined in section 6, shall be accomplished on Condition Code A cylinders prior to shipment when the need is detected as a result of preshipment inspection.

E. Full and empty cylinders that are classified as Condition Code A shall be inspected thoroughly as they are taken out of stock in preparation for shipment. Applicable inspection elements are indicated within the following paragraphs:

Inspection Element	Paragraph
1. Cylinder Identification	4-2A
2. Cylinder Count	4-2B
3. Exterior Finish	4-2G
4. Requalification Inspection and Test	4-2H
5. Valves or Plugs	4-2I
6. Valve Protection Caps	4-2K
7. Cleanliness	4-2L
8. Labels and Tags	4-2M
9. Condition Codes	4-2N

F. Full and empty cylinders classified as Condition Code D or F being shipped for refill and/or reconditioning shall be inspected thoroughly as they are taken out of stock prior to shipment. Applicable inspection elements are indicated within the following paragraphs:

Inspection Element	Paragraph
a. Cylinder Identification	4-2A
b. Cylinder Count	4-2B
c. Valve Protection Caps	4-2K
d. Labels and Tags	4-2M
e. Condition Codes	4-2N

G. The provisions of AFJMAN 24-204/TM 38-250/NAVSUP PUB 505/MCO P4030.19G/DLAM 4145.3, Preparing Hazardous Materials for Military Air Shipments, will apply when the mode of shipment is military aircraft.

SECTION 5

SAFE USE, STORAGE, AND HANDLING

5-1. GENERAL. Personnel who handle, store, and/or use cylinders of compressed gases must be trained to properly recognize and identify the characteristics of the various gas products and the proper methods of safely handling full and empty cylinders. Such persons must also be capable of recognizing and evaluating conditions that may require a change in the serviceability status of the cylinders or their contents. Under normal use and handling, the condition of the gas contents will not change. The following safe handling rules and general guidelines are provided as the more essential requirements to be practiced by personnel using and handling compressed gas cylinders. All cylinders being filled, in service, or in transit shall be secured at the fill or work station, on the hand truck, on the servicing cart or trailer, or on the transport container or vehicle.

5-2. FILLING OF CYLINDERS. Compressed gas cylinders shall only be filled by the owner or with the owner's consent. This responsibility is assumed by the property custodian and the assigned contracting officer for the purchase of compressed gases in Government-owned cylinders. The contents of a cylinder shall be identified by the proper chemical name and the cylinder shall be properly color coded and stenciled in accordance with MIL-STD-101, latest edition. All cylinders used for the transportation and storage of compressed gases shall comply with the applicable DoD and DOT regulations and specifications (see paragraph 4-2).

A. Maximum Filling Capacities. Cylinder filling capacities shall be as authorized and regulated by Title 49 CFR, Part 173, in conjunction with the data permanently stamped into the head or shoulder of the cylinder. Cylinders for gases in a liquefied state at 70øF shall be charged by weight based on the filling density (percentage) of the product and the water weight capacity of the cylinders. The weight of the product is found by multiplying the products fill density as found in Part 173 of Title 49 CFR by the weight of the water the cylinder will hold. Cylinders for gases in a gaseous state at 70øF shall be charged by pressure to a calculated pressure based on the charging temperature and the service pressure of the cylinders. The filling pressure shall be determined by adding or subtracting an established value (approximately 5 psig) to or from the service pressure of the cylinders for each degree the filling temperature is above or below 70øF. The filling pressure shall be convertible to the service pressure of the cylinders at 70øF.

B. Transferring Gases. Compressed gases shall not be transferred from one cylinder to another except by authorized personnel using specifically designed equipment and the manufacturer's operating instructions.

C. Incompatibility. Compressed gas cylinders must not contain incompatible gases capable of combining chemically with each other or with the cylinder material so as to endanger its serviceability.

D. Cylinder Service. The gas service of a compressed gas cylinder shall not be changed unless authorized by the applicable Military Service engineering activity or DSCR-JDT.

5-3. MAINTENANCE. Compressed gas cylinders and their component parts and accessories shall be maintained only by authorized personnel and designated activities as outlined in section 6. All maintenance and cylinder reconditioning shall be performed in accordance with MIL-STD-1411 and shall comply with the requirements of Title 49 CFR.

5-4. CYLINDER USAGE. The following guidelines are provided to assure safe usage of each cylinder and its contents:

A. The contents of a cylinder shall be verified by checking the attached label, the cylinder markings, and the valve and its outlet connection before connecting it for use. If the contents of a cylinder cannot be identified, the cylinder shall be returned to the source of supply. The cylinders color code shall not be solely relied upon for the identification of its contents.

B. The removable valve protection cap, provided for the protection of the cylinder valve, shall be kept on the cylinder at all times except when the cylinder is in use dispensing its contents.

C. The valve outlet cap or plug as provided, shall be kept on the valve outlet at all times except when the cylinder is in use as stated above.

D. Compressed gas cylinders shall not be used for any purpose other than to contain the designated gas product in accordance with this regulation and regulations or documents cited herein.

E. The cylinder valve shall remain closed at all times (charged or empty) except when the cylinder is in use. The term "in use" means when gas is flowing from the cylinder, when the cylinder gas is maintaining pressure in a supply line, or when the cylinder is standing by during and between operations using the gas.

F. Cylinders shall not be placed where they might become a part of an electrical circuit. When the cylinders are used in conjunction with electric welding, the cylinders shall not be grounded. These precautions are to prevent burning by an electric welding arc.

G. Compressed gas cylinders shall not be subjected to a temperature above 125øF (51.7øC). A flame shall never be permitted to come in contact with any part of a compressed gas cylinder. If ice or snow accumulates on a cylinder, it should be thawed with water at a temperature not exceeding 125øF (51.7øC).

H. Cylinders shall not be subjected to artificially created low temperatures. Many steels undergo significantly decreased impact resistance and ductility at low temperatures. Some noncryogenic liquefied gases have relatively low vapor pressures at low ambient temperatures and may require the use of check valves to prevent backflow into the cylinder.

I. Respiratory protection necessary to ensure the minimal acceptable requirements as outlined in TB MED 502/DLAM 1000.2, Occupational and Environmental Health Respiratory Protection Program; OPNAV INST 5100.23B, Navy Occupational Safety and Health (NAVOSH) Program Manual; or Air Force Occupational Safety and Health (AFOSH) Standard 161-1, Respiratory Protection Program shall be used when confronting or handling a leaking cylinder. Appropriate personal protective equipment for the type of gas shall also be immediately available and worn when a leak is discovered or suspected. If the cylinder contains flammable gas, it shall be kept away from all sources of ignition. The leaking cylinder shall be removed outdoors to a well-ventilated location or placed under an exhaust ventilating system suitable for the product. If the gas is hazardous (e.g., flammable, poisonous, corrosive) an appropriate sign shall be placed at the cylinder warning of the hazardous properties. If emergency assistance or advice concerning the handling of a leaking cylinder or other emergencies involving cylinders is required, the gas supplier should be the first information/assistance source contacted. If the supplier is unknown or not accessible, contact an information source such as the U.S. Coast Guard National Response Center at 800-424-8806 or the Chemical Transportation Emergency Center (CHEMTREC) at 800-424-9300 or 202-483-7616 in CONUS and Canada, Puerto Rico, and the Virgin Islands; from overseas, Alaska, and Hawaii, call 202-483-7616 collect for advice and/or assistance.

J. If a leak develops in the valve packing around the stem, the cylinder valve should be closed and the valve gland or packing nut tightened as appropriate. If the leak continues when the valve is reopened, the valve shall be reclosed and a tag attached stating the cylinder is unserviceable. Appropriate action should then be taken to have the cylinder returned to the fill contractor for proper repair or advise for correct disposition of the cylinder.

K. When in doubt about the routine proper handling of a compressed gas cylinder or its contents, the manufacturer or supplier of the gas shall be consulted.

L. A positive pressure of 15 to 24 psig shall be retained in all cylinders tagged or labeled empty to prevent the cylinder from becoming contaminated during idle storage or shipment. Before returning an empty cylinder, the valve shall be closed and a proper fitting cylinder valve protection cap, if the cylinder is designed for one, shall be installed. Valve outlet caps or plugs, if provided, shall be installed in a gas tight condition. The empty

cylinders shall be labeled and tagged in accordance with paragraph 4-4A and subparagraph M, below, of this enclosure.

M. Serviceable, reconditioned, cylinders "cleaned and purged" of hazardous residue in preparation for storage or shipment shall be charged with a positive pressure of an inert gas (e.g., nitrogen), or dry, oil-free air not to exceed 24 psig (39 psia) at 70øF. (Under no circumstances shall shop air be introduced into a "cleaned and purged" serviceable cylinder.) The cylinders shall be properly tagged or labeled with DD Form 1574, Serviceable Tag-Materiel, or DD Form 1574-1, Serviceable Label-Materiel. The tag or label shall be marked or over-stamped with "Does Not Contain a Hazardous Gas." A DOT "EMPTY" label is not required because the cylinder contains a pressure that is less than 25 psig (40 psia) and it does not contain a hazardous residue.

N. Nonrefillable cylinders, such as DOT Specification 39 cylinders, shall not be refilled with any material after the original contents have been exhausted. The cylinders shall be emptied of all pressure (0 PSIG), punctured with a sharp object, and then if possible, flattened.

O. The use of oxygen and fuel gas cylinders, including storage and handling by the user, for welding, cutting, brazing and other allied processes, shall comply with the requirements of AWS Standard Z49.1, latest edition, Safety in Welding and Cutting.

5-5. CONNECTING CYLINDERS AND WITHDRAWING CONTENTS

A. Compressed gases shall be handled and used only by properly trained persons.

B. The user responsible for handling the cylinder and connecting it for use shall check the identity of the gas by reading the label or other markings on the cylinder before using. If the contents are not properly and completely identified, the cylinder shall be returned to the supplier without being used. The cylinder color code shall not solely be relied upon for content identification. It is there to represent the type of hazard the releasing gas would create.

C. Keep the removable valve protection and valve outlet caps and plugs in place until connecting the cylinder for use.

D. Secure all cylinders while in use to prevent them from being pulled or knocked over.

E. Examine the outlet of the valve for any dirt or other contamination before attaching any service device such as a regulator or fill or service manifold pigtail. The outlet may be cleared of dust and dirt by slightly opening the valve for an instantaneous burst of pressure.. Always point valve outlet away from yourself and others. CAUTION: DO NOT CLEAR VALVE OUTLET BY OPENING THE VALVE ON CYLINDERS CONTAINING CORROSIVE, TOXIC OR POISONOUS GASES.

F. A suitable pressure regulating device, not a needle valve or similar pressure reducing device without a regulating mechanism, shall be used where gas is admitted to a system of lower pressure rating than the supply pressure, and where, due to the gas capacity of the supply source, the system rating may be exceeded. This is a requirement regardless of the possible presence of a pressure relief device.

G. A suitable pressure relief device shall be used to protect a down stream system that has a pressure rating and flow capacity of less than the supply source. A pressure relief device shall always be used in a cryogenic system where the expanding liquid can be trapped between two valves or other flow control devices.

H. Threaded connections that do not match shall not be forced. Threads on regulator connections or other auxiliary equipment shall match those on the cylinder valve outlet. Detailed information may be found in paragraphs 3-4 and 4-2I.

I. Service manifolds used to feed a service system from several cylinders shall be of adequate design and equipped with the necessary regulating devices to assure safe use with the designated compressed gas, operating temperatures and pressures and the desired flow capacity.

J. Regulators, gauges, hoses, and other appliances provided for use with a particular gas, or group of gases, shall not be used on cylinders containing gases having different, possibly incompatible, chemical properties unless information obtained from the supplier or other authoritative source indicates that this can be done safely. As an example, only pressure-regulating devices approved for use with oxygen shall be used in oxygen service.

K. Cylinder valves shall be opened slowly. Valve outlets shall be pointed away from all personnel and sources of ignition. On valves without hand wheels, only the wrenches or keys designed for that purpose shall be used and it shall remain on the valve as long as the valve is open. Wrenches or other torque ACHEATING@ devices shall not be used to operate valves with hand wheels. Valve hand wheels shall not be hammered when attempting to open or close the valve. For valves that are hard to open or close, or frozen because of corrosion, the cylinder shall be tagged and taken to have the valve replaced by an authorized activity. During use, all cylinder valves except acetylene will be opened fully and then closed one-half turn, ensuring the valve is free for rapid operation should the need arise. Acetylene cylinder valves shall not be opened more than one and one-half turns.

L. Compressed gases shall not be used to dust off clothing. The gas may collect in the clothing and create a serious fire hazard later. The burst of pressure may create sudden damage to the eyes or other parts of the body.

M. A positive pressure of at least 15 psig shall be left in all compressed gas cylinders except those that are emptied and purged, to prevent contamination prior to its next use. With this positive pressure and the valve tightly closed the cylinder will not breathe in the surrounding atmospheric air and its contaminants. The valves on acetylene cylinders must be tightly closed to prevent the lose (evaporation) of the acetone solvent.

N. Suitable traps or check valves shall be used in systems where a cylinder may be contaminated by the feedback of process materials.

O. Connections to piping, regulators, and other appliances shall be kept tight to prevent leakage. Where hose is used, it shall be kept in good condition. If a leak is detected at a connection, the pressure shall be released before an attempt is made to tighten or repair the leak.

P. Before a regulator is removed from a cylinder, the cylinder valve shall be closed and the regulator and all down stream equipment drained of all pressure.

Q. Acetylene cylinders (DOT 8 or 8AL) shall be used in the valve-up vertical position only (45 deg or less of vertical). If for some reason the cylinders need to be stored or transported in the horizontal position they shall be allowed to stand vertically for at least 2 hour prior to their use. This will prevent drawing off acetone solvent with the acetylene when withdrawing the product.

5-6. MOVING CYLINDERS. The following guidelines will be observed in moving cylinders from one location to another:

A. Cylinders shall not be rolled, dragged, or slid. Where practical, the user shall use a suitable hand truck, fork truck, roll platform, or similar device with cylinders secured for transportation. One cylinder at a time may be tilted and rolled to and from a filling or dispensing manifold and, to and from a staging area within the filling plant or using facility.

B. Cylinders shall not be dropped or permitted to strike violently against each other or other surfaces.

C. Cylinder valve protection caps shall not be used for lifting cylinders except for hand trucks that grip the cap for lifting the cylinder onto the hand truck. The flange that holds the cap on a high-pressure cylinder is only peened in place and may not hold the whole weight of the cylinder. In those cases, the cylinder shall be lifted no higher than 6 inches for no longer than it takes to properly position the cylinder on the hand truck. This is not to

be interpreted as prohibiting cylinders with caps from being suspended during manufacturing operations or when tilting containers to an upright position.

D. Magnets shall not be used for lifting cylinders.

E. Ropes, chains, or slings shall not be used to suspend cylinders unless provisions at time of manufacture have been made on the cylinder for appropriate lifting attachments such as lugs or handles.

F. Where appropriate lifting attachments have not been provided on the cylinders, suitable cradles or platforms to hold the cylinders shall be used for lifting and moving.

5-7. STORING CYLINDERS. Storage procedures and facility design and construction requirements shall be provided for the storage of compressed gases contained in high and low pressure cylinders located at the work site, at the distribution facility of a military installation, and at a Service Center or Defense Depot. These requirements shall be contingent on the hazardous characteristics and the quantity of each gas to be stored at each location. The surrounding structures, industrial and human activities, and the environment within the immediate area must also be considered. The following are general requirements for the safe storage of compressed gases:

A. The storage facility or storage area shall provide compressed gas cylinders and their contents with protection against physical damage, fire hazards, adverse environmental conditions, and tampering by unauthorized personnel. The storage facility or area shall also provide sufficient isolation of the compressed gases to enable safety and emergency response personnel and equipment to control the situation if a leak were to develop or the cylinders were threatened by a fire in the immediate area. Incompatible gases and incompatible materials shall be physically separated. Cylinders shall be protected from any object that will produce a harmful cut or abrasion in the surface of the metal. Cylinders shall not be stored near potential ignition sources. The storage area may be a separate special storage room, building, shed, or secure (fenced) improved outdoor storage area that provides physical protection for the cylinders. The requirements for each type of storage are provided herein or in the applicable NFPA standards and codes. Occupational Safety and Health Administration (OSHA) requirements for storage are contained in Title 29 CFR.

B. Before cylinders containing a compressed gas are placed in storage they shall be prominently tagged or labeled to identify the proper hazard classification as required by Title 49 CFR, Title 29 CFR, Title 40 CFR (Hazardous Wastes), and section 2 of this enclosure. The cylinders shall also be color coded and stenciled with the approved chemical name or proper shipping name of the contained gas in accordance with the most current issue of MIL STD-101. At this time it is revision AB@.

C. Compressed gases shall be segregated by their hazard class or division into three primary groups: flammable gas(2.1), nonflammable gas (2.2), and poison gas(2.3)(See para 172.400 of Title 49 CFR). If an additional secondary transportation hazard is present in conjunction with the primary classification, such as poison gas and flammable gas or nonflammable gas and oxidizer, the secondary transportation hazard must be considered to determine the compatibility of the gas with other gases and the need for further segregation and separation within the primary group. The three primary transportation hazard classifications shall be subdivided as necessary as follows:

1. Group I TRANSPORTATION HAZARD CLASS OR DIVISION (2.1) (FLAMMABLE)
   a. Flammable Gas
   b. Flammable Gas, Corrosive

2. Group II TRANSPORTATION HAZARD CLASS OR DIVISION (2.2) (NONFLAMMABLE)
   a. Nonflammable Gas
   b. Nonflammable Gas, Oxidizer
   c. Nonflammable Gas, Corrosive

3. Group III TRANSPORTATION HAZARD CLASS OR DIVISION (2.3)(POISON)
   a. Poison Gas

b. Poison Gas, Flammable Gas
c. Poison Gas, Oxidizer
d. Poison Gas, Corrosive
e. Poison Gas, Corrosive, Oxidizer
f. Poison Gas, Oxidizer, Corrosive

5-8. TYPES OF STORAGE

A. Storage in Buildings and Rooms With Other Commodities. This type of storage is defined as the storage of limited quantities of compressed gases in cylinders in the same room or bay of a building but physically separated by a specified minimum distance from incompatible compressed gases, flammable liquids, or incompatible materials. Refer to the appropriate NFPA National Fire Codes for each flammable or oxidizing gas to be stored to establish the maximum allowable volume or quantity limitation for one location and the minimum separation distance. If a National Fire Code has not been written for a particular flammable or oxidizing gas (e.g., chlorine), storage information will be obtained from the supplier or DSCR-JDTA. As a general rule applicable to cylinders and small liquefied gas tanks, separation of at least 20 feet (6 meters) is considered appropriate for incompatible gases and materials. An alternative separation is the provision of a noncombustible barrier with a fire resistance rating of at least 2 hour, constructed 5 feet in height for cylinders standing on the floor, or of a height equal to the height of a stack of cylinders that are palletized and stacked more than one tier high. A minimum distance of 1 foot shall be maintained between the barrier and the cylinders in storage.

B. Storage in Separate Rooms Without Other Commodities. This type of storage is defined as the storage of compressed gases contained in cylinders in the same building but physically isolated in a separate room from incompatible materials and gases, flammable liquids, or materials. The design requirements for the separate room shall comply with NFPA Standard 58, Storage and Handling of Liquefied Petroleum Gases, including explosion venting, ventilation, and heating.

C. Storage in Separate Buildings Without Other Commodities

1. This type of storage is defined as the storage of compatible compressed gases contained in cylinders in a separate building or structure located a specified safe distance from all other structures and equipment except those housing operations related directly to the production of the stored gases.

2. The building shall be designed and constructed of materials that will provide sufficient fire protection for the compressed gases to be stored and protect the cylinders from the elements, tampering, and physical damage.

3. Separate buildings used for the storage of flammable or poison gases shall be designed and constructed in compliance with the requirements found in NFPA Standard 58 and shall be located at least 50 feet from adjacent important buildings and equipment. If, due to space limitations, the storage buildings must be located less than 50 feet from adjacent buildings that are constructed of combustible materials or have unprotected openings, the storage building shall also have the exposed wall constructed of materials having a fire resistance of at least 2 hours. (See NFPA Standard 220, Standard on Types of Building Construction.) The ventilating, heating, and electrical requirements shall be in compliance with the requirements cited in paragraphs 5-9B, 5-9C, and 5-9D.

4. Buildings used to store nonflammable compressed gases either separately or with other occupancy may be of standard general purpose warehouse construction as described in NFPA Standard 231, Indoor General Storage, and NFPA Standard 220, Types of Building Construction. The building shall be constructed aboveground and shall have a concrete floor. The ventilation requirements shall be as stated in paragraph 5-9B. Nonflammable gases displace oxygen in the air in the immediate area and do not create a fire hazard; therefore, the fire protection system shall be designed for the protection of the building structure, if warranted.

5. Separate buildings used to store oxidizing gases (oxygen) may be constructed of combustible (NFPA Standard 231) or noncombustible (NFPA Standard 220) material or a combination of both. The storage building shall be located at least 20 feet from noncombustible buildings and 50 feet from combustible buildings or combustible outside open storage. Automatic sprinkler protection shall be provided for combustible buildings

containing gaseous oxidizer storage and for noncombustible materials within 50 feet of segregated storage of gaseous oxidizers. The sprinkler system shall be in accordance with NFPA Standard 13, Installation of Sprinkler Systems. The ventilating, heating, and electrical requirements shall be in compliance with the requirements cited in paragraphs 5-9B, 5-9C, and 5-9D.

D. Outside Open Improved Storage Area

1. Outside open improved storage areas as defined herein are designated, improved, and secured areas that will protect cylinders from physical and environmental damage and tampering from unauthorized personnel.

2. The cylinders shall be stored above ground on a raised concrete slab or by other means that prevent their contact with the ground.

3. The area should be covered with a fixed noncombustible canopy that will provide protection from inclement weather and the direct rays of the sun.

4. Location of the storage areas shall be crosswind or downwind of any industrial or residential buildings. In the event of a cylinder leak, this will carry the gas away from the congested area; in case of fire in the main building, a crosswind would carry the flame and heat away from the storage area.

5. Distance between the storage areas and occupied or important buildings and equipment shall be determined by the type and quantity of gases to be stored.

6. Storage areas shall be kept free of all weeds, and of all flammable and incompatible materials.

5-9. GENERAL STORAGE REQUIREMENTS

A. Full and empty cylinders shall be stored in separate locations, in a manner that will allow cylinders with the oldest hydrostatic test date to be removed first with minimal handling of other cylinders. Cylinders shall be further segregated as necessary by Condition Code classification. Full cylinders shall be properly identified with the current FSC 6830 or 6505 NSNs representing the cylinder and their contents. Empty cylinders shall be properly identified with the correct FSC 8120 NSN that represents the empty cylinder. Refer to paragraph 4-2A for methods of identifying cylinders.

B. Separate storage rooms or enclosures and separate cylinder storage buildings shall be well ventilated and dry. Ventilation openings to the outside shall be provided at both the ceiling or roof (highest point) and within 6 inches of the floor. Vents shall be at least 5 feet from any opening to the enclosure or building and shall be of the nonclosing type. When mechanical ventilation is used, air circulation shall be at the rate of at least 1 cubic foot per minute per square foot of floor area. When natural ventilation is used, outlet and inlet openings shall be provided, each having a total free area of at least 1 square inch for each square foot of floor space. Temperatures within storage buildings or enclosures shall not be allowed to exceed 125øF (54.4øC) at the maximum height of the cylinders either standing on the floor or palletized and stacked.

NOTE: When there is a conflict between DoD storage requirements and the storage requirements of the host nation, the more stringent requirements shall apply.

C. Heating of separate storage rooms, enclosures, and separate (detached) buildings, if essential, shall be by steam, hot water, or other indirect means. Any heating system or heating unit using an open flame shall be prohibited.

D. Electrical equipment for separate storage rooms, enclosures, and separate (detached) buildings shall conform to the provisions of NFPA Standard 70, National Electric Code, Article 501 for Class 1 division 2 locations.

E. Outside open improved storage with no protection from the direct rays of the sun, where the surface of a cylinder could exceed 125øF, shall be limited to use with empty cylinders or full cylinders containing only nonliquefied compressed gases. Cylinders containing liquefied gases or acetylene that are stored outdoors shall be protected from the direct rays of the sun with a fixed canopy (preferably noncombustible) capable of withstanding all local environmental conditions. This is essential to prevent rupture of the cylinders or, at a minimum, to prevent the actuation of the pressure-relief device. Cylinders may become liquid full at temperatures of 125øF or greater and create a hydraulic pressure that will exceed the pressure rating of the pressure-relief devices or, when relief devices are not authorized or used, that will exceed the rupture pressure of the cylinder.

F. All cylinders, regardless of their location, shall be protected from continuous dampness and shall not be stored near salt and other corrosive chemicals or fumes. Resulting rust or corrosive action will deteriorate the cylinders and their accessories to a condition that will create a safety hazard or cause the cylinders to become unusable. Although this condition occurs more commonly at the foot ring of acetylene, chlorine, or other low-pressure cylinders, it will also cause the threads of the valve protection cap to become corroded, making the cap difficult or impossible to be removed or installed.

G. Compressed gas cylinders stored at DLA or DoD facilities, where it is desired to have them pallitized, shall be palletized in either the vertical or the horizontal position in accordance with MIL-HDBK-774, Palletized Unit Loads, or as otherwise directed using heavy duty four way pallets manufactured to the requirements of NN-P-71.

1. All compressed gas cylinders in storage waiting use or shipment shall be secured by either palletizing them or storing them standing in a valve end upright position, nested tightly together, in an approved storage area where they are unlikely to be knocked over.

2. Cylinders that are inherently unstable in the vertical position, must be palletized, boxed, crated, or secured to a fixed stanchion or fixture.

3. Cylinders located in an authorized storage area that permits pedestrian or vehicular traffic, must be palletized, boxed, crated, or secured to a fixed stanchion or fixture.

4. Cylinders that cannot otherwise be secured, shall be bound together in groups of three or more to reduce their capability of being knocked over.

5. Cylinders equipped with valves but without either provisions for a valve protection cap or a protective collar shall be stored and secured in a position that will protect the valve. If they are stored horizontally, protection will be provided to prevent anything from coming in contact with the valves. If they are stored vertically, they will be secured from tipping over and hitting the valve against something. If the cylinders are small (i.e., Medical D and E size), they shall be crated in crates that are deep enough to protect the valve from abuse or the shall be stacked horizontally in the crates in a position that no weight will be on the valves. Acetylene cylinders, no matter what size, shall always be stored or shipped in a vertical position.

6. Cylinders equipped with valves and with provisions for valve protection caps, must always be stored and shipped with the valve protection cap securely in place. Cylinders with a plug in place of a valve need not have a valve protection cap installed.

7. Cylinders containing acetylene, all of the liquefied compressed gases, hydrogen, and all high pressure cylinders smaller than 7 inches in dia. by 43 inches tall, shall be palletized in a valve up vertical position. Such cylinders that are transported individually or unpalletized shall be placed in a valve-up vertical position and securely bound in place.

8. All other high pressure cylinders of nonliquefied compressed gases shall be palletized in the horizontal position using 4 inch by 4 inch by 40 inch separator boards and banding straps. The boards shall be notched to provide nesting places for four cylinders per lay with 4 or 5 layers (16 or 20 cylinders) per pallet. The banding straps shall be at least 3/4 inch in width rated for the weight of the full pallet. The bottom and top separator boards need only to be notched on one side. The bottom separator notched on the top and the top separator

notched on the bottom. The top separator board shall be place across the top of the full pallet and banded in place to provide a full resting place for a full pallet when stacking full pallets two or three high.

9. Cryogenic liquid cylinders (DOT 4L) must always be stored and transported in the position for which they are designed to operate, normally in the valve up vertical position.

H. Cylinders shall not be stored near elevators, gangways, or unprotected platform edges, or in locations where heavy moving or flying objects or equipment may strike or fall on them. They also shall not be located near building exits, stairways, or air intake returns for heating or ventilating systems, or in areas normally used or intended for the safe exit of people.

5-10. SAFE USE, STORAGE, AND HANDLING REQUIREMENTS BY SERVICE CLASSIFICATION

A. Flammable Gases

1. General

a. Adequate portable fire extinguishers (carbon dioxide or dry chemical) shall be available for fire emergencies at storage installations.

b. "No smoking" signs shall be posted around the storage area of buildings and at the entrance to special storage rooms.

c. A flame shall not be used for detection of flammable gas leaks. Combustible gas indicators, soapy water, or other suitable solutions shall be used.

d. Provisions shall be made to protect flammable gases against hazardous exposure to and from adjoining buildings, equipment, property, and concentrations of people.

e. Flammable compressed gases (other than cryogenic) for which specific storage procedures are not provided herein or in an NFPA document shall be stored in accordance with their physical properties or as recommended by the manufacturer or knowledgeable authority. Flammable compressed gases in a liquefied state shall be provided storage in accordance with the requirements of NFPA Standard 58. Flammable compressed gases in a nonliquefied state shall be provided storage in accordance with the requirements of NFPA Standard 50A, Gaseous Hydrogen Systems at Consumer Sites.

2. Acetylene

a. Storage of acetylene at the work site, in buildings with other occupancy, in separate storage rooms or storage compartments, and in separate buildings shall be accomplished in accordance with the procedures and facility design requirements of NFPA Standard 51, Standard for the Design and Installation of Oxygen Fuel Gas Systems for Welding, Cutting, and Allied Processes, and of NFPA Standard 51B, Standard for Fire Prevention in Use of Cutting and Welding Processes.

b. Acetylene cylinders that have been palletized for storage at a Defense Depot or other high gas capacity facility shall only be stored vertically and one tier high. This will prevent the possibility of spreading flames from one cylinder to another by the flame from the pressure relief devices in the top and bottom heads of the cylinders. Flames from a fully charged cylinder can reach as far as 15 feet from the relief device from which it is exhausting. Storing the cylinders one tier high will also enable direct contact of the spray from a sprinkler system to each cylinder for cooling in case of a fire in the immediate area. Cooling will prevent or delay the actuation of the pressure-relief devices that, if actuated, would feed more fuel to the fire. Storage of cylinders one tier high will also lessen the possibility of a cylinder detonating on impact from an accidental fall.

c. The maximum acceptable quantity of acetylene in cylinders, except those in actual use or attached ready for use, shall be limited to a total gas capacity of 2,500 cubic feet to be located in one area at the work site or in

the main areas of buildings with other occupancy in compliance with NFPA Standard 51. Quantities in excess of those permitted shall be stored in separate special rooms, separate special buildings, or acceptable improved outdoor storage locations where acetylene may be stored in unlimited quantities. The total gas capacity in one storage area may be increased to 5,000 cubic feet in cylinder storage areas protected by an automatic sprinkler system and water supply designed in accordance with NFPA Standard 13. The storage of acetylene with other fuel gases shall be in strict compliance with NFPA Standards 51 and 51B, and with Title 29 CFR, Section 1910.102.

3. Liquefied Petroleum Gases

a. Storage of Liquefied Petroleum Gases (LPG) (e.g., propane, propylene, butane, butylene) contained in cylinders for use with oxygen in welding or cutting operations shall be in compliance with NFPA Standards 51 and 51B.

b. Storage of LPG in cylinders at a location or facility not referenced in subparagraph 5-10A3a, above, shall be in compliance with NFPA Standard 58.

c. Storing LPG cylinders only one tier high provides more efficient fire protection; however, if space is limited and the canopy or building is constructed of noncombustible materials, palletized cylinders may be stored two tiers high.

4. Hydrogen

a. Storage of gaseous hydrogen in cylinders at the consumer site or at a designated storage installation shall be in accordance with the procedures and facility design requirements of NFPA Standard 50A, Standard for Gaseous Hydrogen Systems at Consumer Sites.

b. Adequate ventilation shall be provided in the storage area. Floor level inlet and outlet openings in exterior walls or the roof shall have a minimum area of 1 square foot for each 1,000 cubic feet of storage volume and explosion venting shall be designed to relieve a maximum internal pressure of 25 pounds per square foot in compliance with NFPA Standard 50A.

c. Hydrogen cylinders shall be stored only one tier high; this will enable direct contact of the spray from the sprinkler system to each cylinder for cooling in case of a fire within the immediate area. Cooling will prevent or delay the activation of the pressure-relief device, which when activated will feed more fuel to the fire.

B. Nonflammable Gases

1. Oxidizing Gases (Oxygen)

a. The storage area must be kept free of all flammable gases and liquids and other combustible materials (oxygen vigorously supports combustion).

b. Ventilation in the storage area must be sufficient to prevent the concentration of oxygen in the air from exceeding 23 percent. Ventilation requirements shall be as prescribed in paragraph 5-9B.

c. Oxygen cylinders, their valves, and all accessories (e.g., regulators, hoses, protection caps) must be kept free of oil, grease, or other hydrocarbon products and shall not be handled with oily hands, oily gloves, or greasy equipment.

d. Storage of gaseous oxygen in cylinders for use with a fuel gas in a welding or cutting operation shall be in compliance with NFPA Standard 51. Storage of gaseous oxygen for other applications shall be in compliance with NFPA Standard 43C, Storage of Gaseous Oxidizing Materials, and NFPA Standard 50, Bulk Oxygen Systems at Consumer Sites. Emphasis shall be placed on the segregation, separation, and quantity limitations of each type of storage.

2. Inert Gases (Nonflammable)

a. Inert gases such as argon, helium, neon, and nitrogen are simple asphyxiants that can displace the oxygen in the air, causing rapid suffocation due to oxygen deficiency. Respiratory protection, as cited in paragraph 5-4I, shall be worn by at least two persons working together in an atmosphere where the oxygen concentration is less than 19 percent by volume.

b. Buildings or housing structures for the storage of inert nonflammable compressed gases shall be constructed in accordance with paragraph 5-8C4.

c. Inert gases may be stored in the area used to separate different types of fuel gases or fuel and oxidizing gases located at the consumption site or in the industrial buildings.

d. Inert gases may be stored in unlimited quantities at the storage site, in storage rooms, in separate buildings, and in outside storage areas, provided adequate ventilation and/or personal protective equipment is available and properly used.

C. Corrosive Gases

1. Corrosive gases such as ammonia, chlorine, methylamine, and sulfur dioxide are corrosive on contact with tissue and mucous membranes and with metals. Not all of these gases are used or stored by DoD activities, but are identified by type to assist anyone finding these gases in use or storage.

2. Personal protective equipment shall be worn to avoid contact with acid or alkaline gases. Face shields, rubber (or other suitable chemically resistant material) gloves, and aprons shall be worn with long-sleeved shirts and long trousers. Open shoes and sneakers are prohibited. Reference the appropriate Material Safety Data Sheets (MSDS), for safety information.

3. Personnel handling or using acid and alkaline gases shall have available for immediate use in emergencies respirators or self-contained breathing apparatus as prescribed in paragraph 5-41. Respirators may be used only under conditions where the concentration of the acid or alkaline gas will not exceed the rating of the respirator and the oxygen content of the atmosphere is not less than 19 percent by volume. Equipment shall be immediately available to personnel in the storage or work area, and kept out of the areas most likely to be contaminated.

4. Areas in which acid or alkaline gases are filled, used, or stored shall be equipped with an approved emergency shower and eyewash fountain. Drenching with copious amounts of water is an accepted first-aid procedure when corrosive gases come in contact with skin or eyes.

5. Outside storage of acid or alkaline gases, at other than the using site, shall be in accordance with paragraph 5-8D. Inside storage shall be in a separate noncombustible building without other occupancy in accordance with paragraph 5-8C or in a separate room without other occupancy in accordance with paragraph 5-8B and of noncombustible construction with a fire resistance rating of at least 2 hours. Storage facilities shall also have at least two exits, with doors that open outward. Closed structures shall be equipped with a ventilating system that will provide a 1- to 4-minute air exchange. For gases that are heavier than air, the intake of exhaust fans, if used, shall be located near floor level.

D. Poison Gases

1. Poison gases such as carbonyl fluoride, chlorine, chlorine trifluoride, diborane, fluorine, germane, hydrogen cyanide, hydrogen selenide, nickel carbonyl (liquid), nitric oxide, nitrogen dioxide, ozone, phosgene, phosphine, and stibine are poisonous gases that are dangerous to life when very small amounts are mixed with air. They are marked with either a skull and crossbones poison or a poison gas label and may have a flammable or nonflammable label.

2. Personnel handling and using poison gases shall have respirators or self-contained breathing apparatus for the particular gas in storage or use, as prescribed in paragraph 5-4I, available for immediate use in emergencies. Respirators may be used only where the concentrations of the poison gas will not exceed the rating of the respirator and where the oxygen content of the atmosphere is not less than 19 percent by volume. Equipment shall be immediately available to personnel in the storage or work area, and kept out of the area most likely to be contaminated.

3. Poison gas cylinders shall be filled and used only in forced ventilation areas or, preferably, in hoods with forced ventilation, or outdoors. Poison gases will not be emitted into the environment in a concentration in excess of the reportable quantity (RQ) as regulated by Title 40 CFR, Section 302.6.

4. Personnel working in the immediate area where these gases are handled shall be instructed as to the poisonous nature of the gases and methods of protection against harmful exposure and first-aid treatment in case of exposure. Personnel shall not be exposed to concentrations of poison gases in excess of the time weighted threshold limit values (TLV) as established by OSHA.

5. Outside storage of highly toxic poison gases at other than the using site shall be in accordance with paragraph 5-8D. Inside storage shall be in a separate noncombustible building without other occupancy in accordance with paragraph 5-8C or in a separate room without other occupancy in accordance with paragraph 5-8B and of noncombustible construction with a fire resistance rating of at least 2 hours. Storage facilities shall also be equipped with at least two exits with doors that open outward. Closed structures shall be equipped with a ventilating system that will provide a 1-to 4-minute air exchange.

6. For gases that are heavier than air, the intake of exhaust fans, if used, shall be located near floor level.

E. Cryogenic Liquefied Gases

1. Cryogenic liquids are compressed gases that have been refrigerated into a liquid state at relatively low pressures and extremely low temperatures of -130øF (-90øC) at atmospheric pressure or colder (oxygen -297.33øF nitrogen -320.36øF, argon -302.55øF, hydrogen -423.0øF, and helium -452.1øF). Because of their low temperatures, they are transported and stored in multiwall, vacuum-insulated cylinders, storage tanks, cargo tank trucks, and tank cars to minimize evaporation and venting of the gas. Small quantities of some cryogenic liquids are also handled and stored in nonpressurized Dewar flasks (vacuum-insulated containers) for laboratory applications. These containers are regulated by the International Civil Aviation Organization (ICAO) when being transported by commercial aircraft.

2. Cryogenic liquids and their cold vapors will cause frostbite injury upon contact with tissue. When handling cryogenic liquids, suitable eye and face protection, such as a full face shield, shall be worn to protect against the spray or splash of the extremely cold liquid and gas. Hand protection, such as insulated gloves and other personal protective equipment, shall be worn to prevent contact with the cold liquids, cold gases, and cold equipment or piping.

3. Cryogenic containers shall be stored and handled in well-ventilated areas to prevent excessive concentrations of the gas. Containers are equipped with pressure-relief devices that permit intentional venting of gas.

4. Cryogenic cylinders designed for vertical use shall be handled and stored in an upright position. The cylinders must not be dropped, tipped over, or rolled on their sides.

5. Containers and equipment designed for a specific cryogenic liquid service shall not be used for the storage of any other product unless such service is authorized by DOT and/or the cognizant Service engineering activity.

6. Cryogenic containers shall be provided with pressure-relief devices adequate to prevent excessive pressures within the containers.

7. Liquid oxygen containers shall be kept clean and free of grease, oil, and organic materials. Smoking and open flames are prohibited in areas where liquid oxygen is stored. Liquid oxygen systems at consumer sites shall comply with NFPA Standard 50.

8. Smoking, open flames, and general purpose electrical equipment are prohibited where liquid hydrogen is stored or used. Liquid hydrogen systems at consumer sites shall comply with NFPA Standard 50B.

9. Smoking, open flames, and general purpose electrical equipment are prohibited where liquefied natural gas is stored or handled. Liquefied natural gas systems at utility plants consumer sites shall comply with NFPA Standard 59A.

F. Procedures for Specific Cylinders. Certain gases and liquids in cylinders in the military system, because of their extremely hazardous nature or unique properties, require special storage and handling. In addition to the general storage and handling procedures cited herein, the following additional procedures shall apply to the following materials:

1. Chlorine

a. Chlorine cylinders shall be stored in accordance with subparagraph B3, above.

b. In the event of a spill, leak, or exposure to chlorine from cylinders (including to multi-unit (TMU) or ton containers, DOT specification 106A500X and 106A500) the following actions shall be taken:

(1) Personnel not equipped with self-contained breathing apparatus and full protective clothing shall be excluded from the area until the leak has been stopped.

(2) If the leak cannot be stopped by closing the cylinder or container valve, the local emergency response plan shall be activated.

(3) If a "Chlorine Emergency Kit" is available, and personnel with proper protective equipment are trained to use the kit, the cylinder or container shall be capped. The "Chlorine Emergency Kits" and instruction manuals have been assigned the following NSNs:

NSN	ITEM
8120-01-007-0257	Chlorine Emergency Kit A (Cylinder)
8120-01-007-0258	Chlorine Emergency Kit B (Ton Cylinder/Container)
	Manual Instruction, Kit A
	Manual Instruction, Kit B
	Manual Instruction, Chlorine

(4) If a "Chlorine Emergency Kit" is not available, or if personnel with proper protective equipment and knowledge of the use of the kit are not available, advice and/or assistance will be solicited from the Chlorine Emergency Plan (CHLOREP), which operates 24 hours a day with the following phone number: 800-424-9300, CONUS, Canada, Puerto Rico, Virgin Islands 202-483-7616, from overseas, Alaska, Hawaii (Call collect)

(5) The CHLOREP has been established by the United States and Canadian chlorine producers and is managed by the Chlorine Institute and CHEMTREC. When activated by telephone in the event of a chlorine emergency, trained industry experts are immediately put in touch with the scene. These experts will evaluate the seriousness of the accident or emergency and will make recommendations and give advice. If the situation is beyond the capabilities of a CONUS activity, CHLOREP experts will physically respond to the accident or emergency scene with the equipment to resolve the problem.

(6) In the event of a chlorine release in CONUS, U.S. Territories, or territorial waters, if the quantity released is 10 pounds or greater, the person having knowledge of the release will report the release to the U.S. Coast Guard National Response Center at 800-424-8802 or 202-267-2675. This report is necessitated by Title 40 CFR, Section 302.6, Title 49 CFR, Section 171.15, and Public Law 99-499 (Superfund Amendments and Reauthorization Act (SARA).

(7) CAUTION! Although water spray or fog sometimes is used to assist in the control of chlorine gas clouds or fumes, water should never be applied directly to the leak and the container should never be immersed in water.

2. Chlorine Trifluoride

a. Chlorine trifluoride is the most hazardous compressed gas, in cylinders, currently used by the Military Services. Personnel who handle the cylinders shall be trained to recognize the brown cylinder with a single green band. Cylinders authorized to contain chlorine trifluoride are DOT specification 3A, 3AA, 4BA, or 4BN and shall not be equipped with a pressure relief device.

b. Upon receipt, chlorine trifluoride cylinders shall be isolated immediately in open improved storage, on bare ground or on a concrete pad, at least 50 feet from anything combustible. Cylinders shall be secured in a vertically upright position until a competent authority certifies that the storage facility is adequate. Chlorine trifluoride cylinders shall be stored in compliance with the requirements outlined for both oxidizers (subparagraph B1, above) and poison gases (subparagraph C, above). A Storage Quality Control Report (DD Form 1225) will be submitted to DSCR-JDT in accordance with paragraph 10-2A.

3. Ethylene Oxide (Gaseous Sterilants)

a. Ethylene oxide should not normally be stocked by Defense Depots.

b. Ethylene oxide and dichlorodifluoromethane mixtures are gas sterilants. Cylinders of gas sterilants may be received by Defense Depots as customer returns.

c. When such a cylinder has been returned and has not cleaned and purged, it shall be assigned Condition Code F and stored and maintained using the same precautions as if the cylinder was full. DSCR shall be advised of the receipt of the cylinder and which gaseous sterilant mixture it last contained (if known) as outlined in paragraph 10-2B.

G. Personal Protective Equipment. Personal protective equipment, as required by Title 29 CFR, shall be immediately available and suitable for each different type of gas stored at the same location. Respirators as cited in paragraph 5-4I shall be available for each type of gas being stored and handled. Equipment needs will vary greatly depending on the types of gases stored and their health hazards. Personnel who handle cylinders shall be trained in the proper selection and use of the various types of personal protective equipment.

H. Storage Controls

1. All cylinders (both full and empty) in Condition Code A must be controlled to ensure cylinders with the earliest (oldest) hydrostatic test date are issued first. This is based on the date of the last hydrostatic test in accordance with paragraph 3-3.

2. Procedures shall be established locally to detect, reclassify, and report Condition Code A empty cylinders that must be downgraded to Condition Code D because of expiration of the hydrostatic test date as outlined in paragraph 4-2H.

3. Storage procedures and controls outlined in paragraphs 5-9 and 5-10 for filled cylinders shall also apply to empty cylinders with a positive residual pressure.

SECTION 6

MAINTENANCE OF CYLINDERS

6-1. GENERAL. In-storage maintenance of cylinders shall be limited to external cleaning, and replacement of valve dust caps or plugs, valve hand wheels, and valve protection caps when such actions are all that are required to classify a cylinder to a Condition Code of A or D.

6.2. SAFETY PRECAUTIONS

A. Cylinder Cleaning. Cylinders that have become chemically contaminated either internally or externally shall be cleaned in accordance with ASTM G-93, STANDARD PRACTICE FOR CLEANING METHODS FOR MATERIAL AND EQUIPMENT USED IN OXYGEN ENRICHED ENVIRONMENTS.

B. Personal Protective Equipment. Neoprene gloves and eye protection such as splash goggles or face shield shall always be used when working with cleaning solvents or agents.

C. Ventilation and Respiratory Considerations. Existing ventilation systems in areas approved for storing compressed gases covered by this regulation should be adequate for keeping vapors at a safe concentration (less than 1,000 parts per million of vapor in contaminated air). However, each and every case should be scrutinized carefully to ensure good safety practices are followed. Special ventilation should be provided in work areas where high concentrations are likely to occur and in low places where heavy vapors may collect. It may be prudent to consider using appropriate respiratory protection as prescribed in paragraph 5-4I.

D. Leak Detection. Soap solutions, frequently used to detect leaks around valves, must not be used on the outlet connection of valves in aviator's breathing oxygen service. Never use an open flame to detect gas leaks. Leak detection instruments or commercial leak detector solutions compatible with oxygen shall be used. If a leak is detected, the first things to do is to clear the immediate area of all personnel. Determine what type of a gas is leaking, how bad, and is it safe to move the cylinder. If it is safe to move the cylinder, take all precautions for breathing purposes and move the cylinder down wind of all industrial and residential areas. Determine by guidelines provided in section seven how the gas can be safely disposed of under the situation. Moving the cylinder to a safe place may be all you can do and then you will have to call in help. An emergency response team should always be available (See Section 7).

6-3. ADDITIONAL SERVICES. Maintenance beyond the scope of that indicated above for in-storage maintenance will be performed by commercial contractors or by depot activities as directed by DSCR. Maintenance to be performed by commercial contracts, Defense Depot maintenance, and/or Military Service maintenance activities will be coordinated through HQ DLA, ATTN: DLA-OW (DLAM 4151.1, Maintenance Management Manual). Maintenance performed by either commercial or military activities shall be performed in accordance with MIL-STD-1411.

SECTION 7

DISPOSAL OF COMPRESSED GASES OR LIQUIDS IN CYLINDERS

7-1. GENERAL

A. The information in this section is provided to assist anyone finding, through inspection or use, a cylinder that has developed a leak and is creating a safety hazard or it is necessary to remove the contents of a cylinder for its safe disposal through the local DRMO. It must be remembered above all that it is imperative to properly identify the compressed gas contents of the cylinder(s) in question.

EMERGENCY ASSISTANCE

B. Emergency advice or assistance is available from the gas supplier or manufacturer. If they are unknown or inaccessible, contact an information source such as the U.S. Coast Guard National Response Center at 800-424-8802 or 202-267-2675. An alternate information source is CHEMTREC at 800-424-9300 or 202-483-7616 in CONUS, Canada, Puerto Rico, and the Virgin Islands. From overseas, Alaska, and Hawaii, call CHEMTREC collect at 202-483-7616.

C. Disposal action within CONUS or U.S. Territories shall be accomplished in accordance with the following regulations:

1. Clean Air Act, Title 40 CFR, Part 61.
2. Clean Air Act, Title 40 CFR, Part 82 (1990)
3. Resource Conservation and Recovery Act (RCRA), Title 40 CFR, Parts 260-265.
4. State regulations.
5. Department of Defense or Service/Agency regulations.

D. Disposal action taken in countries outside U.S. jurisdiction shall be accomplished in accordance with the applicable Status of Forces Agreement or International Treaty, or as prescribed by appropriate authorities or regulations.

E. The release of the gaseous contents of serviceable or unserviceable compressed gas cylinders into the atmosphere is now tightly controlled by the Environmental Protection Agency. Of major concern at this time is the release of the refrigerant gases known as Chlorofluorocarbons (CFCs), the Hydrochlorofluorocarabons (HCFCs), and the fire fighting agents known as HALONS. These materials contain or are manufactured by the use of Chlorine which has been identified as the agent that is destroying the OZONE layer of the atmosphere. These materials, known as OZONE DEPLETING SUBSTANCES (ODS) have or will be phased out of production to meet the requirements of the International Agreement know as the Montreal Protocol which has been incorporated into the 1990 Amendment of the Clean Air Act, Part 82, Code of Federal Regulation(CFR). These ODS products have been segregated into two definitive Classes of identification. The Class I products have been identified as the most destructive and are known as AChlorofluorocarbons, Chlorinated Solvents, and the fire fighting Halons of which all have been removed from production. The Class II products, known as Hydrochlorofluorocarbons are less destructive and will be phased out of production by the year 2030. Section 608 of the Clean Air Act, (Refrigerant Recycling Rule) prohibits knowingly venting or knowingly releasing or disposing of any Class I or Class II product to the environment (Effective 1 July 1992). These products must be recovered and recycled or reclaimed. (See section 12 of this enclosure for the procedures on returning these products to the DOD reserve for reuse in approved essential applications). A complete listing of these products can be found in Part 82, CFR 40. Those products currently being used by DOD that meet the criteria of a Class I ODS are listed below:

CHLOROFLUOROCARBONS

CFC-11	Trichlorofluoromethane

CFC-12	Dichlorodifluoromethane
CFC-114	Dichlorotetrafluoroethane
R-500	Azeotropic mixture of CFC-12 and HFC-152a
R-502	Azeotropic mixture of CFC-115 and HCFC-22

HALONS

Halon 1202	Dibromodifluoromethane
Halon 1211	Bromochlorodifluoromethane
Halon 1301	Bromotrifluoromethane
Halon 2402	Dibromotetrafluoroethane

SOLVENTS

Methyl Chloroform	1,1,1 Trichloroethane
CFC-113	Trichlorotrifluoroethane

F. The procedures for the disposal of compressed gas cylinders are contained in section 8 of this enclosure.

7-2 DISCHARGE OF GASES NOT REGULATED AS WASTES OR POLLUTANTS.

A. The following compressed gases have been identified as not being regulated as hazardous wastes or a pollutants and may be discharged into the atmosphere provided the proper safety precautions are observed:

Air	Hexafluoroethane
Argon	Neon
Carbon Dioxide	Nitrogen
Carbon Dioxide and Oxygen Mixture	Nitrogen and Oxygen Mixture
Helium	Nitrous Oxide
Helium and Oxygen Mixture	Sulfur Hexafluoride (domestic)/Sulphur Hexafluoride (international)

SAFETY PRECAUTIONS

B. The following safety precautions and operating procedures must be adhered to when venting (discharging) the contents of a compressed gas cylinder.

1. It is absolutely essential that the contents of the cylinder be identified as not regulated as wastes or pollutants prior to considering any discharge of its contents into the atmosphere as a disposal method. If a gas or liquid is not listed by name in this regulation, the supplier, basic producer, or proper authority shall be contacted for disposal advice.

2. Care must be taken to assure the released energy does not cause the cylinder to rocket. Under all circumstances, the cylinder shall be firmly secured in an upright position with the discharge outlet pointed away from personnel at all times. A needle valve shall be securely attached to the discharge connection of the cylinder valve to adequately control the discharge rate. If a needle valve is not available or cannot be adapted to the valve outlet, a brass sealing valve outlet cap or plug, drilled with a 3/32-inch hole and placed wrench-tight on the valve outlet, will provide a safe discharge of gas. When discharging carbon dioxide from a cylinder provided with a siphon or dip tube, the exhaust will be in the form of a "snow" or "dry ice." These cylinders with a siphon or dip tube can be identified by an "S" on the side of the valve.

3. If the contents of a cylinder must be removed by some method other than through a properly operating valve, care must be employed to release the content slowly, so that the released energy does not cause the

cylinder to rocket. If a cylinder valve is damaged, preventing the discharge of the content in a normal manner, it may be possible to release the pressure from the cylinder by loosening the pressure relief device. This must be done only by a qualified person who is completely familiar with gas cylinder and the operation of its pressure relief device. It should not be attempted without first securing the cylinder in a well ventilated area where the possible ejection of the relief device will cause no harm.

4. The area chosen for discharging compressed gases that are not regulated as wastes or pollutants shall be in an isolated location outdoors, where the escaping gas will not present a hazard to personnel or property.

5. At least two qualified persons shall be present while the cylinders contents are being discharged. Appropriate personal protective equipment as prescribed in paragraph 5-4I shall be worn.

6. Favorable weather conditions must prevail during discharge operations (e.g., slight breeze, no fog or rain, preferably a clear day). Cylinders shall not be subjected to a temperature above 125øF as prescribed in paragraph 5-4G.

7. Cryogenic (Refrigerated) fluids, such as liquefied argon, helium, hydrogen, neon, nitrogen or oxygen shall be handled only by fully trained and experienced personnel equipped with the necessary safety equipment to protect them from the extreme cold temperatures of -297 Degrees F and below.

7-3. HAZARDOUS SUBSTANCES AND HAZARDOUS WASTES.

A. Hazardous substances are those materials and their corresponding Reportable Quantities (RQs) listed or designated as "hazardous substances" under Section 101(14) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Public Law 96-510. The listing may be found in Title 40 CFR and Title 49 CFR.

1. Any material that is subject to the Hazardous Waste Manifest Requirements of the U.S. Environmental Protection Agency as specified in Title 40 CFR, Part 262, is a "hazardous waste."

2. DoD activities treating, storing, disposing of, or transporting hazardous substances and hazardous wastes shall comply with applicable laws and regulations.

3. DoD activities in CONUS, U.S. Territories, or territorial waters that discover a release of a hazardous substance in a quantity equal to or greater than the RQ for the substance are required to promptly report the release to the U.S. Coast Guard National Response Center at 800-424-8802 or 202-267-2675. This requirement results from the enactment of Public Law 99-499 on October 17, 1986.

7-4. DISPOSAL OF HAZARDOUS GASES OR LIQUIDS IN CYLINDERS.

A. The proper and safe method of disposal of the hazardous contents of a compressed gas cylinder shall be selected by recognizing and evaluating the potential hazard the escaping gas will create (will it be safe to release to the atmosphere or must it be neutralized). The type of waste product that will be generated in the disposal process must also be recognized and the proper handling must be considered. The disposal methods provided in this document are intended for use only by qualified personnel. These recommendations do not cover all possible disposal methods. Detailed information is available from a supplier or manufacturer of the compressed gas contained in the cylinder. Activities within CONUS or U.S. Territories must hold a valid Waste Treatment, Storage, or Disposal Facility (TSDF) permit issued by the U.S. Environmental Protection Agency, State, or Territory when treating, storing, or disposing of hazardous waste gases.

B. Disposal Methods.

CAUTION

The recommended methods of disposal provided here are to be followed by qualified personnel knowledgeable of and experienced in the practical applications of stoichiometric amounts of neutralizing agents for the following selected hazardous gases and liquids.

1. Acetylene. Use for intended purpose or burn down contents of cylinder using an approved welding kit or burning manifold. If not feasible, contact supplier for advice.

2. Anhydrous Ammonia. Convert to ammonium nitrate by passing vapors into a nitric acid solution.

3. Carbon Monoxide. The cylinder contents may be piped to an approved incinerator for burning. Experienced personnel may place the cylinder in a pit and burn the carbon monoxide in a controlled manner to produce carbon dioxide.

4. Chlorine. Neutralize by passing vapors into 18 to 20 percent sodium hydroxide solution.

5. Chlorine Trifluoride. Contact supplier or manufacturer of the gas or an approved professional disposal firm.

6. Cyclopropane. The waste should be destroyed by piping into an approved Federal- or State-permitted TSDF incinerator by a licensed professional disposal firm.

7. Dimethylamine. Neutralize by passing vapors into a nitric acid solution.

8. Ethyl Chloride. Neutralize by passing vapors into sodium hydroxide solution.

9. Ethylene Oxide, and Ethylene Oxide and Nonflammable Gas Mixtures. Amenable to disposal in permitted bacteriological waste treatment facilities under controlled conditions after proper acclimation of the system.

10. Fluorocarbons and Chlorofluorocarbons (Flammable and Nonflammable). The refrigerant and fire fighting materials identified as R-11, R-12, R-114, R-500, R-502, R-503, Halon 1202, 1211, 1301 and 2402 have been designated as Class 1 Ozone Depleting Substances (ODS) and must be recovered and reclaimed for reuse in essential use applications. The DLA has been tasked with establishing and maintaining a DOD reserve for use in designated critical applications. Contact DSCR-JDSA for procedures on ordering empty cylinders and turn in of the used recovered products. All ozone depleting substances will eventually be phased out of manufacture and replaced.

11. Hydrogen. May be vented or burned under controlled conditions by experienced personnel. If vented, shut off and secure all ignition sources in an isolated controlled access open area. Attach at least 15 feet of piping to the cylinder so that the gas is vented well above ground level. Post warning signs reading: "Warning Venting Flammable Gas" and guard area until the gas has vented. All safety precautions outlined in paragraph 7-2B shall apply.

12. Hydrogen Chloride. Neutralize by passing vapors into a sodium hydroxide solution.

13. Hydrogen Sulfide. Neutralize by passing vapors into a sodium hydroxide solution.

14. MAPP. Use for intended purpose. If not feasible, contact supplier for advice (AIRCO).

15. Methyl Bromide. Neutralize by passing vapors into a sodium hydroxide solution.

16. Methyl Chloride. Neutralize by passing vapors into a sodium hydroxide solution.

17. Methoxyflurane. The waste should be destroyed by piping into an approved Federal or State permitted TSDF incinerator by a licensed professional disposal firm. If a permitted disposal firm is not readily available, guidance and advice should be requested from DSCR-JDT.

18. Oxygen. May be vented in the same manner as hydrogen. The area chosen for discharge must be cleared of any combustible materials, including vegetation. Post signs reading: "Warning Venting Oxygen Stay Clear." ANO SMOKING WITHIN 50 FEET@.

19. Liquefied Petroleum Gases. Use for intended purposes. If not feasible, contact supplier for advice.

20. Phosgene. Neutralize by passing vapors into a sodium hydroxide solution.

21. Sulfur Dioxide. Neutralize by passing vapors into a sodium hydroxide solution.

C. Hazardous Wastes.

CAUTION.

When gases or liquids have been chemically changed into salts or other compounds, additional hazardous wastes may be created. Newly created compounds may require additional treatment or hazardous waste disposal at a permitted facility.

SECTION 8

DISPOSAL OF COMPRESSED GAS CYLINDERS

8-1. GENERAL. Disposal of compressed gas cylinders shall be accomplished in accordance with the technical procedures outlined in this regulation and in compliance with the policy and accountability procedures prescribed by DoD 4160.21-M, Defense Materiel Disposition Manual. Disposal of compressed gases or liquids in cylinders is covered in section 7 of this enclosure. Non-Government-owned cylinders shall be returned to their rightful owners. If the owner cannot be determined, or if the owner has executed a release document officially abandoning the cylinder(s) on Government property, the cylinder(s) shall be processed in accordance with paragraph 8-4, below. The disposal of Government-owned cylinders shall be processed through a Defense Reutilization and Marketing Office (DRMO) for any of the following reasons:

A. Cylinders that have been condemned from further service due to physical defects detected by a visual inspection performed by a competent inspector. (See section 4, paragraph 4-2E of this enclosure.)

B. Cylinders that have been condemned from further service due to metal fatigue as determined by a hydrostatic test performed by a DOT approved and registered retest facility.

C. Cylinders that were not manufactured by a DOT approved manufacturer or that were not manufactured in compliance with DoD or DOT approved specifications.

D. Cylinders that have been condemned from further service due to manufacturing defects or unauthorized modifications or changes in service. (See section 4, paragraph 4-2D of this enclosure.)

E. Cylinders that have been declared excess by the Inventory Control Point (DSCR-JDSA) to all known or anticipated DoD requirements and has provided disposal guidance.

8-2. DISPOSITION INSTRUCTIONS

A. Disposition instructions do not have to be requested from the DLA inventory manager for cylinders on hand that have been condemned from further service by the U.S. Government as cited in paragraphs 8-1A through 8-1D, above. Activities having custody of condemned cylinders shall transfer them to a DRMO as prescribed in paragraphs 8-3 and 8-4, below.

B. All excess compressed gas cylinders shall be reported to the DLA Inventory Manager at either DSCP or DSCR for identification to valid National Stock Numbers and to determine if they are owned by the U S Government. Such cylinders shall be disposed of as directed by the DLA Inventory Manager.

C. DOT specification 39 cylinders (small propane, refrigerant, calibrating gases, etc) are designed as single trip, non-refillable cylinders to be used one time for the initial storage and shipment of a compressed gas and then destroyed. These cylinders are designed of minimum strength materials and will not tolerate the repeated flexing of refills. Federal law forbids transportation of such cylinders if they have been refilled, with a fine of up to $25,000 and a 5-year imprisonment (49 United States Code, 1809). To prevent reuse of such cylinders, they shall be evacuated to the local Environmental Protection Agency standards, equalized to atmospheric pressure and then destroyed. The method of destruction is not critical, but the cylinder must be rendered incapable to contain any compressed gas under pressure. Once the cylinder has been rendered useless as a container, it shall be disposed of as scrap metal.

8-3. TRANSFER OF CYLINDERS TO DRMO. Government-owned cylinders designated to be processed for disposal through a DRMO shall be tagged or labeled to indicate the MILSTRAP Supply Condition Code, the current contents of the cylinder, and, if applicable, the required DOT and EPA labels and markings. **DRMOs WILL NOT ASSUME PHYSICAL CUSTODY OF COMPRESSED GAS CYLINDERS UNLESS THEY HAVE BEEN RENDERED TO SCRAP AS OUTLINED IN PARAGRAPH 8-3E BELOW**. DRMO

property disposal processing of excess compressed gas cylinders shall include acceptance of accountability, but not physical custody, for reutilization, donation screening and/or sales actions on behalf of the activity reporting the excess. Activities having physical custody of the compressed gas cylinders shall store cylinders in accordance with section 5 of this enclosure. Cylinders reported for disposal action will be classified as follows:

A. Serviceable (Nonhazardous, Not Regulated). New cylinders and used serviceable cylinders that contain only a residue of a nonhazardous compressed gas (e.g., nitrogen, argon, and helium at a pressure less that 25 psig) do not require hazardous materials labeling IAW Title 49 CFR. These cylinders shall be designated as MILSTRAP Supply Condition Code A and shall be tagged with a DD Form 1574, Serviceable Tag-Materiel, or labeled with a DD Form 1574-1, Serviceable Label-Materiel. The tag or label shall be marked or over stamped with the statement "DOES NOT CONTAIN A HAZARDOUS GAS." Cylinders shall have their valves tightly closed. Cylinders designed for valve protection caps shall have caps securely installed with full thread engagement. Cylinders not designed for valve protection caps shall be boxed, crated, palletized, and strapped, as appropriate, to protect the cylinders from physical damage. All cylinder identifying marking shall be recorded and provided to the receiving DRMO for permanent recording on the transfer document at time of sale. Refer to paragraph 8-6.

B. Serviceable (DOT Regulated and Labeled). Used serviceable cylinders that contain a compressed gas at a pressure of 25 psig at 70øF or greater or contain a residue (less than 25 psig) of a hazardous gas (e.g., flammable, toxic, reactive, poisonous, irritating or one of the Class I or II ODS) shall be properly labeled as a hazardous material IAW Title 49 CFR and as an ODS as required by Part 82 of Title 40 CFR. If facilities and an EPA licensed technician are available, all residue of a Class I or II ODS shall be recovered and returned to the DOD reserve. The cylinder shall then be returned to the Inventory Control Point. These cylinders shall be designated as MILSTRAP Supply Condition Code A and shall be tagged with a DD Form 1574, Serviceable Tag-Materiel, or labeled with a DD Form 1574-1, Serviceable Label-Materiel. Cylinders shall have their valves tightly closed and those designed for valve protection caps shall have securely installed with full thread engagement. Cylinders not designed for valve protection caps shall be boxed, crated, palletized, and strapped, as appropriate, to protect the cylinders from physical damage. All cylinder identifying markings shall be recorded and provided to the receiving DRMO for permanent recording on the transfer document at time of sale. Refer to paragraph 8-6.

C. Unserviceable (Reparable, Nonhazardous). Used unserviceable (reparable) cylinders that contain only the residue of a nonhazardous compressed gas (e.g., nitrogen, argon, and helium at a pressure less than 25 psig) do not require hazardous material labeling IAW Title 49 CFR. The cylinders shall be designated as MILSTRAP Supply Condition Codes D or F and shall be tagged with a DD Form 1577-2, Unserviceable (Reparable) Tag-Materiel, or labeled with a DD Form 1577-3, Unserviceable (Reparable) Label-Materiel. The tag or label shall be marked or over stamped with the statement "DOES NOT CONTAIN A HAZARDOUS GAS." Cylinders shall have their valves tightly closed and those designed for valve protection caps shall have them securely installed with full thread engagement. Cylinders not designed for valve protection caps shall be boxed, crated, palletized, and strapped, as appropriate, to protect the cylinders from physical damage. All cylinder identifying markings shall be recorded and provided to the receiving DRMO for permanent recording on the transfer document at time of sale. Refer to paragraph 8-6.

D. Unserviceable (Reparable, DOT Regulated and Labeled). Used unserviceable (reparable) cylinders that contain compressed gas at a pressure of 25 psig at 70øF or greater or the residue (less than 25 psig) of a hazardous gas (e.g., flammable, toxic, reactive, poisonous, irritating, or one of the Class I or II ODS) shall be properly labeled as a hazardous material IAW Title 49 CFR and as an ODS as required by Part 82 of Title 40 CFR. If facilities and an EPA licensed technician are available, all residue of a Class I or II gas shall be recovered and returned to the DOD reserve. The cylinders shall then be returned to the Inventory Control Point. These cylinders shall be designated as MILSTRAP Supply Condition Codes D or F and shall be tagged with a DD Form 1577-2, Unserviceable (Reparable) Tag-Materiel, or labeled with a DD Form 1577-3, Unserviceable (Reparable) Label-Materiel. Cylinders shall have their valves tightly closed and those designed for valve protection caps shall have securely installed with full thread engagement. Cylinders not designed for valve protection caps shall be boxed, crated, palletized, and strapped, as appropriate, to protect the cylinders from physical damage. All cylinder identifying markings shall be recorded and provided to the receiving DRMO for permanent recording on the transfer document at time of sale. Refer to paragraph 8-6.

E. Unserviceable (Condemned, Nonhazardous Scrap). Used unserviceable (condemned) cylinders that previously contained a nonhazardous compressed gas or cylinders previously containing a hazardous compressed gas that have been thoroughly purged shall be emptied of pressure and the valve removed. Any cylinder that previously contained an ODS shall have the contents recovered and returned to the DOD reserve(see Section 12). A hole shall be cut or drilled (large enough that it cannot be welded closed) in the cylinder to render it unable to hold a positive pressure. The words >CONDEMNED-SCRAP= shall be metal stamped into the shoulder of the cylinder near the permanent markings. If it is not possible to cut (torch or drill) a hole in the cylinder, the inlet threads shall be destroyed sufficiently to prevent installing a valve with a gas tight seal. These cylinders shall be designated as MILSTRAP Supply Condition Codes AH@ or AS@ and shall be tagged with a DD Form 1577, Unserviceable (Condemned) Tag-Materiel or DD Form 1577-1, Unserviceable (Condemned) Label-Materiel shall be attached. The Words ACONDEMNED-SCRAP= shall be stamped or printed on the tag of label. DRMOs will accept physical custody of the remains of the scrapped cylinder.

F. Unserviceable (Condemned, DOT, RCRA or CAA (Clean Air Act) Regulated). Used unserviceable (condemned) cylinders (not leaking) that contain a regulated gas or the residue of a regulated gas (e.g., flammable, toxic, reactive, poisonous, irritating or one of the Class I or II ODS) shall be properly labeled as a hazardous material IAW Title 49 CFR and as an ODS as required by Part 82 of Title 40 CFR. These cylinders shall be assigned MILSTRAP Supply Condition Code H." A DD Form 1577, Unserviceable (Condemned) Tag-Materiel, or DD Form 1577-1, Unserviceable (Condemned) Label-Materiel, shall be attached. If the contents cannot be safely removed through normal use, the cylinders shall be removed to a safe isolated location. Their contents shall be safely removed by an approved method by qualified personnel or the cylinders shall be removed from the premises. The DRMO may assist in obtaining the services of a Federal, state, or local permitted contractor who can render the cylinder(s) and its contents non-hazardous. In the event a release of a hazardous material could result or is anticipated due to the condition of the cylinder, the Activitys Installation Spill Contingency Plan (ISCP), Spill Prevention, Control, and Countermeasures (SPCC) Plan, or Facility Contingency Plan (FCP) should be activated. If warranted, response action as appropriate will be taken to render the cylinder(s) harmless. (See section 7 of this enclosure for emergency assistance contacts.)

8-4. SPECIAL PROVISIONS FOR THE DISPOSAL OF NON-GOVERNMENT OWNED CYLINDERS. Compressed gas cylinders that are not owned by the U S Government or their ownership has not been determined will be handled and disposed of as follows:

A. If ownership can be determined, the facility, installation, base, or activity having physical custody shall notify the owner of the quantity and type of cylinder(s) held by the Government by certified or Registered Mail. The owners will be given 30 days from the date of receipt of notification to:

1. Request the cylinder(s) be returned, shipped at their expense. The contents of the cylinder must be absolutely verified and a Proper Shipping Description be assigned in accordance with Title 49 CFR.

2. Arrange for the pickup of the cylinder(s) by common, contract, or private carrier, at the owner's expense. If the contents of the cylinder cannot be absolutely identified, the owner shall be requested to prepare the necessary shipping papers, labeling, marking, and placarding will be the responsibility of the owner or his agent.

3. Notify the Government that, as the owner of the cylinder(s), they are releasing the ownership of the cylinder(s) as abandoned, to the Government. The notification from the Government shall include the proper documents, as prescribed in DoD 4160.21-M, to allow the owner to perform this release of the cylinder(s), as abandoned, to the Government.

B. If the owner does not respond to the notification, or if the owner executes an abandoned property release, the following action will be taken:

1. The facility, installation, base, or activity having physical custody will determine if the cylinder(s) are full, partially full, or empty. The holder will determine the DOT Proper Shipping Description for each cylinder.

2. If the cylinder(s) contains a hazardous material, the activity having custody will determine if the contents can be used safely in normal operations. If the material cannot be safely used, or if the cylinder(s) contains a hazardous waste or residue of a hazardous material, the activity having custody will arrange for the cleaning and purging of the cylinder(s) by an authorized or permitted Government or commercial treatment facility.

3. When cleaned and purged of all hazardous materials the activity having possession of the cylinder(s) will process them through a DRMO in the same manner as Government-owned cylinders in paragraph 8-3, above.

4. Abandoned, non-Government-owned cylinders for which ownership can be determined will be accounted for by DRMOs as required by DoD 4160.21-M. DoD or DLA activities will not place non-Government-owned cylinders on stock records or in stock. Record Purpose Only accounting, or maintaining an informal record, is permissible.

C. When cylinders are found and proper authorities confirm that ownership cannot be determined or is unknown and/or positive identification of the contents cannot be absolutely verified, a serious, possibly life-threatening situation could exist. The following action will be taken under these circumstances:

1. Cylinders may be found in what appears to be an unauthorized dumping on Government property, or cylinders of unknown origin may be discovered with missing labels or markings (e.g., dug up during excavation). The facility, installation, base, or activity finding cylinders under these circumstances will determine if the Installation Spill Contingency Plan (ISCP), Spill Prevention, Control, and Counter-measures (SPCC) Plan, or Facility Contingency Plan (FCP) should be activated. If warranted, response action as appropriate will be taken to render the cylinders harmless.

2. When cylinders in apparently serviceable condition are found commingled with Government-owned cylinders, in storage or use in Government-owned facilities, the facility, installation, base, or activity shall determine or arrange for the determination of the exact condition and contents of each cylinder.

3. When cylinders are rendered harmless and/or the exact condition and contents are positively identified, the activity having custody will process the cylinders through a DRMO in the same manner as Government-owned cylinders in paragraph 8-3, above.

4. All cylinders that are being turned into a DRMO for disposal action as a result of a base closure which fall into the category of containing an AUNKNOWN@ gas will be processed through a disposal service contract. Such a contract or contracts can be provided by DRMS with the service activity paying the costs.

8-5. ASSISTANCE IN DETERMINING OWNERSHIP. Assistance in identifying the ownership symbols found on the shoulders of cylinders will be provided by DSCR-JDTA, upon request. A data base of about 10,000 ownership symbols that was compiled by the DOT from the beginning of the registration program through 1969 is at our disposal to help identify the owner of a cylinder and possibly what type of a product was shipped in it. In addition to this data file, the Compressed Gas Association has picked up the registration program and is now compiling the registration symbols in a CGA Pamphlet C-16.1. This pamphlet will incorporate symbols assigned since 1969 up through the current revision of the pamphlet. This pamphlet does not contain all of the currently used symbols because not all of the cylinder owners chose to pay the fee to have their symbol recorded in this pamphlet. Assistance will be provided by calling **DSN 695-3230** OR **A/C 804-279-3230.**

8-6. RECORDING OF CYLINDER IDENTIFICATION AT TIME OF ISSUE/SALE. Cylinders (both Government owned and abandoned commercial) that are sold, donated, or otherwise leave Government custody shall have the permanent ownership markings, the ICC/DOT Specification, the service pressure, the serial number, the manufacturer's symbol, the date of manufacture and the full name and address of the purchaser recorded on the transfer document. It shall not be necessary to remove the ownership markings at the time of transfer. The transfer document shall be used for proof of ownership by both the purchaser and the Government at any later date. One copy of the transfer document shall remain on file at the Disposal Activity, and one copy shall be given to the recipient of the cylinder. Any inquiry by an investigative agency to verify the

sale/ownership of a specific cylinder (identified by serial number and manufacturer) shall be directed to DRMS-LHP, phone A/C 616-961-5911. The document shall be dated and signed by a representative of the Disposal Agency.

NOTE:

All ICC/DOT permanent markings, e.g., ICC/DOT Specification, service pressure, serial number, manufacturer symbol, date of manufacture, and the last hydrostatic test date, shall not be disturbed and **SHALL BE FULLY LEGIBLE.** If the permanent markings (after removing all paint) are not legible (readable), the cylinders must be condemned and not be turned in to DRMOs without first reducing them to scrap, meeting the requirements of paragraph of 8-3E above. All costs of returning any misidentified cylinders will be born by the generating/turn-in activity.

SECTION 9

CLASSIFICATION OF CYLINDERS IN SUPPLY CONDITION CODES

9-1. GENERAL. All cylinders shall be classified with a Supply Condition Code in accordance with DoD 4000.25-2M. The cylinders shall be visually inspected upon receipt and a Supply Condition Code shall be assigned. Supply Condition Codes shall also be changed as necessary upon reinspection.

9-2. CYLINDER CLASSIFICATION. Assignment of Supply Condition Codes to cylinders shall be limited to the criteria and codes cited as follows:

A. Supply Condition Code A

1. Cylinders that are suitable for issue without further repair or maintenance, or those that can be made suitable by normal in-storage maintenance, shall be assigned Supply Condition Code A. This condition shall be determined by performing the applicable inspection as outlined in section 4.

2. Any empty cylinder that has been received without positive residual pressure shall be subjected to the hammer test as outlined in CGA Pamphlet C-6. Any cylinder that will pass the hammer test will then be inverted and checked for condensed moisture. If the cylinder shows no sign of moisture when inverted, the rest of the condition inspection can be performed. If there is any sign of moisture or other contaminants, the cylinder will be placed in Supply Condition Code F.

3. A further inspection of an acceptable visual inspection of the exterior surface of a cylinder is as follows:

a. If the cylinder is being returned from a reconditioning facility, it should have been inspected and resurfaced as outlined in paragraphs 5.2.2 and 5.3.6 of MIL-STD-1411.

b. Cylinders being recycled at the user's location may be assigned Supply Condition Code A if they have only paint wear and scratches from handling and will pass all surface corrosion inspections outlined in CGA Pamphlet C-6, C-6.1, C-6.2 or C-6.3. When an estimated 3 to 5 percent of the cylinder surface is showing bare metal, the cylinder shall be at least spot painted to preserve its condition. When more than 10 percent of the cylinder surface shows bare metal it will be totally stripped of paint and repainted in accordance with paragraph 5.2.2 of MIL-STD 1411.

4. The droplight used for the inspection of flammable gas cylinders must be explosion-proof. As an alternative to a droplight, a mirror illuminated by an outside source of light may be used to reflect light into the cylinder.

5. Cylinders that are found to be unsatisfactory on internal inspection shall be tagged or marked as requiring internal cleaning and will be assigned Supply Condition Code F.

B. Supply Condition Code D

1. Supply Condition Code D shall be assigned to empty cylinders when their hydrostatic test serviceable period has exceeded that period outlined in paragraph 3-3, and that require no other repairs or maintenance.

NOTE:

A full or partially filled cylinder whose hydrostatic test serviceablility period has expired may remain in service until the product is exhausted, then it cannot be refilled until a hydrostatic retest is performed.

2. The principal application of Supply Condition Code D shall be to report Supply Condition Code A cylinders in depot storage that must be downgraded to an unserviceable status only because of an expired hydrostatic test date. Newly received cylinders will rarely require assignment of Supply Condition Code D.

C. Supply Condition Code F. Cylinders that require maintenance or reconditioning beyond the storage maintenance as outlined in section 6, shall be assigned Supply Condition Code F.

NOTE:

Supply Condition Codes D and F as described above are not to be considered "suspense" conditions. Cylinders that are assigned either of these Supply Condition Codes will be maintained as such until they are needed for refilling and then they will be scheduled for the necessary reconditioning and then refilled and put back into service.

D. Supply Condition Code H. Cylinders with any of the physical defects equal to or exceeding the recommendations found in CGA Pamphlet C-6, C-6.1, C-6.2, C-6.3 (see paragraph 4-2E) or have failed a hydrostatic retest shall be assigned Supply Condition Code H and transferred to a DRMO in accordance with DoD 4160.21-M and section 8. Such cylinders shall not be referred to DSCR for disposition instructions.

E. Supply Condition Codes J and K

1. Supply Condition Codes J and K shall be used as noted below when a cylinder cannot be identified to a valid NSN, or when ownership, e.g., Government or non-Government-owned, is in question.

2. If the NSN is valid and ownership is known, cylinders normally require only a visual inspection by depot personnel to establish the Supply Condition Code. This should be accomplished in the same time and manner as outlined in DoD 4000.25-2-M and section 9 of this regulation.

3. Supply Condition Code J shall be used only to suspend cylinders that are found in depot stock that cannot be assigned a valid NSN or when ownership is in question. (See paragraph 4-2C.)

4. Supply Condition Code K shall be used to report cylinders received as customer returns or as a result of redistribution with an incorrect NSN assigned to the cylinder(s) on the shipping document.

F. Supply Condition Code L

1. New, filled, or reconditioned cylinders shall be assigned Supply Condition Code L only when the discrepancy results from noncompliance with the terms of the contract or when it involves damage in transit.

2. Frequently a contractor will return Government-furnished cylinders as unsuitable for rehabilitation or refilling. This should not be reported as a discrepancy against "NEW PROCUREMENT." These cylinders shall be assigned Supply Condition Code H and reported in accordance with DLAM 4140.2, Supply Operations Manual, Volume I, Distribution System Procedures, and subparagraph D, above. DD Form 250, Material Inspection and Receiving Report, and DD Form 1155, Order for Supplies or Services, shall be used to account for the number of cylinders received.

3. When Government-furnished valves are returned by a cylinder filling or servicing contractor as unsuitable for further use, they shall be considered scrap and transferred to a DRMO as such. DSCR shall not be notified of this action.

G. Supply Condition Code S. Supply Condition Code S shall be used to describe cylinders that have no value except for the basic material content. This code is used only for cylinders being turned in to DRMOs in accordance with DoD 4160.21-M and section 8.

H. DoD Supply Condition Codes. Supply Condition Codes that are reported to DSCR must conform to those contained in DoD 4000.25-2-M. General Services Administration (GSA) and Military Service Supply Condition Codes shall not be used in any of the reports in section 10.

SECTION 10

REPORTING RECEIPTS OR INVENTORY ADJUSTMENTS

10-1. GENERAL. Receipt and inventory adjustment transactions on cylinders shall be reported to DSCR in accordance with DoD 4000.25-2-M, DLAI 4140.55/SECNAVINST 4355.18A/AFJMAN 23-215/AR 735-11-2, Reporting of Supply Discrepancies, and the specific provisions and/or exceptions of this regulation. Distribution depots shall establish internal controls to ensure and verify transmittal of DD Form 1486, DoD Receipt Document, and DD Form 1487, DoD Materiel Adjustment Document, that result from disposition instructions provided by this regulation.

10-2. REPORTS. The following reports shall be used under the circumstances indicated, and shall provide the specific information required herein in addition to that required by the applicable directive. Failure to provide this information will result in the return of the report.

A. DD Form 1225, Storage Quality Control Report. DD Form 1225 shall be used only to report on hand cylinders in FSC 6830 and 8120 that must be reclassified Condition Code J in accordance with paragraph 9-2E or when requested by DSCR. Cylinders whose ownership is unknown will not be reported and the proper ownership shall be determined as outlined in paragraph 4-2C4. (Contractor-owned, -leased, or -loaned cylinders shall be identified and returned to their rightful owners by the using Military Service activity and shall not be reported to any DLA activity as excess cylinders.) The DD Form 1225 that is used to report cylinders in Condition Code J shall contain the complete cylinder identification information as outlined in paragraph 4-2A. DD Form 1225 shall not be forwarded when cylinders in-storage are reclassified as Condition Codes D, F, or H. This provision is an exception to DLAM 4140.2, Volume I. For Defense Depots, transmittal of DD Form 1348-1, and the DAC Card, is,
therefore, essential to ensure adjustment of inventory records.

B. SF 364, Report of Discrepancy. SF 364 will be used to report discrepancies in cylinders that are received under the following conditions:

1. Receipts from Military Service activities returning empty cylinders to the DLA Supply System as excess property, if the discrepancy exceeds a value of $100 and is the responsibility of the shipper as outlined in subparagraph B2, below.

2. Receipts from redistribution if the value of the discrepancy exceeds $100 and is the responsibility of the shipper (in the case of GSA, see subparagraph C, below).

3. Receipts from contractors or vendors that involve overage, shortage, or damage for which the contractor is apparently responsible.

4. Receipts with any of the following discrepancies:

a. Incorrect item identification.

b. Incorrect or missing documentation.

c. When cylinders appear to have been received in error, e.g., intended for another activity or shipped without proper authority.

d. For any discrepancy not otherwise specifically noted herein, if it appears that the shipper is responsible.

5. Customer returns are usually identified by the shipper as being in Condition Code A. An SF 364 shall not be submitted when cylinders are reassigned to Condition Codes D or F upon receipt. However, cylinders received as customer returns that are reassigned to either Condition Code K or H shall be reported as such.

6. The DD Form 1225 that is used to report cylinders that, in Condition Code K, shall contain the complete information as outlined in paragraph 4-2A.

C. SF 361, Transportation Discrepancy Report. SF 361 shall be used in accordance with AR 55-38/DLAR 4500.15/NAVSUPINST 4610.33/AFR 75-18/MCO P4610.19, Reporting of Transportation Discrepancies in Shipment, to report all discrepancies in receipts that are the fault of the carrier.

SECTION 11

COMPRESSED GAS CYLINDER REQUALIFICATION FACILITIES

11-1. GENERAL. In the early 1980s, the Department of Transportation negotiated with the Department of Defense and the Defense Logistics Agency to provide a means to inspect and certify overseas cylinders retest and reconditioning facilities to eliminate the need to have all cylinders returned to the United States for retesting and reconditioning in-accordance-with the United States Code of Federal Regulations. The DOT determined it necessary to establish an independent agency, other than the owner or operator of the test facility (Military or Commercial), to perform the inspection and certification. It was designated at that time the most qualified agency to perform the inspection and certification program was the Defense Logistics Agency with the Mission Assignment placed with the Defense General Supply Center(now DSCR) under the management of DSCR-JDTA. Such a program was established and we now have over twenty registered facilities world wide. It was estimated the first year of operation the Government saved over $2,000,000 in cylinder transportation cost.

Requalification (inspection, hydrostatic testing, and physical reconditioning) of compressed gas cylinders shall be performed by requalification facilities (hereafter referred to as "facility" or "facilities") that have been inspected and registered with DOT. The registration of a facility with the DOT must specifically identify the DOT specification cylinders (Types) for which the facility has been inspected, approved and registered to requalify (Retest). Each facility performing the required requalification shall be fully capable to safely and accurately perform the required inspections, tests and reconditioning of the cylinders. The method of obtaining the facility registration shall be determined by the location of the requesting facility. The facilities that are located within the United States or its territories/possessions shall correspond directly with DOT to obtain the desired registration. The facilities located outside the United States, its territories, or its possessions otherwise identified as an overseas location or facility shall correspond through a designated Military Service Office of Primary Responsibility (OPR) to DSCR-JDTA. DSCR has been authorized by DOT to act as an independent inspection agency to respond to all DoD requests for registration of overseas requalification (retest) facilities, whether military or commercial. It is the responsibility of the requesting CONUS activity to pay for the expense of the inspection visit. The activity will negotiate directly with the inspection agency for the cost of the inspection. The expense of the inspection trip to an overseas activity is currently being funded through a Mission Assignment from DOD to DLA.

11-2. REGISTRATION OF FACILITIES. Facilities located within the United States, its territories, or its possessions shall be registered with the DOT in the name of the requesting DoD activity or the commercial firm that will be performing the cylinder requalification. Facilities at an overseas location, either Military Service or commercial, shall be registered in the name of the requesting DoD activity. The designated office within that activity shall be either the managing office of the Military Service facility or the managing office that is administering the contract requirements with the commercial firm performing the cylinder retesting and reconditioning. The request for registration and the completion of the application forms shall be accomplished and signed by a management representative of the commercial firm and the DoD activity.

11-3. REGISTRATION PROCEDURES. The following procedures shall be used in obtaining a DOT facility registration as prescribed by Title 49 CFR, Sections 173.34, 173.300a and 173.300b:

A. Facilities within the United States, Its Territories, or Its Possessions

1. Military Service activities and commercial firms desiring registration of their facilities shall submit a letter requesting such registration to the following office:

Director, OHMT, DMT-20
Office of Hazardous Materials Transportation
U.S. Department of Transportation
400 Seventh Street, S.W.
Washington, DC 20590

2. Upon receipt of the written request for registration, the Director, OHMT, will provide the applicant with a copy of the registration procedure, a list of approved independent inspection agencies, a list of minimum requirements, and an application form.

3. From the list provided by the Director, OHMT, the applicant shall select one of the independent inspection agencies, whose recommendation will be solicited for registration purposes, to perform an inspection of the facility.

4. Upon completion of a satisfactory inspection, the independent inspection agency will provide the applicant with a letter of recommendation and the Director, OHMT, with an inspection report.

5. The applicant shall then submit the letter of recommendation and a completed application form to the Director, OHMT, for consideration.

6. The Director, OHMT, will evaluate all the information relating to the requalification operation and, if it is determined to be acceptable, will provide the applicant with a letter of registration bearing a unique registration number.

7. The registration will be valid for 5 years, subject to the requirements for equipment maintenance and any changes in the testing and reconditioning capabilities of the facility.

B. Overseas Facilities

1. A DoD activity at an overseas location that desires the registration of a Military Service facility or commercial facility under contract to the DoD activity shall submit a written request for facility registration to one of the following OPRs of the applicable Military service:

Army	Commander U.S. Army Belvoir Research, Development and Engineering Center ATTN: STRBE-FRM Fort Belvoir, VA 22060-5606
Air Force	Commander Air Force Petroleum Office (AFPET) DET 3 WR-ALC/SF 1014 Billy Mitchell Blvd, Suite 1, Bldg 1621 Kelly AFB, TX 78241-5603 DSN (Product Engineering): 945-7613 Commercial: (210) 925-7613 Message Address: DET 3 WR-ALC KELLY AFB TX//SF//
Navy	Commander Naval Air Warfare Center Code 4.8.7.2 Air Craft Division Hwy 547, Bldg 596-1 Lakehurst, N.J. 08733-5091 DSN 624-2963 Commercial: (732) 323-2963

2. The request shall be evaluated for essentiality by the OPR and, if found acceptable, forwarded to the Defense Supply Center Richmond, DSCR-JDTA, Richmond, VA 23297-5610.

3. Upon receipt of the written request for registration, DSCR-JDTA shall provide the requesting DoD activity with an application form and a list of minimum requirements for equipment, personnel, and documentation necessary to become registered as an acceptable requalification facility. DSCR shall provide a copy of the cover letter without enclosures to the OPR.

4. The requesting DoD activity shall complete and return the application for registration to DSCR-JDTA. The requesting DoD activity shall verify that all essential equipment is on hand and in good operating condition to perform internal and external visual inspection, hydrostatic testing, reconditioning of the cylinders, and equipment calibration at the requalification facility. The requesting DoD activity shall also ensure that all prescribed regulations, specifications, standards, and manuals are on hand and current and that requalification facility operating personnel are familiar with the prescribed documents.

5. Upon receipt of the completed application, DSCR-JDTA shall review the documentation for completeness and, if acceptable, negotiate an inspection visit with the requesting activity.

6. During the inspection visit, additional training by the DSCR-JDT representative will be provided upon request.

7. Upon completion of the facilities inspection, DSCR shall submit the following documents to the Director, OHMT:

a. Letter requesting inspection and registration.
b. Signed application.
c. Inspection report.
d. Letter of recommendation.

8. The DOT will evaluate all the information relating to the requalification operation and, if it is determined to be acceptable, will provide the applicant with a letter of registration bearing a unique registration number. This number shall be marked on each cylinder that is inspected, tested, and approved for further use by the designated facility. A copy of the letter of registration shall be provided to the OPR through DSCR.

9. The registration will be valid for 5 years, subject to the requirements for equipment maintenance and any change in the retesting and reconditioning capabilities of the facility.

10. Additional site/facility registration requirements may exist at OCONUS locations, depending on the requirements of the host nation.

C. Special Conditions. Registration granted by the Director, OHMT, for overseas facilities are for requalification of only U.S. Government-owned cylinders.

11-4. MINIMUM REQUIREMENTS FOR EQUIPMENT AND PERSONNEL. The following list outlines the equipment, documentation, and reference material normally necessary to perform visual and hydrostatic tests required by Title 49 CFR, Section 173.34. Facility personnel must be able to demonstrate their knowledge of Title 49 CFR and CGA Pamphlets C-1, C-5, C-6, C-6.1, C-6.2 and C-6.3. They must also be able to demonstrate the capability of operating the test equipment to perform the required tests to the degree of accuracy required by the regulations. If the proposed test equipment and supporting data and documents differ from those prescribed, the independent inspection agency (DSCR-JDTA) should be advised of any such differences. The proposed alternate method by which the competence of the testing personnel and/or the accuracy of testing equipment shall be demonstrated by the test facility but should be explained to the inspection official prior to the inspection of the facility. The following shall be available onsite at the time of the inspection:

A. Regulations. A current copy of Title 49 CFR, Parts 100 to 185, or a similar reprint. Copies of this regulation can be obtained from:

Superintendent of Documents
U.S. Government Printing Office

Washington, DC 20402

B. Pamphlets. CGA Pamphlets C-1, C-5, and C-6, C-6.1, C-6.2 and C-6.3. These can be obtained from:

Compressed Gas Association, Inc.
Crystal Square Two
1725 Jefferson Davis Highway
Arlington, VA 22202-4102
Phone 703-412-0900

C. Certificate of Calibration. A certificate of calibration representing the most resent calibration of both the operating test and master gauges as applicable through their operating ranges.

D. Calibrated Cylinder. A calibrated cylinder of similar size and expansion range as that of the U.S. Government-owned cylinders being tested and a chart of it's expansion values.

E. Hydrostatic Test Equipment. Hydrostatic test equipment capable of performing the desired testing in a range of 25 to 75 percent of its designed maximum capability with an accuracy of 1 percent of any designated test pressure and resultant expansion value.

F. Visual Inspection Equipment. Equipment necessary for both internal and external visual inspection.

G. Record keeping Form. A sample of the facility's Record keeping form, which must display the same information illustrated in CGA Pamphlets C-1 and C-6.

H. Required MIL-STDs. Copies of MIL-STD-1411 and MIL-STD-101 and all documents referenced therein. Copies can be obtained from:

Naval Publications and Forms Center
5801 Tabor Avenue
Philadelphia, PA 19120
Telephone: DSN 442-3321
Commercial 215-697-4107
215-697-2179
215-697-0158
215-697-0159
215-697-2667

I. Required Regulation. Copies of this regulation and all documents referenced herein.

SECTION 12

MANAGING THE DEFENSE RESERVE OF OZONE DEPLETING SUBSTANCES

12-1. MISSION ASSIGNMENT.

A. The Defense Logistics Agency (DLA) was assigned the mission of managing the Defense Reserve of Ozone Depleting Substances to ensure that the supplies for mission critical applications are available. DLA will provide central management for the receipt, storage and issuance through the Defense Supply Center Richmond (DSCR) which is the activity within DLA that manages these substances. The Defense Depot Richmond Virginia (DDRV) is the initial storage site for ODS.

B. It is imperative that your military service or defense agency turn in to the Reserve the following excess CFCs and Halons: CFCs - 11, 12, 113, 500, 502 and Halons - 1202, 1211, 1301. The Reserve accepts both used and new CFCs and Halons in a relatively pure state (I.E. not as a component of other products). These chemicals may have been purchased under the Federal Supply Classes (FSC) of 6830 and 4210, or from a commercial source. CFC/Solvent-113 (Type I & II) and 1,1,1 Trichloroethane (FSCs 6850 and 6810) can also be turned in to the Reserve provided they have never been used and the containers in which the chemicals reside have never been opened or unsealed.

C. Parts 1and 2 of this section will provide procedures on how to turn-in excess ODS. Parts 2, 3, 4, 5 and 6 will provide National Stock Numbers (NSNs) specifically assigned to identify ODS turned in to the Reserve and associated recovery cylinders. Part 7 provides the list of chemicals by name that form a part of the ODS Reserve..

D. For questions concerning requisitions and stock availability, contact DSCR-JDSA, DSN 695-3756 or (804)-279-3756. Procedural concerns may be addressed to DSCR-RP, DSN 695-5203 OR (804 279-5203.

PART 1

GENERAL ODS TURN-IN INFORMATION

12-2. PROCEDURES

A. No authorization/pre-notification to the item manager or ODS Program Office is required when turning in ODS to the Reserve.

B. All types of ODS containers will be accepted in the Reserve to include cylinders, fire extinguishers, drums, spheres and canisters. Government recovery cylinders are available free of charge through DSCR for ODS turned in to the Reserve. Only these recovery cylinders should be used for recovering ODS from systems. They can be requisitioned by following normal MILSTRIP procedures. The government cylinders used for recovering CFC refrigerants are painted orange, and Halons red. Both have yellow tops and dual port valves (in some cases on the larger cylinders, two valves)to distinguish them from single port valve standard spec gas cylinders. For only Navy shipboard applications, dual port spec gas (virgin) CFC cylinders will soon be available. These unique spec gas cylinders can also be used for recovering CFCs.

C. All ODS containers returned to the Reserve must be tagged/labeled as follows:

1. The shippers DOD Activity Address Code (DODAAC).
2. The shipping activity with POC and phone number.
3. The NSN of the cylinder:(s) containing the recovered ODS (see Part 2).
4. Type of ODS (I.E.. Halon 1301 or CFC-12).
5. The quantity of containers on the pallet or within the shipping crate.
6. Packaged and labeled in compliance with DOT regulations.

NOTE

WHEN MULTIPLE CONTAINERS (CYLINDERS, DRUMS, SPHERES, CANISTERS, OR FIRE EXTINGUISHERS) WITH THE SAME NSN ARE SHIPPED PALLETIZED OR IN BOX/CRATE, APPLY ONLY ONE TAG/LABEL TO THE SHIPMENT, NOT TO EACH ITEM.

D. Fire suppression system cylinders and canisters with electrical charges or initiators must be deactivated prior to shipment to the Reserve. Also, safety caps must be used to cover exposed actuation mechanisms and discharge ports on these special cylinders, otherwise dangerous safety situations could arise during the shipping, receiving, or storage process. Local fire protection equipment companies can provide safety services. Special handling procedures for Halon system cylinders are provided later in this part. If further guidance is need contact Mr. Joe Schmierer of the ODS Reserve Program Office at DSN 695-5202 ro (804) 279-5202.

E. Monetary credit will not be given for turned in ODS or cylinders. However, ownership credit will always be given to the service or agency for the pounds of ODS returned to the Reserve. ODS can be requisitioned from the Reserve by service-authorized activities.

F. Empty recovery, and spec gas cylinders must be turned in to the reserve. Spec gas empty cylinders (see Part 2 for applicable NSNs) should not be used for recovery purposes. Spec gas cylinders will be refurbished and refilled with product for future requisitions. There are exceptions to recovery product into spec gas cylinders but this applies to limited Navy shipboard applications. Approval by the ODS Program Office is required to obtain these unique spec gas cylinders for shipboard applications

G. CFC/Solvent-113 and 1,1,1 Trichloroethane when turned in must be in their original containers in which the seal has never been broken.

H. Burnt out or mixed reserve products can be turned in to the Reserve. Clearly identify the chemical by defining its components (I.E.. R-12 & R-502)

I. The following items are not a part of the Reserve:
1. Empty fire extinguishers (valves removes).
2. Empty commercial containers.
3. Aerosol cans with Reserve chemicals.
4. Dry chemicals.

NOTE

CONTACT YOUR LOCAL PROPERTY DISPOSAL OFFICE FOR GUIDANCE ON THE DISCARDING OF THESE ITEMS.

12-3. TRANSPORTATION GUIDANCE

A. When shipping ODS refer to the following documents as needed:
1. The applicable sections of this document.
2. MIL-STD-129N, Military Standard Marking for Shipment and Storage.
3. Title 49, Code of Federal Regulations 49, Part 173 :(Particularly 173.301), Requirements for the Shipment of Compressed Gas Cylinders.

B. If money is not available with your activity to ship excess ODS to the Reserve, Transportation cost assistance can be provided for shipments costing $250.00 or greater. This cost assistance is strictly for transporting ODS and not for packing costs. For transportation cost assistance fax the following data to Mr. Steve Minus as (804) 279-4970 or DSN 695-4970:

1. Type and quantity of ODS.
2. Total weight of shipment.
3. The shipping cost.

4. Requesting facility and point of contact.

C. Turn-ins should be forwarded to the following address:

Defense Depot Richmond Virginia (DDRV)
SW0400
Cylinder Operations
8000 Jefferson Davis Highway
Richmond, VA 23297-5900

D. If your activity is personally transporting ODS to the Reserve be sure to schedule your delivery with the DDRV Dispatch Office at DSN 695-3834 or (804) 279-3834.

PART 2

SPECIAL ODS TURN-IN PROCEDURES FOR HALON 1301

12-4. PROCEDURE

A. Halon 1301 is typically incorporated into built-in fire suppression systems applications with the charged Halon cylinder connected to the system piping. Because the Halon is over pressurized with nitrogen to facilitate distribution, these system cylinders are usually disconnected from the system and used as the transportation cylinder to return the product to the Reserve as the systems are taken out of service. However, fire suppression system cylinders and canisters with electrical charges or initiators must be deactivated prior to shipment to the Defense Reserve. Special care should be taken when deactivating and disassembling the systems. The valves on these cylinders are designed in a manner that upon activation , they are changed instantly from closed position to fully open position and will dispense the Halon in under 10 Seconds. The combination of these sensitive valves and the high pressure within the cylinders required compliance with good safety practices.

B. Instructions for dismantling a Halon Fire Suppression System are provided as follows:

1. The first step is to deactivate the actuation system, which is usually electrical or pneumatic. However, disconnection from the electrical or pneumatic source is not sufficient from a safety standpoint. In the case of pneumatic systems, there is often still a small pin exposed that must be covered with a safety cap before handling. Just the slightest touch on this pin could cause full activation of the valve. In the case of electrically activated valves, simple disconnection of the electrical leads to solenoid valves is acceptable. However, if the electrical connection is to an explosive initiator, it is very important to remove the initiator. This is a very important safety practice, because static electricity can cause the explosive to detonate. These actions should be done before any other dismantling is initiated.

2. The next step is to disconnect any discharge piping from the discharge port. Immediately upon disconnection of the piping, install an anti-recoil device (discharge port safety cap). Safety caps should be used to cover exposed actuation mechanisms and discharge ports on these special cylinders, otherwise dangerous safety situations could arise during the shipping, receiving, or storage process. Application of manufacturers designed and supplied caps are the proper safety practice. In some cases the threads are not exactly the same as pipe threads and may not hold under the pressure of release. However, if pipe caps, plugs or plates are substituted for manufacturers caps, at least four opposing holes must be drilled in the anti-recoil cap, plug or plate to disperse any release of the Halon if the valve inadvertently activates. Anti-recoil device safety caps/plugs/plates must always be in place before handling the cylinders.

3. Adherence with the above safety practices is paramount before removing any cylinder from the mounting position. Once the safety devices are in place, cylinders can be moved with relative safety. However, these are high pressure compressed gas cylinders and require all the safe handling practices of any other gas cylinder. Also, protective safety wear is required for personnel deactivating cylinders.

PART 3

NSNs FOR EMPTY RECOVERY CYLINDERS

COMMODITY	EMPTY RECOVERY SIZE:(LB)	CYLINDER NSN
HALONS		
Halon 1202	160	8120-01-356-1781
Halon 1211	200	8120-01-356-1248
Halon 1211	1500	8120-01-356-1249
Halon 1301	117	*8120-01-371-0533
REFRIGERANTS		
R-11	59	8120-01-356-5960
R-11	170	8120-01-356-9756
R-11	1400	8120-01-355-9763
R-12	45	8120-01-355-4017
R-12	145	8120-01-355-4018
R-12	1190	8120-01-355-4019
R-114	57	8120-01-356-1245
R-114	165	8120-01-356-1246
R-114	1360	8120-01-356-1247
R-500	43	8120-01-357-6774
R-500	127	8120-01-357-7656
R-500	1045	8120-01-357-7657
R-502	44	8120-01-335-6770
R-502	128	8120-01-357-6771
R-502	1050	8120-01-357-6769

*Denotes a High pressure cylinder of 600 psig plus.

PART 4

NSNs FOR EMPTY SPEC GAS (VIRGIN) PRODUCT CYLINDERS (FOR TURN-INS ONLY)

COMMODITY	CAPACITY (POUNDS SIZE)	CYLINDER NSN
HALONS		
Halon 1202	160	8120-01-339-6277
Halon 1202	2000	8120-01-371-0532
Halon 1211	200	8120-00-337-2899
Halon 1211	1500	8120-01-396-2165
Halon 1301	137 & 150	8120-00-531-8193
Halon 1301	1123 & 1240	8120-01-356-5961
REFRIGERANTS		
R-11	59	8120-01-355-9760
R-11	170	8120-01-355-9761

R-11	1400	8120-01-355-9762
R-12	45	8120-01-337-1816
R-12	145	8120-01-337-6242
R-12	1190	8120-01-355-4016
R-114	57	8120-01-354-9400
R-114	165 (10 x 49)	8120-00-063-3983
R-114	165 (12 x 36)	8120-01-337-6236
R-114	1360	8120-01-356-1244
R-500	43	8120-01-357-6773
R-500	127	8120-01-357-6772
R-500	1045	8120-01-357-9137
R-502	44	8120-01-357-7655
R-502	128	8120-01-336-6239
R-502	1050	8120-01-357-6907

Part 5

NSNs FOR TURN-INS OF ODS

COMMODITY	EXTINGUISHER OR CYLINDER CAPACITY (SIZE)	NSN FOR TURN-IN
HALON IN CYLINDERS OR EXTINGUISHERS		
Halon 1202	160	6830-01-356-1780
Halon 1211	1-5	6830-01-376-8013
Halon 1211	6-10	6830-01-376-8014
Halon 1211	11-20	6830-01-376-8015
Halon 1211	21-60	6830-01-376-8016
Halon 1211	61-125	6830-01-376-8017
Halon 1211	126-200	6830-01-356-1209
Halon 1211	201-340	6830-01-376-8018
Halon 1211	341-1500	6830-01-356-1211
Halon 1301	1-5	6830-01-376-8394
Halon 1301	6-10	6830-01-376-8395
Halon 1301	11-20	6830-01-376-8396
Halon 1301	21-70	6830-01-376-8397
Halon 1301	71-100	6830-01-376-8398
Halon 1301	101-117	6830-01-371-0501
Halon 1301	118-125	6830-01-376-8399
Halon 1301	126-150	6830-01-356-9752
Halon 1301	151-200	6830-01-376-8400
Halon 1301	201-260	6830-01-376-8401
Halon 1301	261-350	6830-01-376-8402
Halon 1301	351-530	6830-01-376-8403
Halon 1301	531-600	6830-01-376-8404
Halon 1301	601-1240	6830-01-356-5958
REFRIGERANTS		
R-11	59	6830-01-355-9754
R-11	170	6830-01-355-9756

R-11	1400	6830-01-355-9758
R-12	45	6830-01-355-4013
R-12	145	6830-01-355-6648
R-12	1190	6830-01-355-4015
R-114	57	6830-01-356-1203
R-114	165	6830-01-356-1205
R-114	1350	6830-01-356-1207
R-500	43	6830-01-357-7650
R-500	127	6830-01-358-5123
R-500	1045	6830-01-357-7654
R-502	44	6830-01-357-6726
R-502	128	6830-01-357-6727
R-502	1050	6830-01-357-6905

PART 6

NSNs FOR TURN-IN OF CFC SOLVENTS IN DRUMS/CANS

COMMODITY	CAPACITY	NSN FOR TURN-IN
CFC/Solvent 113	6 oz	6850-01-424-8532
	1 pint	6850-01-424-8533
	1 quart	6850-01-424-8540
	1 gl / 11 lbs	6850-01-424-8531
	100 lb	6850-01-424-8535
	200 lb	6850-01-424-8536
	5 gl / 60 lb	6850-01-424-8534
	55 gl / 690 lb	6850-01-424-8537
1,1,1 Trichloroethane	6 oz	6850-01-424-8538
	1 pint	6850-01-424-9662
	1 quart	6850-01-424-9665
	1 gl / 12 lb	6850-01-424-8539
	5 gl / 60 lb	6850-01-424-9674
	55 gl / 640 lb	6850-01-424-9673

PART 7

CLASS I OZONE DEPLETING SUBSTANCES IN THE RESERVE

CFCs	CHEMICAL NAME	SYMBOL
CFC-11	Trichlorofluoromethane	CFCl3
CFC-12	Dichlorodifluoromethane	CF2Cl2
CFC-114	Dichlorotetrafluoroethane	C2F4Cl2
R-500*	(See note below)	CF2Cl2/C2F2
R-502**	(See note below)	CF2Cl/C2F5Cl

HALONS

Halon 1202	Dibromodifluoromethane	CF2Br2
Halon 1211	Bromochlorodifluoromethane	CF2ClBr
Halon 1301	Bromotrifluoromethane	CF3Br

SOLVENTS

Methyl Chloroform	1,1,1 Trichloroethane	CH3CCl3
CFC-113	Trichlorotrifluoroethane	C2F3Cl3

* Azeotropic mixture of CFC-12 and HFC-152a (1,1 Difluoroethane)
** Azeotropic mixture of CFC-115 and HCFC-22

Encl 2

DLAI 4145.25
AR 700-68
NAVSUPINST 4440.128D
AFJMAN 23-227(I)
MCO 10330.2D

MEDICAL GASES AND GAS CYLINDERS UNDER MANAGEMENT OF DEFENSE PERSONNEL SUPPORT CENTER

SECTION 1

1.1. Gases for medical use are shipped in the same type of steel cylinders as other compressed gases, and use similar valves and valve protection caps. Medical cylinders can be distinguished by the letters AMED≅ stamped into the shoulder of the cylinder and/or the word AMEDICAL≅ or AUSP≅ stenciled on the cylinder after the name of the gas on two diametrically opposite locations parallel to the longitudinal axis of the cylinder. The procedures in enclosure 1 of the document apply to medical gases and constitute the procedures of the proper color coding, storage, handling, inspection, maintenance, and shipment of medical gases. Requirements for reports to DSCR indicated in enclosure 1 of this document will apply also for medical gases and cylinders, with these reports being forwarded to Defense Personnel Support Center(DPSC). Some supplementary instructions for medical gases are desirable, and they are outlined in this enclosure. All cylinders, both empty and filled, managed by DPSC shall meet pressure and all other requirements of the applicable specifications. The medical gases and cylinders centrally managed by DPSC are:

A. Full cylinders:

NSN	GAS	GAL	SIZE
6505-00-130-1940	Nitrous Oxide, USP	2,000	M
6505-00-130-1920	Nitrous Oxide, USP	250	D
6505-00-132-5225	Oxygen, USP	800	M
6505-00-132-5181	Oxygen, USP	95	D
6505-00-132-5199	Oxygen, USP	1,650	H

B. Empty Cylinders

NSN	GAS	GAL	SIZE
8120-00-130-1941	Nitrous Oxide, USP	2.000	M
8120-00-130-1921	Nitrous Oxide, USP	250	D
8120-00-132-5226	Oxygen, USP	800	M
8120-00-132-5182	Oxygen, USP	95	D
8120-00-132-5200	Oxygen, USP	1,650	H

C. Refillable medical gas cylinders are Dot Specification 3AA2015 purchased to Fed Spec RR-C-901, Amend #1 thereto and RR-C-901/3.

D. Nonreuseable (nonrefillable) containers (NRC) are disposable emergency oxygen cylinders managed by DPSC. The full cylinder NSN is 6505-00-965-2439, Oxygen, USP, with Tube and Face Mask. It contains 24 gallon of gaseous oxygen and is a DOT-39 NRC 1000/1250 cylinder.

1-2. PROCEDURES

A. Storage and Handling

1. Medical gases shall be evaluated and considered for their chemical characteristics and stored and handled in a similar manner as the industrial gases outlined in enclosure 1 of this document.

2. The principal types of medical gases are:

Carbon Dioxide
Carbon Dioxide and oxygen mixture
Cyclopropane (no longer in general use)
Ethylene oxide and nonflammable gas mixtures
Helium and oxygen mixture
Methoxyflurane Nitrogen
Nitrogen and oxygen mixture Nitrous oxide
Oxygen

3. The hazards of the medical gases are outlined in enclosure 1 of this document.

4. The maintenance of the purity of medical gases is the utmost importance. There are serious hazards involved in transferring compressed gas from one cylinder to another, therefore medical gases shall not be transferred from one cylinder to another.

B. Inspection - Filled Cylinders.

1. Inspection of filled medical gas cylinders consists of a receiving inspection, a storage inspection, and an inspection at time of shipment. Inspection for refilled medical gas cylinders (after refurbishing) will be accomplished at the suppliers facility. Filled Cylinders that are ready for issue and use will bear the tag as required by the DPSC contract to indicate that the cylinders are full. In addition, oxygen-filled cylinders will bear DD Form 1191, Warning Tag for Medical Oxygen Equipment.

2. Inspect all oxygen received at a medical facility for patient use to ensure that it has a letter of certification from the supplier stating that the oxygen meets the requirements of the United States Pharmacopoeia (USP) and Food and Drug Administration (FDA).

1-3. SHELF LIFE. Medical gases managed by DPSC no longer are designated as Type I (non-extendable) shelf-life items with a designated expiration date. This requirement for all DOD medical gases was waived by the FDA in 1987. The full and empty cylinder retesting and reconditioning requirements shall be as outlined in Enclosure 2, Section 3, para 3-3. The cylinder has an indefinite life span and with proper care and hydrostatic testing the cylinder will last 50 to 60 years.

SECTION 2

INSTRUCTIONS FOR AIR FORCE USERS

2-1. Air Force activities should refer to Chapter 16, AFMAN 23-110, Vol 5, AF Materiel Management System - General, for specific guidance concerning purchase, receipt, storage, and issue of medical gases.

2-2. Oxygen for patient use must comply with the provisions of the National Fire Protection Association (NFPA) 99, Standard for Health Care Facilities. It covers the storage and handling of gases, and the protection of the medical facility. Chapters 4 and 8 of NFPA 99 discuss the installation, storage and other requirements for gases and cylinders in medical facilities, while chapters 12 through 19 discuss specific requirements in various types of medical facilities such as hospitals and clinics.

2-3. Selected pamphlets published by the Compressed Gas Association (CGA) should be used as references by medical facilities. CGA Pamphlet P-1, Safe Handling of Compressed Gases in Containers, Pamphlet P-2,

Characteristics and Safe Handling of Medical Gases, and Pamphlet P-2.7, Guide for the Safe Storage, Handling & Use of Portable Liquid Oxygen Systems in Health Care Facilities are applicable.