INCH–POUND

MIL–STD–101C
26 August 2014

SUPERSEDING
MIL–STD–101B
3 December 1970

DEPARTMENT OF DEFENSE
STANDARD PRACTICE
COLOR CODE FOR PIPELINES AND FOR COMPRESSED GAS CYLINDERS

AMSC N/A

FSC 8120

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FORWARD

1. This standard is approved for use by all Departments and Agencies of the Department of Defense (DoD).

2. This standard covers a common color code system for the identification of materials in piping systems and contained in compressed gas cylinders, and to facilitate the segregation of these cylinders at depots. The previous revision to MIL−STD−101 also covered medical gas cylinders. Medical gases have been removed from this standard and are covered in NATO Standard AMedP−53. The use of this standard will promote greater safety and will lessen the chances of error, confusion, or inaction in times of emergency by providing, along with hazard markings, a uniform color code to quickly warn personnel of outstanding hazards inherent in the materials involved.

3. The major changes from the previous revision of this standard are as follows:

(a) Addition of materials to the table of color codes for compressed gases to reflect assignments made since the last time the standard was revised.

(b) Removal of medical gases from the table of color codes for compressed gases and from figure 2 to eliminate a conflict between this standard and NATO Standardization Agreement 2121.

(c) Replacement of ANSI Z48.1 with the Compressed Gas Association standard CGA C−7 for marking of commercial−owned cylinders.

(d) Clarification that adherence to MIL−STD−101 does not exempt the compressed gas cylinder from required marking and stamping requirements in Department of Transportation regulations.

4. Comments, suggestions, or questions on this document should be addressed to: U.S. Army Edgewood Chemical Biological Center, ATTN: RDCB−DEA−S, 5183 Blackhawk Road, APG, MD 21010−5424 or emailed to usarmy.APG.ecbc.list.specs-team@mail.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at https://assist.dla.mil/.

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1. SCOPE

1.1 Scope. This standard establishes a common color code for visual warnings to accompany the written identification of materials covered in piping systems and contained in compressed gas cylinders, and to facilitate the segregation of these cylinders at depots. This standard does not define the manner or conditions under which these materials may be used safely.

1.2 Applicability. This standard is applicable to all ground based piping systems and to all compressed gas cylinders owned by or procured for the Department of Defense including type D one−ton containers (Department of Transportation Specification 106A500), but excludes cylinders containing medical gases. The applicability of this standard to industry piping systems and commercial−owned cylinders (see 5.2.5.1) is encouraged. Requirements specified herein are optional for hose lines and nozzles, ship installations, equipment intended for operations in forward area facilities, steam plants, and hydroelectric plants. The color coding of medical gas cylinders is covered by North Atlantic Treaty Organization Standard AMedP−53. The identification method for bulk petroleum product systems is covered in MIL−STD−161. The identification of pipe lines for aircraft, missiles, and space vehicles is covered in MIL−STD−1247. The color coding for containers of liquid propellants is not covered by this standard.

1.3. **Method.** This standard establishes, defines, and assigns a color for recognition to each of six classes of materials. Five classes have been selected to represent universally recognized types of hazards involved in the handling of dangerous gases and liquids. The sixth class is assigned for exclusive use of fire protection materials and equipment. This standard requires the application of the color warnings in a distinctive manner, as a visual aid and supplement to written identification.

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 or 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3 or 4 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Government documents, drawings, and publications. The following Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

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CODE OF FEDERAL REGULATIONS

49 CFR 178.35 – General requirements for specification cylinders

(Copies of this document are available online at http://www.ecfr.gov/.)

2.3 Non–Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

COMPRESSED GAS ASSOCIATION

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

(Copies of this document are available online at http://www.cganet.com/.)

2.4 Order of precedence. Unless otherwise noted herein or in the contract, in the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. DEFINITIONS

3.1 For the purpose of this standard, the following definitions shall apply:

(a) **Commercial colors**. Commercial colors are the colors which may be used, in a limited arrangement, on a small portion of the body and bottom of a compressed gas cylinder for commercial identification and designation of ownership (See 5.2.2 and 5.2.5.1).

(b) **Compressed gas cylinder**. A compressed gas cylinder is any tube, bottle, or other type of pressure cylinder larger than 3 inches in diameter by 6 inches in length, which contains a pressure that exceeds 104 pounds per square inch at 130°F or any liquid flammable material having a vapor pressure exceeding 40 pounds per square inch absolute at 100°F. One–ton type bulk containers are included. All ammunition and medical gases are excluded (see NATO Standard AMedP–53 for approved color codes for medical gases).

(c) **Piping systems**. Piping systems consist of any pipeline or conduit used for the transport of gases, liquids, or semiliquids, but not those used for carrying solids in air or gas. Valves, fittings, operating accessories, pipe coverings, and pipe installations of any kind (including submerged or buried pipe lines, their markers or buoys, and their points of tie–in with pumping stations and storage or dispensing facilities) shall be considered as parts of a piping system. Supports, brackets, or other non–operating accessories are not considered parts for application of warning colors.

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(d) **Primary color warning**. A primary color warning is the color assigned to the class into which a material is classified in accordance with its primary hazard from a safety standpoint. These colors appear as a circular band on piping systems, and as main body, top, or band colors on compressed gas cylinders.

(e) **Secondary color warning**. A secondary color warning is the color assigned as a warning of a secondary hazard possessed by a material having type of hazard distinctly different from that indicated by its primary color warning. These colors appear as arrows (or triangles) on piping systems and as main body, top, or band colors on compressed gas cylinders.

(f) **Title**. A title is any lettered identification required on a piping system or a compressed gas cylinder. Titles shall identify the contents by complete names, or by generally recognized abbreviations, symbols, letters, numerals, or combinations thereof.

4. GENERAL REQUIREMENTS

4.1 Colors. The colors assigned in this standard shall conform in hue and chroma to the requirements identified by number in FED−STD−595 (see 6.4). No change shall be made in the assigned colors without prior approval of the preparing activity of this standard.

4.2 Warning colors. The following colors are assigned for use as both primary and secondary warnings.

(a) **Yellow, No. 13655 – flammable materials**. All materials known ordinarily as flammables or combustibles.

(b) **Brown, No. 10080 – toxic and poisonous materials.** All materials extremely hazardous to life or health under normal conditions as toxics or poisons.

(c) **Blue. No. 15102 – anesthetics and harmful materials**. All materials productive of anesthetic vapors and all liquid chemicals and compound hazardous to life and property but not normally productive of dangerous quantities of fumes or vapors.

(d) **Green, No. 14187 – oxidizing materials.** All materials which readily furnish oxygen for combustion and fire producers which react explosively or with the evolution of heat in contact with many other materials.

(e) **Gray, No. 16187 – physically dangerous materials**. All materials, not dangerous in themselves, which are asphyxiating in confined areas or which are generally handled in a dangerous physical state of pressure or temperature.

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(f) **Red, No. 11105 – fire protection materials**. All materials provided in piping systems or in compressed gas cylinders exclusively for use in fire protection.

4.3 Colors having no significant meaning.

(a) **Black, No. 17038 and White, No. 17875.** These colors are assigned, without significant meaning, for general use where specified in this standard except as follows: Water–piping systems containing water suitable for human consumption and installed for this purpose shall be painted White, No. 17875 throughout or shall be painted to match surroundings when not in conflict with other color designations in this standard

(b) **Orange, No. 12246 and Buff, No. 13594**. These colors are assigned, without significant meaning, for use as colors on selected compressed gas cylinders for segregation of identical material requiring recognition within more than one assigned class (see table III.)

5. DETAILED REQUIREMENTS

5.1 Piping system identification.

5.1.1 Exact identification. Exact identification of materials in any piping system for hazardous materials and the use classification for fire protection is mandatory and shall be made only by means of titles lettered in black or white. These titles shall be prominently displayed adjacent to color warnings to obviate errors by personnel. It is recommended, where the view is unobstructed, that titles be lettered on the two lower quarters of the pipe or covering. Lettering in this position is unlikely to be obscured by dust collection or mechanical damage. However, titles should be clearly visible from operating positions, especially those adjacent to control valves. The use of stencils with standard size letters specified in table I is recommended. For pipe lines smaller than 3/4 inch in diameter, the use of securely fastened metal tags, with lettering etched or filled in with enamel is suggested. It is recommended that titles be applied by use of upper case letters and Arabic numerals whenever applicable.

TABLE I. Size of stencil letters.

Outside diameter of pipe or covering, inches	Size of stencil letters, inches
Less than 1–1/2	1/2
1–1/2 to 3–1/2	3/4
3–1/2 to 6	1–1/4
6 to 9	2

TABLE I. Size of stencil letters – Continued.

Outside diameter of pipe or covering, inches	Size of stencil letters, inches
9 to 13	3
Over 13	3–1/2

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5.1.2 Use of colors. The appearance of any of the six colors specified in 4.2 on a piping system shall provide a warning of danger from the hazard involved in the system according to the definitions for warning colors specified therein. Piping systems which do not require warning colors may be painted to match surrounding, if not in conflict with other color designations in this standard or such systems be painted aluminum, black, or remain unpainted.

5.1.3 Primary color warning.

5.1.3.1 Use and application. A primary color warning shall appear on all dangerous piping systems and on all fire protection materials in any installation which is color coded in accordance with this standard. Primary color warnings shall consist of a single color applied as a band or bands which completely encircle the piping system. Color bands shall be applied in conformance with dimensional information shown on figure 1. In lieu of color bands, all pipe and covering on an entire system, including all encircling or partially encircling straps, hangers, and supports, be painted with the primary color warning. However, the use of color bands is preferred because they will indicate dangerous systems to color−blind personnel.

5.1.3.2 Location on piping systems. Immediately adjacent to all operating accessories such as valves, regulators, flowchecks, strainers, cleanouts, pumps, dispensing points, and vents, all coded piping systems shall be painted with a primary color warning. In addition, primary color warnings shall be painted throughout the system at convenient intervals, e.g., ere branch lines join the system, where the system passes underground or through walls, and at any other conspicuous places where warnings are required by safety authorities. If desired, operating accessories may also be painted with the primary color warning.

5.1.4 Arrows and secondary color warnings. An arrow shape shall appear on coded piping systems in any installation which is color coded in accordance with this standard. Any material system possessing an outstanding hazard of a type distinctly different from that indicated by its primary color warning shall have a secondary color warning applied in the shape of an arrow. The color of the arrow shall be selected according to the definitions for warning colors specified in 4.2. Systems which do not involve such additional hazards shall have arrows either the same color as the primary warning, or black or white. When bands are used for the primary warnings, the colored arrows shall appear adjacent to each primary color warning applied to the piping system. When the entire piping system is painted with the primary color warning, the colored arrows shall appear in all locations specified in 5.1.3.2. The arrows shall indicate the normal direction(s)of flow of material in the system. A double-headed arrow shall be placed on lines subject to reverse flow. Dimensional information is is shown on figure 1. Tails may be omitted on arrows, creating triangles with one corner indicating the normal direction of flow. Operating accessories may also be painted with the secondary color warning.

5.1.5 Classification of material in piping systems. The classification of materials in a piping system shall be as specified in table II. N.O.S. refers to materials of like name and hazardous properties but "not otherwise specified." When no secondary color warning is specified, the arrow may be the same color as the primary warning or black or white, as preferred.

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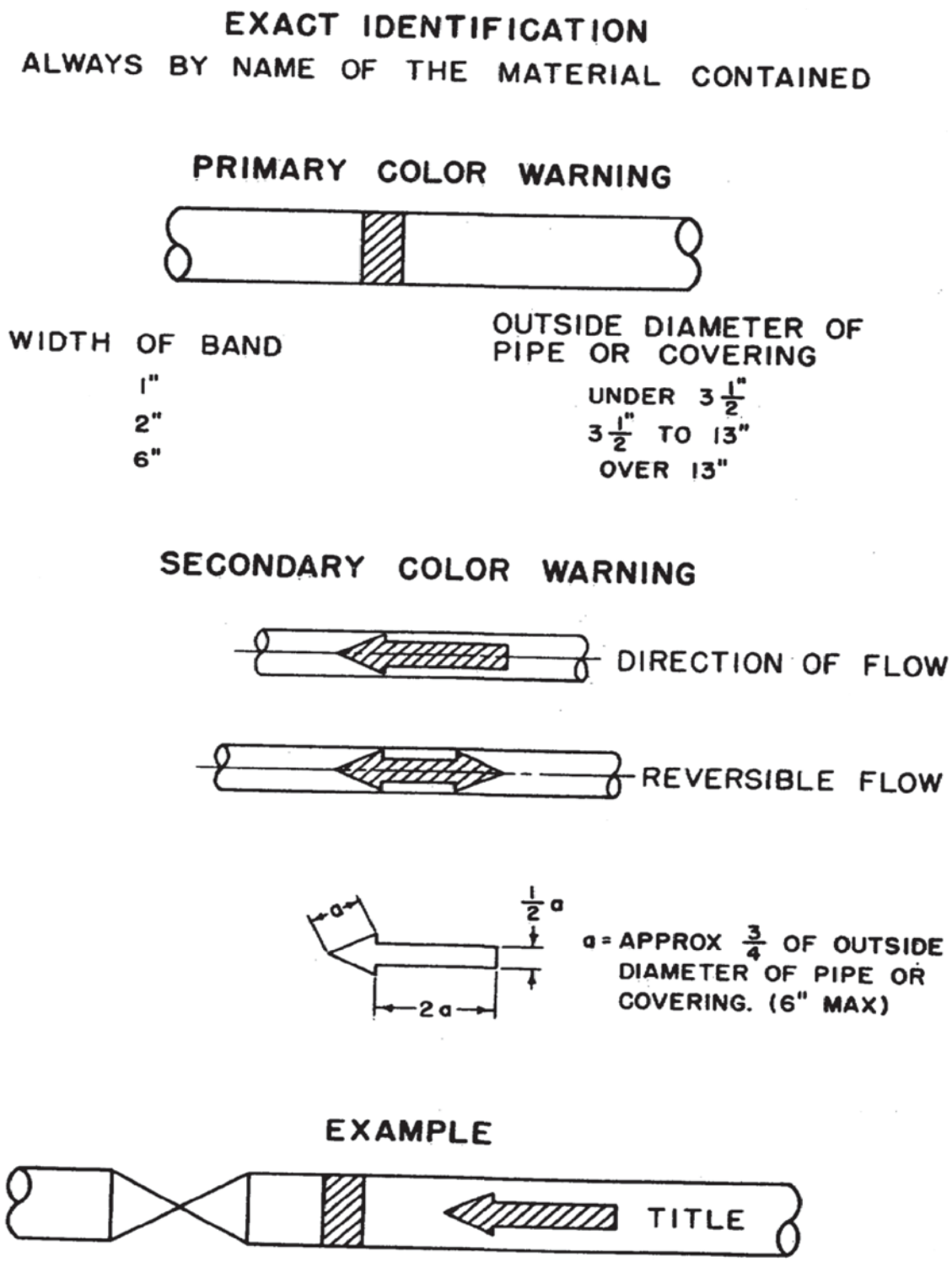

FIGURE 1. Piping systems.

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TABLE II. Classification of materials in piping systems

Material	Primary color warning	Secondary color warning
Acetaldehyde	Yellow	Blue
Acetic acid, aqueous solution	Blue	Yellow
Acetic acid, glacial	Blue	Yellow
Acetic anhydride	Blue	Yellow
Acetone	Yellow	−−−
Acetone oils	Yellow	−−−
Acetyl chloride	Blue	−−−
Acetylene	Yellow	−−−
Acid, liquid, N.O.S.	Blue	−−−
Acrolein	Brown	Yellow
Acrylonitrile	Yellow	Brown
Aerosol insecticide	Gray	−−−
Air, compressed	Gray	Green
Alcohol, allyl, liquid	Yellow	Brown
Alcohol, amyl, butyl, ethyl, propyl, N.O.S.	Yellow	−−−
Alcohol, methyl	Yellow	Blue
Alkaline corrosive liquids, N.O.S.	Blue	−−−
Aluminum borohydride	Yellow	Brown
Ammonia, anhydrous	Brown	Yellow
Amyl acetate	Yellow	−−−
Aniline (oil), liquid	Brown	Yellow
Argon	Gray	−−−
Argon−oxygen mixture	Green	−−−

TABLE II. Classification of materials in piping systems −Continued

Material	Primary color warning	Secondary color warning
Arsenic trichloride	Brown	Blue
Material	Primary Color	Secondary Color Warning
Arsenical acids and Liquids, N.O.S.	Brown	Blue
Benzaldehyde	Yellow	−−−

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Benzene (benzol, coal tar light oil)	Yellow	Brown
Benzine (petroleum ether, petroleum naphtha)	Yellow	–––
Benzoyl chloride	Blue	–––
Benzyl chloride	Blue	Yellow
Boron hydrides (alkyl decaborane, alkyl pentaborane, diborane, dihydrotetraborane, hexaborane, pentaborane, and N.O.S.)	Brown	Yellow
Boron trichloride	Brown	–––
Boron trifluoride	Brown	Gray
Bromine	Brown	Green
Bromine pentafluoride	Brown	Green
Bromine trifluoride	Brown	Green
Bromoacetone	Brown	–––
Bromobenzene	Yellow	–––
Bromochloromethane	Brown	Gray
Bromochloromethane, fire	Red	Brown
Bromotrifluoromethane	Gray	–––
Bromotrifluoromethane, fire	Red	–––
Butadiene	Yellow	–––
Butane (see petroleum gas)	Yellow	–––
Butyl acetate	Yellow	–––
Butyl ether	Yellow	–––
Camphor oil	Yellow	–––
Carbon bisulfide (carbon disulfide)	Yellow	Brown
Carbon dioxide	Gray	–––
Carbon dioxide, fire	Red	–––

TABLE II. Classification of materials in piping systems –Continued

Material	Primary color warning	Secondary color warning
Carbon monoxide	Yellow	Brown
Carbon tetrachloride	Brown	Blue

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Caustic potash, liquid (potassium hydroxide)	Blue	–––
Caustic soda, liquid (sodium hydroxide)	Blue	–––
Chloracetyl chloride	Blue	–––
Chlorine	Brown	Green
Chlorine trifluoride	Brown	Green
Chloroacetone	Brown	Yellow
Chlorosulfonic acid	Blue	Green
Chloropicrin	Brown	–––
Chloropropane	Yellow	Blue
Chromic acid solution	Blue	Green
Coal gas (see manufactured gas)	Yellow	Brown
Coal tar distillates, N.O.S.	Yellow	Brown
Crotonaldehyde	Blue	Yellow
Crude oil, petroleum	Yellow	–––
Cyanide, liquid (potassium solutions, sodium solutions), N.O.S.	Brown	–––
Cyanogen gas	Brown	Yellow
Cyclopropane	Yellow	Blue
Decalin (decahydronaphthalene)	Yellow	–––
Dibromodifluoromethane	Gray	–––
Dibromodifluoromethane, fire	Red	–––
Dichloropentane	Yellow	–––
Diethanolamine	Yellow	–––
Diethylenetriamine	Yellow	–––
Difluorochloroethane	Gray	Yellow
Difluoroethane	Gray	Yellow
Diisobutyl ketone	Blue	Yellow

TABLE II. Classification of materials in piping systems –Continued

Material	Primary color warning	Secondary color warning
Dimethylamine, anhydrous	Yellow	Blue
Dimethyl ether	Yellow	Brown

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Dimethyl sulfate	Brown	Blue
Dimethyl sulfide	Yellow	Blue
Diphenyl–diphenyl oxide (”Dow-therm A”)	Gray	–––
Dispersant (dichlorodifluorome-thane–difluoroethane mixture)	Gray	–––
Electrolyte acid, N.O.S.	Blue	–––
Ethane	Yellow	Blue
Ethers, anesthetic: diethyl, ethyl, isopropyl, sulfuric, N.O.S.	Yellow	Blue
Ethyl acetate	Yellow	–––
Ethyl benzene	Yellow	–––
Ethyl bromide	Yellow	Blue
Ethyl butyl acetate	Yellow	–––
Ethyl butyrate	Yellow	–––
Ethyl chloroacetate	Yellow	–––
Ethyl chloride	Yellow	Blue
Ethylenediamine	Yellow	Blue
Ethyl hexaldehyde	Yellow	–––
Ethyl lactate	Yellow	–––
Ethyl methyl ketone	Yellow	Blue
Ethyl nitrate	Yellow	Blue
Ethyl nitrite	Yellow	–––
Ethyl silicate	Yellow	–––
Ethylamine	Yellow	Blue
Ethylene	Yellow	Blue
Ethylene chlorohydrin	Yellow	–––
Ethylene dichloride	Yellow	Blue
Ethylene glycol	Yellow	–––

TABLE II. Classification of materials in piping systems –Continued

Material	Primary color warning	Secondary color warning
Ethylene oxide	Yellow	Blue
Fluorine	Brown	Green

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Formaldehyde	Yellow	Brown
Formic acid	Blue	Yellow
Fuel oil, N.O.S	Yellow	–––
Fuels: JP, RP, RS, diesel, N.O.S.	Yellow	–––
Fumigant, carbon dioxide – ethylene oxide mixture	Gray	Blue
Furfural	Blue	Yellow
Gasoline (motor fuel)	Yellow	–––
Helium	Gray	–––
Hydrazine	Brown	Yellow
Hydrocarbons, heavy: Hexanes, Heptanes, octanes, N.O.S.	Yellow	–––
Hydrochloric acid	Blue	–––
Hydrocyanic acid	Brown	–––
Hydrofluoric acid	Brown	–––
Hydrofluorosilic acid	Blue	–––
Hydrogen	Yellow	–––
Hydrogen bromide	Brown	–––
Hydrogen chloride, anhydrous	Brown	–––
Hydrogen cyanide, anhydrous	Brown	Green
Hydrogen fluoride, anhydrous	Brown	Green
Hydrogen, liquid	Yellow	Gray
Hydrogen peroxide	Green	Blue
Hydrogen sulfide	Yellow	Brown
Hydroxyacetic acid (glycolic acid), aqueous solutions	Blue	–––
Ink (solvent type), N.O.S.	Yellow	–––
Insecticide, liquid, N.O.S.	Brown	Yellow

TABLE II. Classification of materials in piping systems –Continued

Material	Primary color warning	Secondary color warning
Iodine heptafluoride	Brown	Green
Isopentane	Yellow	Blue
Jet fuel (all grades)	Yellow	–––

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Kerosene	Yellow	–––
Krypton	Gray	–––
Lacquer	Yellow	–––
Manufactured gas (coal, oil pintsch, producer, water, and N.O.S)	Yellow	Brown
Mercaptans (thioalcohols, N.O.S.)	Yellow	–––
Mercury compounds (solutions), N.O.S.	Brown	–––
Methane	Yellow	–––
Methylamine	Yellow	Brown
Methyl acetate	Yellow	–––
Methyl acetone	Yellow	–––
Methyl acetylene propadiene mixture (MAPP)	Yellow	–––
Methyl amyl acetate	Yellow	–––
Methyl amyl ketone	Yellow	–––
Methyl bromide	brown	–––
Methyl bromide, fire	Red	Brown
Methyl chloride	Yellow	Brown
Methyl cyanide (acetonitrile)	Brown	Yellow
Methyl formate	Yellow	Blue
Methyl hydrazine	Brown	Yellow
Methyl mercaptan	Yellow	Brown
Methyl sulfide	Yellow	Brown
Methylene chloride	Blue	Gray
Natural gas, fortified, N.O.S.	Yellow	Brown
Neon	Gray	–––

TABLE II. Classification of materials in piping systems –Continued

Material	Primary color warning	Secondary color warning
Nickel carbonyl	Brown	Yellow
Nicotine compounds	Brown	–––
Nitrating acid (mixed acid)	Blue	Green

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Nitric acid	Blue	Green
Nitric acid, fuming	Brown	Green
Nitrobenzene	Brown	Yellow
Nitrogen	Gray	–––
Nitrogen dioxide	Brown	Green
Nitrogen peroxide	Brown	Green
Nitrogen tetroxide	Brown	Green
Nitrogen–helium mixture	Gray	–––
Nitrogen–oxygen mixture	Gray	Green
Nitrogen trifluoride	Blue	Green
Nitromethane	Yellow	Blue
Nitrosyl chloride	Brown	–––
Nitrous Oxide	Blue	–––
Oil, hydraulic	Yellow	Gray
Oil, lubricating, N.O.S.	Yellow	–––
Oil, fish, vegetable, edible, N.O.S.	Yellow	–––
Oxygen	Green	–––
Oxygen–carbon dioxide mixture	Gray	Green
Oxygen, electrolytic	Green	–––
Oxygen fluoride	Brown	Green
Oxygen, liquid (LOX)	Green	Gray
Ozone	Green	Brown
Paint	Yellow	–––
Paraldehyde	Yellow	–––
Pentane	Yellow	–––
Perchloric acid	Green	Blue
1–Pentene	Yellow	–––

TABLE II. Classification of materials in piping systems –Continued

Material	Primary color warning	Secondary color warning
Petroleum gas (acetogen, butane–propane mixture, 1–butene, cyclo-propane, isobutane, neo–pentane, and N.O.S.)	Yellow	–––

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Perchloroethylene	Blue	–––
Perchloryl fluoride	Brown	Green
Phenylcarbylamine chloride	Brown	Gray
Phosgene	Brown	–––
Phosphorus oxychloride	Blue	Green
Phosphorus tribromide	Blue	Green
Phosphorus trichloride	Blue	Green
Potassium permanganate solution	Green	–––
Propylene	Yellow	Gray
n–Propyl nitrate	Yellow	Brown
Propyne	Yellow	Gray
Pyrosulfuryl chloride	Blue	–––
R–11, Trichlorofluoromethane	Gray	–––
R–12, Dichlorodifluoromethane	Gray	–––
R–14, Tetrafluoromethane	Gray	–––
R–21, Dichlorofluoromethane	Gray	–––
R–22, Chlorodifluoromethane	Gray	–––
R–112, Tetrachlorodifluoroethane	Gray	–––
R–113, Trichlorotrifluoroethane	Gray	–––
R–114, Dichlorotetrafluoroethane	Gray	–––
R–115, Chloropentafluoroethane	Gray	–––
R–124A, Chlorotetrafluoroethane	Gray	–––
R–C–316, Dichlorohexafluorocyclobutane	Gray	–––
R–C–317, Chloroheptafluorocyclobutane	Gray	–––
R–C–318, Octafluorocyclobutane	Gray	–––
Shellac	Yellow	–––

TABLE II. Classification of materials in piping systems –Continued

Material	Primary color warning	Secondary color warning
Solvents, N.O.S.	Yellow	–––
Steam	Gray	–––
Stoddard solvent	Yellow	–––

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Sulfur dichloride	Brown	–––
Sulfur dioxide	Brown	Gray
Sulfur hexafluoride	Gray	–––
Sulfur monochloride	Blue	–––
Sulfur trioxide	Brown	Green
Sulfuric acid	Brown	Green
Sulfuric acid, fuming (Oleum)	Brown	Green
Tetraethyl lead	Brown	–––
Tetrafluoroethylene, inhibited	Gray	–––
Thionyl chloride	Brown	Green
Tin tetrachloride, anhydrous	Blue	–––
Titanium tetrachloride	Blue	–––
Toluene	Yellow	Brown
Triamylamine	Brown	Yellow
Tributylamine	Yellow	Blue
Triethanolamine	Blue	Yellow
Triethylamine	Brown	Yellow
Trimethylamine, anhydrous	Brown	Yellow
Turpentine	Yellow	–––
Unsymmetrical dimethyl hydrazine	Brown	Yellow
Vacuum (non–contaminated)	Gray	–––
Varnish	Yellow	–––
Vinyl bromide	Blue	–––
Vinyl chloride	Yellow	–––
Vinyl methyl ether	Yellow	Blue
Waste acid (spent nitrating acid)	Blue	Yellow
Water, over 50 psig or 150° F	Gray	–––
Water, fire	Red	–––

TABLE II. Classification of materials in piping systems –Continued

Material	Primary color warning	Secondary color warning
Water, potable	White	–––
Waxes, liquid	Yellow	–––

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Xenon	Gray	−−−
Xylene	Yellow	Brown
Xylidine	Brown	Yellow

5.2 Cylinder identification.

5.2.1 Assignment of colors. The use of color coding for compressed gas cylinders covered by this standard is mandatory. The assignment of colors to extend coverage of material handled in compressed gas cylinders shall be made only after approval of the preparing activity of this standard. Requests for color coding of additional materials not covered by this standard should include technical details of the material, primary and secondary hazards of the material, and technical details of the cylinder, including the type of cylinder valve used.

5.2.2 Exact identification. In addition to Department of Transportation (DOT) marking and stamping requirements (see 5.2.5.5), exact identification of any material contained in a compressed gas cylinder is mandatory and shall be made only by means of the written title as specified in table III. The title shall appear in two locations diametrically opposite and parallel to the longitudinal axis of the cylinder. It is recommended that the titles be applied by use of upper case letters and Arabic numerals whenever applicable. On cylinders 4 inches in diameter and larger, the title shall be in approximately 2−inch high letters. On cylinders less than 4 inches in diameter, letters may be reduced in size. Where a title includes a modifier, such as "oil−free," the modifier shall follow the chemical designation and should be shown in letters approximately three−fourths as high. Cylinders having a background color of yellow, orange, or buff shall have the title painted with black letters. Cylinders having a background color of red, brown, blue, gray, green, or black shall have the title painted with white letters. Mixtures of two or more gases shall show the percent of each gas as part of the title.

5.2.3 Use of colors.

5.2.3.1 Color warnings. The appearance on the body, top, or as a band(s) on compressed gas cylinders of any of the six colors specified in 4.2 shall provide a warning of danger from the hazard involved in handling the type of material contained in the cylinder according to the definitions for warning colors in 4.2.

5.2.3.2 Cylinder color bands. Cylinder color bands appear upon the cylinder body and serve as color warnings when they are yellow, brown, blue, green, or gray. The bands also provide color combinations to separate and distinguish cylinders for convenience in handling, storage, and shipping. Color bands for segregation purposes will not be specified for new materials not presently covered by this standard when new color codes for them are assigned.

5.2.4 Painting of cylinders. All cylinders shall be painted in accordance with table III and figures 2 and 3 to provide uniform recognition throughout the Department of Defense.

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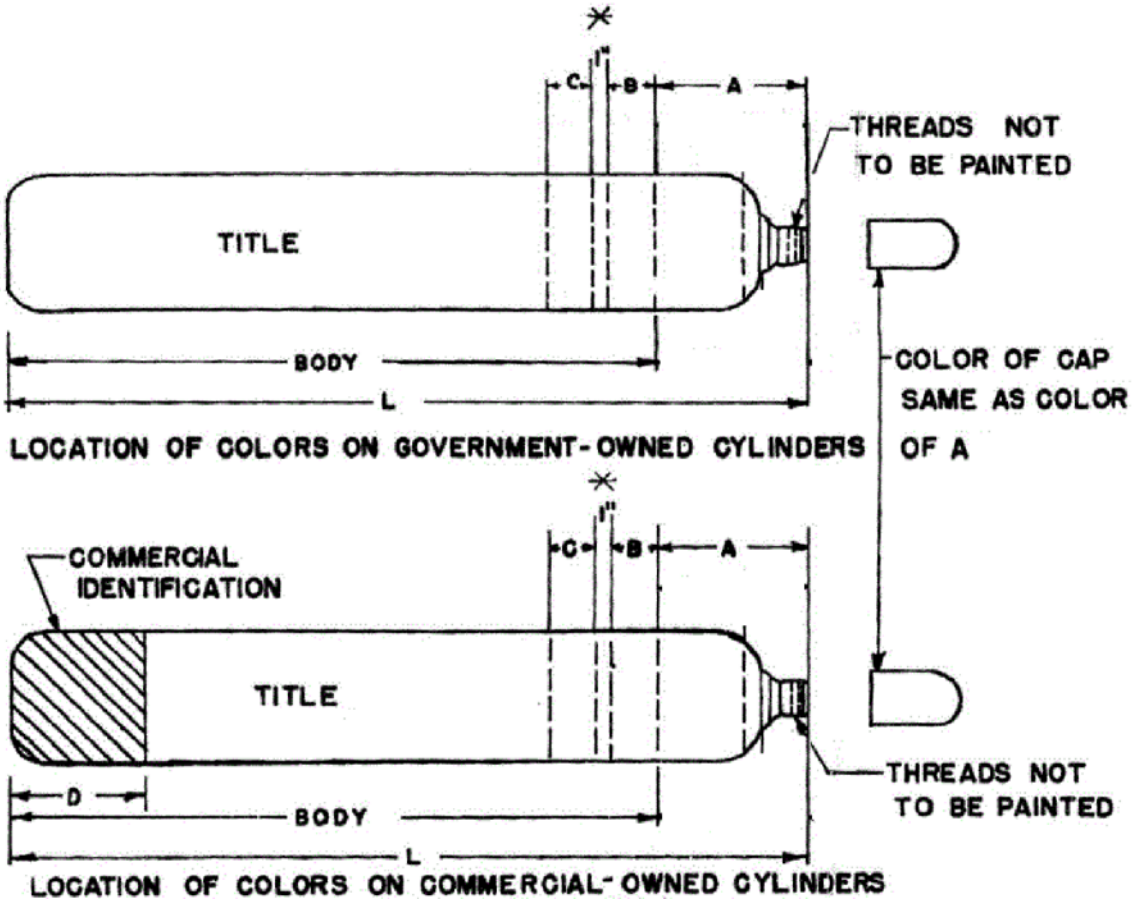

LOCATION DIMENSIONS

Overall Length, L	Shoulder Color	Cylinder Color Band(s)		Commercial Identification
	A	B	C	D
Over 30 inches	L/5	3 inches	3 inches	L/6
30 inches and under	L/5	2 inches	2 inches	L/6

*1–inch space to be omitted if Bands B & C are different colors.

FIGURE 2. Bottle type cylinders.

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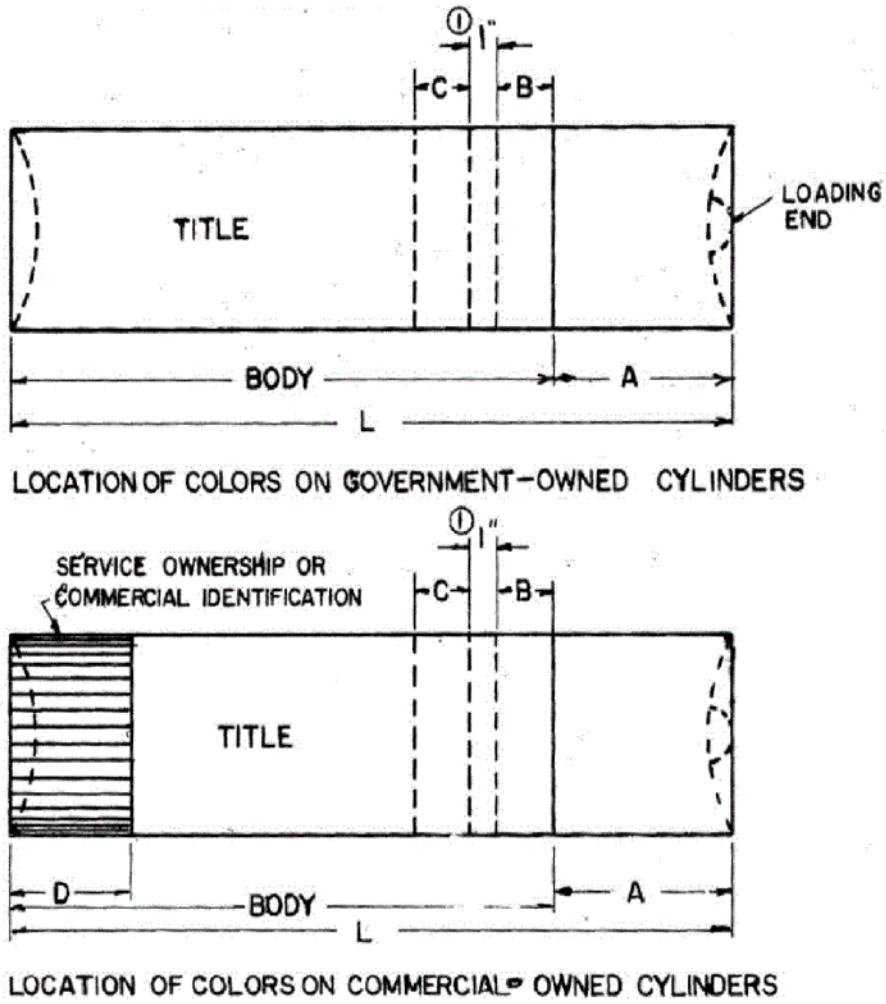

LOCATION DIMENSIONS

Overall Length, L	Cap and Shoulder Color	Cylinder Color Band(s)	Commercial Identification
	A	B & C	D
Over 30 inches	1/4 of L	3 inches	1/6 of L
30 inches and under	1/4 of L	2 inches	1/6 of L

① 1–inch space to be omitted if Bands B & C are different colors.

FIGURE 3. Tube type cylinders.

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TABLE III. Titles and color codes for compressed gas cylinders.

Title	Location on cylinder			
	Top A	**Band B**	**Band C**	**Body**
Acetylene	Yellow	Yellow	Yellow	Yellow
Acrolein	Yellow	Brow	Black	Brown
Aerosol insecticide	Buff	Buff	Buff	Buff
Air, compressed, breathing	Black	Green	Black	Black
Air, carbon monoxide	Brown	Green	Brown	Brown
Air, dry, special purpose	Black	Green	Black	Black
Air, hexane	Black	Green	Yellow	Black
Air, hydrogen	Black	Green	Yellow	Black
Air, hydrogen sulfide	Black	Green	Brown	Black
Air, oil-free	Black	Green	Black	Black
Air, oil-tolerant	Black	Green	Green	Black
Alkyl decaborane	Yellow	Brown	Brown	Yellow
Air, methane	Black	Green	Yellow	Black
Alkyl pentaborane	Yellow	Brown	Brown	Yellow
Ammonia	Brown	Yellow	Orange	Orange
Argon, carbon Dioxide, helium	Gray	Gray	Gray	Gray
Argon	Gray	Gray	Gray	Gray
Argon, hydrogen	Gray	Yellow	Gray	Gray
Argon, oil-free	Gray	White	Gray	Gray
Argon, oil-tolerant	Gray	White	White	Gray
Argon-oxygen mixture	Gray	Green	White	Gray
Argon 90%, 5.0% oxygen, 5.0% carbon dioxide	Gray	Green	Gray	Gray
Boron trichloride	Gray	Brown	Gray	Brown
Boron trifluoride	Gray	Brown	Brown	Brown
Bromoacetone	Brown	Black	Black	Brown
Bromochlorodifluoromethane (Halon 1211) (Fire only)	Red	Red	Red	Red
Bromochloromethane	Buff	Gray	Buff	Buff
Bromochloromethane (Fire only)	Red	Gray	Red	Red

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TABLE III. Titles and color codes for compressed gas cylinders–Continued.

Title	Location on cylinder			
	Top A	**Band B**	**Band C**	**Body**
Bromotrifluoromethane	Orange	White	Gray	Orange
Bromotrifluoromethane (Fire only)	Red	White	Gray	Red
Butadiene	Yellow	White	Buff	Buff
Carbon dioxide	Gray	Gray	Gray	Gray
Carbon dioxide (Fire only)	Red	Red	Red	Red
Carbon monoxide	Yellow	Brown	Brown	Brown
Carbon monoxide gas air mixture	Black	Green	Brown	Black
Chloroacetone	Black	Brown	Black	Brown
Chlorine	Brown	Brown	Brown	Brown
Chlorine trifluoride	Brown	Green	Brown	Brown
Chloropicrin	Brown	Orange	Orange	Brown
Cyanogen	Yellow	Brown	Yellow	Brown
Deuterium	Yellow	Yellow	Yellow	Yellow
Diborane	Yellow	Brown	Brown	Yellow
Dibromodifluoromethane	Buff	White	Buff	Buff
Dibromodifluoromethane (Fire only)	Red	White	Red	Red
Difluorochloroethane	Gray	Yellow	Yellow	Orange
Difluoroethane	Gray	Yellow	Orange	Orange
Dihydrotetraborane	Yellow	Brown	Brown	Yellow
Dimethylamine, anhydrous	Yellow	Blue	White	Buff
Dimethylether	Yellow	Brown	Buff	Buff
Dinitrogen, tetroxide	Brown	Green	Green	Brown
Diethylether	Yellow	Brown	Buff	Buff
Dispersant, dichlorodifluoromethane-difluoroethane, mixture	Buff	Gray	Gray	Buff
Ethane	Yellow	Blue	Yellow	Yellow
Ethyl chloride	Buff	Blue	Yellow	Buff
Ethyl nitrite	Yellow	Buff	Buff	Buff
Ethylamine, anhydrous	Yellow	Blue	Blue	Buff
Ethylene industrial	Blue	Yellow	Buff	Buff

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TABLE III. Titles and color codes for compressed gas cylinders–Continued.

Title	Location on cylinder			
	Top A	**Band B**	**Band C**	**Body**
Ethylene oxide	Yellow	Blue	Buff	Buff
Fluorine	Brown	Green	Green	Brown
Fumigant, carbon dioxide-ethylene oxide mixture	Buff	Blue	Buff	Buff
FM-200, heptafluoropropane	Red	Gray	Black	Red
Fumigant, ethylene oxide-dichlorodifluoromethane mixture	Buff	Buff	Buff	Buff
Helium, compressed	Buff	Gray	Gray	Gray
Helium, argon	Gray	Gray	Gray	Gray
Helium, argon, carbon dioxide	Gray	Gray	Gray	Gray
Helium 90.0%, 6.5% Argon, 3.5% Oxygen	Gray	Green	Gray	Gray
Helium, oil-free	Buff	Gray	Gray	Gray
Helium, oil-tolerant	Gray	Orange	Gray	Gray
Helium-oxygen mixture	Buff*	White**	Green	Green
Hexane air mixture	Black	Green	Yellow	Black
Hydrogen	Yellow	Black	Yellow	Yellow
HFC-125, Pentafluroethane, CHF2CF3	Red	Gray	Orange	Red
Hydrogen Bromide	Black	Brown	Brown	Brown
Hydrogen chloride, anhydrous	Brown	White	Brown	Brown
Hydrogen cyanide, anhydrous	Yellow	Brown	White	Brown
Hydrogen fluoride, anhydrous	Green	Brown	Brown	Brown
Hydrogen, oxygen	Yellow	Green	Yellow	Yellow
Hydrogen 1.0%, 20.0% oxygen, 1.0% argon, 1.0% carbon dioxide, 50 PPM carbon monoxide, 200 PPM R-12, 200 PPM R-114, balance nitrogen	Green	Brown	Yellow	Gray
Hydrogen sulfide	Brown	Yellow	Brown	Brown
Hydrogen sulfide, air mixture	Brown	Green	Brown	Brown
Krypton, oil-free	Gray	Buff	Gray	Gray
Krypton, oil-tolerant	Gray	Buff	Buff	Gray

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TABLE III. Titles and color codes for compressed gas cylinders–Continued.

Title	Location on cylinder			
	Top A	Band B	Band C	Body
Manufactured gas: coal, oil, water, producer, etc.	Brown	Yellow	Yellow	Yellow
Methane	Yellow	White	Yellow	Yellow
Methane air mixture	Black	Green	Yellow	Black
Methyl acetylene propadiene (MAPP) mixture	Yellow	Orange	Yellow	Yellow
Methylamine	Yellow	Brown	Yellow	Buff
Methyl bromide	Brown	Black	Brown	Brown
Methyl bromide (Fire only)	Red	Brown	Red	Red
Methyl chloride	Yellow	Brown	Orange	Orange
Methyl mercaptan	Brown	Yellow	Yellow	Brown
Methyl sulfide	Yellow	Brown	Buff	Brown
Methylene chloride	Gray	Blue	Orange	Orange
Natural gas	Yellow	Brown	Yellow	Yellow
Neon, helium	Gray	Gray	Gray	Gray
Neon, oil-free	White	Buff	Buff	Gray
Neon, oil-tolerant	White	Buff	Gray	Gray
Nickel carbonyl	Yellow	White	Yellow	Brown
Nitric oxide	Brown	Buff	Brown	Brown
Nitrogen (cryogenic)	Gray	Black	Black	Gray
Nitrogen (fire only)	Red	Gray	Gray	Red
Nitrogen, oil-free	Gray	Black	Black	Gray
Nitrogen, oil-free, Tetrafluoromethane (R-14)	Gray	Gray	Gray	Gray
Nitrogen, oil-tolerant	Gray	Black	Gray	Gray
Nitrogen dioxide	Brown	Buff	Buff	Brown
Nitrogen-helium mixture	Gray	Black	Orange	Gray
Nitrogen-oxygen mixture	Black	White	Green	Green
Nitrogen, methane	Gray	Gray	Gray	Gray
Nitrogen, trifluoride	Brown	Green	Green	Brown

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TABLE III. Titles and color codes for compressed gas cylinders–Continued.

Title	Location on cylinder			
	Top A	**Band B**	**Band C**	**Body**
Nitrogen 88%, 11% tetrafluoromethane (R-14), 1% helium	Gray	Gray	Gray	Gray
Nitrogen 80%, 10% helium, 10% oxygen	Gray	Green	Gray	Gray
Nitrosyl chloride	Brown	White	White	Brown
Nitrous oxide	Blue	Blue	Blue	Blue
Oxygen	Green	Green	Green	Green
Oxygen, argon	Green	Green	Green	Green
Oxygen, aviator's	Green	White	Green	Green
Oxygen, electrolytic	Green	White	White	Green
Oxygen-carbon dioxide mixture	Gray*	White**	Green	Green
Oxygen 99.5%, 10 PPM carbon dioxide, 50 PPM methane, 100 PPB acetylene, 400 PPB ethylene, 6 PPM ethane, 6 PPM nitrous oxide, 2 PPM freon 12, 200 PPB trichlorotrifluoroethane, balance argon	Green	Blue	Yellow	Green
Oxygen fluoride	Green	Brown	Green	Brown
Oxygen 17%, 1.1% hydrogen, 0.6% carbon dioxide, 210 PPM freon 12, 210 PPM freon 114, 42 PPM butane, 16 PPM carbon monoxide, 4 PPM toluene, 7 PPM trichloroethylene, 6 PPM freon 11, 3 PPM benzene, balance nitrogen	Green	Brown	Yellow	Gray
Oxygen, nitrogen mixture	Green	Gray	Gray	Green
Ozone	Brown	Green	Green	Green
Pentaborane, stable	Yellow	Brown	Brown	Yellow
Petroleum gas: acetogen, butane, butane-propane, butene-1, cyclopropane, isobutane, isobutylene, neopentane, propane, etc.	Yellow	Orange	Yellow	Yellow
Phenylcarbylamine chloride	Brown	Gray	Gray	Brown
Phosgene	Brown	Orange	Brown	Brown
Propane air mixture	Black	Green	Yellow	Black

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TABLE III. Titles and color codes for compressed gas cylinders–Continued.

Title	Location on cylinder			
	Top A	**Band B**	**Band C**	**Body**
Propylene	Yellow	Gray	Buff	Buff
Propyne	Gray	Yellow	Yellow	Yellow
R-11, Trichlorofluoromethane	Orange	Orange	Orange	Orange
R-12, Dichlorodifluoromethane	Orange	Orange	Orange	Orange
R-13, Chlorotrifluoromethane	Orange	Orange	Orange	Orange
R-21, Dichlorofluoromethane	Orange	Orange	Orange	Orange
R-22, Chlorodifluoromethane	Orange	Orange	Orange	Orange
R-113, Trichlorotrifluoroethane	Orange	Orange	Orange	Orange
R-114, Dichlorotetrafluoroethane	Orange	Orange	Orange	Orange
R-116, Hexafluoroethane	Gray	Gray	Gray	Gray
R-124A, Chlorotetrafluoroethane	Orange	Orange	Orange	Orange
R-500, Dichlorodifluoromethane/ Difluoroethane	Orange	Orange	Orange	Orange
R-501, Monochlorodifluoromethane/ Monochloropentafluoroethane	Orange	Orange	Orange	Orange
R-502, Monochlorodifluoromethane/ Monochloropentafluoroethane	Orange	Orange	Orange	Orange
Sulfur dioxide	Brown	Gray	Brown	Brown
Sulfur hexafluoride	Gray	White	Black	Gray
Tetrafluoroethylene, inhibited	Buff	White	White	Buff
Trifluoromethane (R-23), Tetrafluoromethane (R-14)	Gray	Gray	Gray	Gray
Trimethylamine, anhydrous	Yellow	Blue	Orange	Buff
Vinyl bromide	Buff	Blue	Blue	Buff
Vinyl chloride	Yellow	Orange	Buff	Buff
Vinyl methyl ether, inhibited	Yellow	Black	Buff	Buff
Xenon, oil-free	White	Black	Gray	Gray
Xenon, oil-tolerant	White	Black	Black	Gray

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5.2.5 Additional information.

5.2.5.1 Commercial−owned cylinders. Commercial−owned cylinders are those not owned by or procured for the U.S. Government. Commercial owned cylinders are contractor−owned or supplier−owned cylinders in which compressed gas is supplied to the Government. When Department of Defense activities procure compressed gases in commercial−owned cylinders, it is not mandatory that the cylinders be color coded in accordance with this standard. When such commercial−owned cylinders are not color coded in accordance with this standard, they shall be marked in accordance with the Compressed Gas Association, CGA C−7. If the using Department of Defense activity requires that this standard apply to commercial−owned cylinders, the bottom and lower portion of the cylinder body opposite the valve end may be used for commercial identification. In this area, which shall not exceed one−sixth of the overall length of the cylinder, the use of a solid color other than the body color will not be permitted.

5.2.5.2 Decalcomanias. Two decalcomanias may be applied on the shoulder of each cylinder diametrically opposite at right angles to titles. They should include the title of the gas, precautions for handling, and use. A background color corresponding to the primary warning color of the contents should be used.

5.2.5.3 Shatterproof designation. Shatterproof cylinders shall be stenciled with the phrase "Non−Shat" longitudinally 90 degrees from the titles. Letters shall be black or white and approximately 1 inch in size.

5.2.5.4 Service ownership. On cylinders owned by or procured for the Department of Defense, the bottom and the lower portion of the cylinder body opposite the valve end may be used for Service ownership titles.

5.2.5.5 DOT marking. Adherence to this standard does not exempt the compressed gas cylinder from marking and stamping requirements contained within 49 CFR 178.35.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. The color coding system covered by this standard is intended for use within the DoD as a means to provide a supplemental visual warning of the materials contained in pipelines and compressed gas cylinders.

6.2 Acquisition requirements. Acquisition documents should specify the title, number, and date of this standard.

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6.3 Subject term (key word) listing.

Anesthetics
Fire protection materials
Flammable materials
Oxidizing materials
Physically dangerous materials
Piping system identification
Piping system
Poisonous materials
Toxic materials
Warning colors

6.4 Color chips. Color chips related to FED−STD−595 will no longer be available to calibrate color. As an alternate, users are referred to color coordinates specified in accordance with the International Commission on Illumination CIE L*a*b* (CIELAB) color coordinate system. Color coordinates can be used as an independent reference for comparison and matching. All CIELAB color coordinates for the colors referenced by FED−STD−595 are provided at www.gsa.gov/portal/content/142623.

6.5 Changes from previous issues. The margins of this specification are marked with vertical lines to indicate where changes from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous issue.

Custodians:
Army − EA
Navy − SH
Air Force − 68

Preparing activity:
Army − EA
(Project 8120−2013−001)

Review activities:
Army − AV, CR4, MI
Navy − AS, CG, MC, MS, YD
Air Force − 11, 19, 99
DLA − CC, GS

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