METRIC

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7 March 2011
SUPERSEDING
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FEDERAL SPECIFICATION

CARBON DIOXIDE (CO_2): TECHNICAL AND USP

The General Services Administration has authorized the use of this federal specification by all federal agencies.

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers medicinal and non-medicinal, gaseous and liquid carbon dioxide.

1.2 Classification. The carbon dioxide shall be of the following grades, as specified (see 6.2):

1.2.1 Grades.

Grade A - Medical [United States Pharmacopeia-National Formulary (USP-NF)]
Grade B - Technical

2. APPLICABLE DOCUMENTS

2.1 Government publications. The issues of the following documents, in effect on the date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

Federal Specification

RR-C-901 - Cylinders, Compressed Gas: Seamless Shatterproof, High Pressure DOT 3AA Steel and 3AL Aluminum

Commercial Item Description

A-A-59860	- Valves, Cylinder, Gas (for Compressed or Liquefied Gases)

(Activities outside the federal government may obtain copies of federal specifications, standards, and commercial item descriptions as specified in the General Information section of the Index of Federal Specifications, Standards and Commercial Item Descriptions. The index is for sale on a subscription basis from the General Services Administration, Federal Supply Service, Specification Section, East 470 L'Enfant Plaza SW, Suite 8100, Washington, DC 20407.)

(Single copies of this specification, and other federal specifications, standards, and commercial item descriptions required by activities outside the federal government for bidding purposes are available without charge from the General Services Administration, Federal Supply Service, Specification Section, East 470 L'Enfant Plaza SW, Suite 8100, Washington, DC 20407.)

(Federal government activities may obtain copies of federal standardization documents and the Index of Federal Specifications, Standards and Commercial Item Descriptions from established distribution points in their agencies. Electronic copies may be obtained from https://assist.daps.dla.mil/.)

Military Standards

MIL-STD-101	- Color Code for Pipelines and for Compressed Gas Cylinders
MIL-STD-1411	- Inspection and Maintenance of Compressed Gas Cylinders

(Copies of military specifications, standards, and handbooks required by contractors in connection with specific procurement functions are available from the Standardization Document Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094. Electronic copies may be obtained from https://assist.daps.dla.mil/.)

Federal Regulations

49 CFR 171-185	- Hazardous Materials Regulations

(The Code of Federal Regulations (CFR) is for sale on a subscription basis from the Superintendent of Documents, P.O. Box 371954, Pittsburgh, PA 15250-7954. When indicated, reprints of certain regulations may be obtained from the federal agency responsible for issuing them. Electronic copies may be obtained from http://www.access.gpo.gov/cfr/.)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless a specific issue is identified, the issue in effect on the date of invitation for bids or request for proposal shall apply.

Compressed Gas Association (CGA)

CGA G-6.2	- Commodity Specification for Carbon Dioxide
CGA G-6.3	- Carbon Dioxide Cylinder Filling and Handling Procedures
CGA TB-17	- Test Methods for Evaluating Paints and Coatings on Refillable Steel Compressed Gas Cylinders

(Application for copies should be addressed to the Compressed Gas Association, 4221 Walney Road, 5th Floor, Chantilly, VA 20151-2923. Electronic copies may be obtained from http://www.cganet.com/.)

United States Pharmacopeial Convention

USP-NF	- United States Pharmacopeia-National Formulary

(Application for copies should be addressed to United States Pharmacopeia, 12601 Twinbrook Parkway, Rockville, MD 20852-1790. Electronic copies may be obtained from http://www.usp.org/.)

3. REQUIREMENTS

3.1 Material. The carbon dioxide provided shall be of the grade specified.

3.1.1 Grade A - medical. Grade A carbon dioxide shall conform to the requirements of the USP-NF (quality verification level (QVL) E of CGA G-6.2).

3.1.2 Grade B - technical. Grade B carbon dioxide shall conform to QVL H of CGA G-6.2, with a minimum purity level of 99.5 percent by volume (v/v).

3.2 Containers and valves. The carbon dioxide shall be contained in government-owned and -furnished cylinders conforming to RR-C-901 equipped with valves meeting all requirements of A-A-59860. When specified (see 6.2), new cylinders and valves shall be purchased in accordance with RR-C-901 and A-A-59860 respectively and furnished with the gas product.

3.2.1 Low-pressure containers. When specified (see 6.2), the carbon dioxide shall be delivered to low-pressure bulk liquid storage containers that have been manufactured in compliance with 49 CFR 171-185.

3.3 Cylinder maintenance. Cylinders shall be inspected, maintained, or reconditioned in accordance with the procedures found in MIL-STD-1411 to meet all serviceability requirements of 49 CFR 171-185.

3.3.1 Painting. Cylinders requiring painting shall be color-coded and stenciled in accordance with MIL-STD-101. The paint and the painting process shall be by any method or system that will provide a finish that meets the requirements of CGA TB-17.

3.3.2 Replacement valves. Unless otherwise specified (see 6.2), replacement valves for any defective valves found shall be furnished by the supplier and shall be qualified to meet all requirements of A-A-59860.

3.4 Capacity. Cylinders shall be filled to their rated capacity in accordance with CGA G-6.3 (see 6.3). Low-pressure bulk liquid storage containers shall be filled with the quantity specified in the contract or acquisition order (see 6.2).

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or acquisition order (see 6.2), the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or acquisition order (see 6.2), the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the government. The government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure that supplies and services conform to prescribed requirements.

4.2 Quality conformance inspection.

4.2.1 Sampling. There shall be one test sample taken per lot. Unless otherwise specified herein, sampling shall be from filled containers.

4.2.2 Lot. A lot shall consist of all high-pressure cylinders filled from the same source during an uninterrupted filling sequence and offered for examination at one time. Each delivery of carbon dioxide for filling of a bulk storage container shall be considered a lot. For grade B carbon dioxide, the manufacturer's assay of the source lot used to fill a given bulk storage container may be presented in lieu of testing a sample from that same filled bulk storage container.

4.2.3 Examination. Containers of carbon dioxide shall be examined as specified herein for the following defects:

a. Container or valve not as specified (see 3.2).
b. Container maintenance not as specified (see 3.3).
c. Capacity not as specified (see 3.4).

4.2.4 Tests.

4.2.4.1 Individual container. Each container of carbon dioxide shall be tested for leakage as specified in 4.3.3. Failure of the test shall be cause for rejection.

4.2.5 Testing of samples. Samples selected in accordance with 4.2.1 shall be drawn from the selected containers in accordance with CGA G-6.2 and tested in accordance with 4.2.5.1 or 4.2.5.2. For more information on expected impurities see 6.6. Records of the test methods used and the results of those tests shall be maintained by the contractor for a minimum of two years and made available to the government upon request.

4.2.5.1 Grade A - medical. Grade A carbon dioxide shall be tested as specified in the USP-NF. Failure to meet the acceptance criteria of one or more USP-NF tests shall be cause for rejection.

4.2.5.2 Grade B - technical. Grade B carbon dioxide shall be tested as specified in 4.3. The moisture content determination specified in 4.3.2 may be sampled from the carbon dioxide liquid in the container charging line or continuously monitored by instrument in lieu of sampling from filled containers. The rate at which discrete samples are taken from a container charging line shall be commensurate with and not less frequent than sampling done as specified in 4.2.1.

4.3 Test methods.

4.3.1 Purity. The purity of grade B carbon dioxide shall be determined by gas chromatography or another appropriate instrumental method in accordance with CGA G-6.2. The carbon dioxide container and its contents shall be at a temperature between 21 °C (70 °F) and 24 °C (75 °F). Purity of the grade B carbon dioxide not meeting the requirements of 3.1.2 shall constitute failure of this test.

4.3.2 Moisture content. The water content of grade B carbon dioxide shall be determined by one of the appropriate analytical methods described in CGA G-6.2. The carbon dioxide sample for the moisture content test shall be drawn from the container as a liquid. Grade B carbon dioxide containing water in a quantity greater than 20 parts per million (v/v) at 760 mm of mercury and 21 °C (70 °F) shall constitute failure of this test.

4.3.3 Leakage. Each container shall be tested for leakage after filling by applying a soap solution to all portions of the valve and the junction of the valve and cylinder. Care shall be taken to ensure that the solution does not contaminate the valve outlet or chemically react with the product in the cylinder. Any evidence of gas leakage as indicated by bubbling of the soap solution shall constitute failure of this test.

5. PACKAGING

5.1 Packing, packaging, and marking. Packing, packaging, and marking shall be as specified in the contract or acquisition order (see 6.2).

6. NOTES

INFORMATION FOR GUIDANCE ONLY. (This section contains information of a general or explanatory nature that is helpful, but is not mandatory.)

6.1 Intended use. Grade A carbon dioxide gas is intended for medical use. Grade B carbon dioxide gas is intended for airborne use, life raft inflation, fire extinguishing apparatus, and general purpose use.

6.2 Acquisition requirements. Acquisition documents should specify the following:

a. Title, number, and date of this specification.
b. Grade of carbon dioxide required (see 1.2).
c. Purchase of new cylinder and valves, if required (see 3.2).
d. Delivery to low-pressure bulk liquid storage containers, if required (see 3.2.1).
e. Replacement valves, if required (see 3.3.2).
f. Quantity required for low-pressure bulk liquid storage containers, if required (see 3.4).
g. Responsibility for inspection, if other than the contractor (see 4.1).
h. Inspection facility, if other than contractor selected (see 4.1).
i. Packing, packaging, and marking requirements (see 5.1).

6.3 Cylinder capacity. Cylinders are to be filled by weight, not by pressure. For cylinders containing liquid carbon dioxide, the maximum permitted filling capacity (in accordance with 49 CFR 173.304a) is 68 percent of the cylinder's water weight capacity. This filling capacity limit is required to prevent overfilling and to allow for increased pressure caused by the expansion of the liquid carbon dioxide as it warms up to ambient temperature conditions.

6.4 Materials safety data sheet (MSDS). Contracting officers will identify those activities requiring copies of completed MSDS prepared in accordance with FED-STD-313 and meeting the requirements of 29 CFR 1910.1200. The pertinent government mailing addresses for submission of the data are listed in FED-STD-313, and 29 CFR 1910.1200 requires that the MSDS for each hazardous chemical used in an operation must be readily available to personnel using the material.

6.5 Sampling and testing precautions. This specification requires inspection of material that is potentially hazardous to personnel. This specification does not purport to address all of the safety problems associated with its use. High concentrations of carbon dioxide can asphyxiate quickly without warning and with no possibility of self-rescue, regardless of the oxygen concentration. It is the responsibility of the user of this specification to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

6.6 Impurities. Carbon Dioxide is produced as the by-product of many different chemical mechanisms. The possibility of multiple sources makes it unique in the industrial gas market. This variation of sources can result in a variety of impurities that could be expected in the carbon dioxide. The supplier and contracting officer should work out any appropriate and safe levels for impurities not addressed herein or in CGA G-6.2, based on the actual use of the product at the facility of use.

6.7 Submission of alternate inspection provisions. Proposed alternative inspection provisions should be submitted by the contractor to the procuring contracting officer.

6.8 Government-furnished containers. The contracting officer should arrange to furnish the containers specified in 3.2.

6.8.1 Maintenance of government-furnished cylinders. The contracting officer should specify the extent of the maintenance to be processed by the gas supplier for government-furnished containers.

6.8.2 Customary services. The gas supplier should furnish, at no additional cost, all services that are required at each filling of a container to comply with applicable regulations and normal good practice. Such services should include, but not be limited to, all inspection, testing, evacuation, draining of condensed water, and handling services required for the gas supplied.

6.8.3 Allowable fees. A schedule of allowable fees should be specified by the contracting officer for the gas supplier's performance of services, such as the replacement of valves, valve parts, and cylinder caps, hydrostatic testing, ultrasonic examination, painting, color-coding, marking, and handling of unserviceable containers as required. The gas supplier should furnish all materials and components for these services.

6.9 Part or identification number. The following PIN procedure is for government purposes and does not constitute a requirement for the contractor.

BBC101 - X Example of PIN: BBC101-A

Grade A - Medical (United States Pharmacopeia (USP-NF))
B - Technical

Specification number

6.10 Subject term (key word) listing.

Cylinder
Fire extinguish
Inflation
Life raft
Medical
Valve

6.11 Changes from previous issue. Asterisks (or vertical lines) are not used in this revision to identify changes with respect to the previous issue due to the extensive changes.

MILITARY INTERESTS:

Custodians:
Army - AV
Navy - SH
Air Force - 68
DLA - GS

Review Activities:
Navy - AS, MS

CIVIL AGENCY
COORDINATING ACTIVITY:

GSA - FAS

Preparing Activity:
DLA - GS3

(Project 6830-2011-002)

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST database at https://assist.daps.dla.mil/.