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Safety, Reliability and Quality Assurance, and Protective Services

Safety Standard for Ground Piping Systems Color Coding and Identification

TITLE/APPROVAL PAGE

SAFETY STANDARD FOR

GROUND PIPING SYSTEMS

COLOR CODING AND IDENTIFICATION

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LIST OF EFFECTIVE PAGES

NOTE: This is a complete revision replacing revision A, dated January 17, 1975. A further list of effective pages will be published if future change packages are issued.

Dates of issue of change pages are:

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SECTION I
INTRODUCTION

1.1 SCOPE

This standard establishes a common color code for visual warnings to accompany the written identification of materials covered in piping systems. 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 a uniform color code to quickly warn personnel of outstanding hazards inherent in the materials involved. However, this standard does not define the manner or conditions under which these materials may be used safely.

1.2 APPLICABILITY

This standard applies to all ground based piping systems installed in areas under the jurisdiction of KSC, including the systems located in floor trenches and above suspended ceilings. Sections of piping that are concealed underground, in floor slabs, or in walls or partitions are not subject to the requirements of this standard.

This standard is not applicable to electrical conduits, ventilation ducts, or pipelines installed in missiles, spacecraft, other airborne equipment, or storage vessels.

Identification methods for bulk petroleum product systems is covered in MIL-STD-161. The identification of pipelines for aircraft, missiles, and space vehicles is covered in MIL-STD-1247, and color coding for containers of liquid propellants is covered in MIL-STD-172.

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 for 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.

1.4 REFERENCES

The latest issues of the following documents form a part of this standard to the extent specified:

a. Federal Standard No. 595, Colors.

b. MIL-STD-161, Identification Method for Bulk Petroleum Product Systems Including Hydrocarbon Fuels.

c. MIL-STD-172, Color Code for Containers of Liquid Propellants.

d. MIL-STD-1247, Markings, Functions and Hazard Designations of Hose, Pipe, and Tube Lines for Aircraft Missile and Space Systems.

1.5 DEFINITIONS

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

a. Piping Systems. Piping systems consist of any pipe line or conduit used for the transport of gases, liquids, or semi-liquids, but not those used for carrying solids in air or gas. Valve, 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 nonoperating accessories are not considered parts for application of warning colors.

b. 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.

c. Secondary color warning. A secondary color warning is the color assigned as a warning of a secondary hazard possessed by a material having a type of hazard distinctly different from that indicated by its primary color warning. These colors appear as flow direction arrows on piping systems.

d. Title. A title is any lettered identification required on a piping system. Titles shall identify the contents by complete names, or by generally recognized abbreviations, symbols, letters, numerals, or combinations thereof.

SECTION II
IDENTIFICATION REQUIREMENTS

2.1 GENERAL

The colors assigned in this standard shall conform in hue and chroma to the requirements identified by number in Federal Standard No. 595. No change shall be made in the assigned colors without prior approval of the preparing activity of this standard.

2.1.1 WARNING COLORS. The following colors are assigned to the materials listed 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 compounds hazardous to life and property but not normally productive of dangerous quantities of fumes or vapors.

d. Green, No. 14110 - 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.

f. Red, No. 11105 - Fire Protection Materials. All materials provided in piping systems or in compressed gas cylinders exclusively for use in fire protection.

2.1.2 NONWARNING COLORS. 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.

2.2 DETAILED

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 letters in black and 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 2-1 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, or the use of pressure sensitive tape is suggested (i.e., Design Procurement Document 79K02544). It is recommended that titles be applied by use of upper case letters and arabic numerals whenever applicable.

Table 2-1. 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
9 to 13	3
Over 13	3-1/2

*Additional letter sizes permitted for smaller piping.

2.2.1 USE OF COLORS. The appearance of any of the six colors specified in paragraph 2.1.1 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 surroundings, if not in conflict with other color designations in this standard, or such systems may be painted aluminum, black, or remain unpainted. This exception does not apply to any material, harmless or otherwise, specifically identified and listed in this standard.

2.2.2 PRIMARY COLOR WARNINGS

2.2.2.1 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. Heat resistant paints shall be used on high temperature (200°F and above) piping systems, unless the paint is applied on insulation with an exterior temperature below 200°F. 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 in Figure 2-1. These bands may be made of pressure sensitive tape (only if recommended by the manufacturer for specified temperature range) or painted on, and will be applied not less than 40 feet apart on straight pipe runs inside buildings and 500 feet apart on straight cross country runs. In lieu of color bands, all pipe and covering on an entire system, including all encircling or partially encircling straps, hangers, and supports, may be painted with the primary color warning. However, when this option is exercised, no color bands shall be applied.

2.2.2.2 Location on Piping Systems. Immediately adjacent to and upstream of all operating accessories such as valves, regulators, flow-checks, 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., where branch lines join the system, where the system passes underground or through walls, and at any other conspicuous places where warnings are required by the Safety Office). These markings shall be clearly visible from floor level positions. If desired, operating accessories may also be painted with the primary color warning provided this option is used throughout the system.

2.2.3 SECONDARY COLOR WARNINGS. An arrow 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 the primary color warning shall have a secondary color warning applied in the shape of an arrow. The arrow color shall be selected according to definitions for warning colors specified in paragraph 2.1.1. 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 warning, 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 paragraph 2.2.2.2 and shall indicate the normal direction(s) of flow of material in the system. Pressure sensitive markers are also acceptable. A double-headed arrow shall be placed on lines subject to reverse flow (Figure 2-1). Tails may be omitted on arrows creating triangles with one corner indicating the normal direction of flow.

This option may not be used on double-headed arrows. Operating accessories may also be painted with the secondary color warning provided this option is used throughout the system.

2.3 HAZARDS

Hazards shall be identified in accordance with Table 2-2. Letter sizes shall be the same as those used for function within the same identification group, with a 1/32 inch vertical space between words comprising a set (i.e., a dual hazard, and a 1/4 inch space between sets or between words if only a single hazard is indicated). Where tapes are used to identify function, identification of hazard may be accomplished with

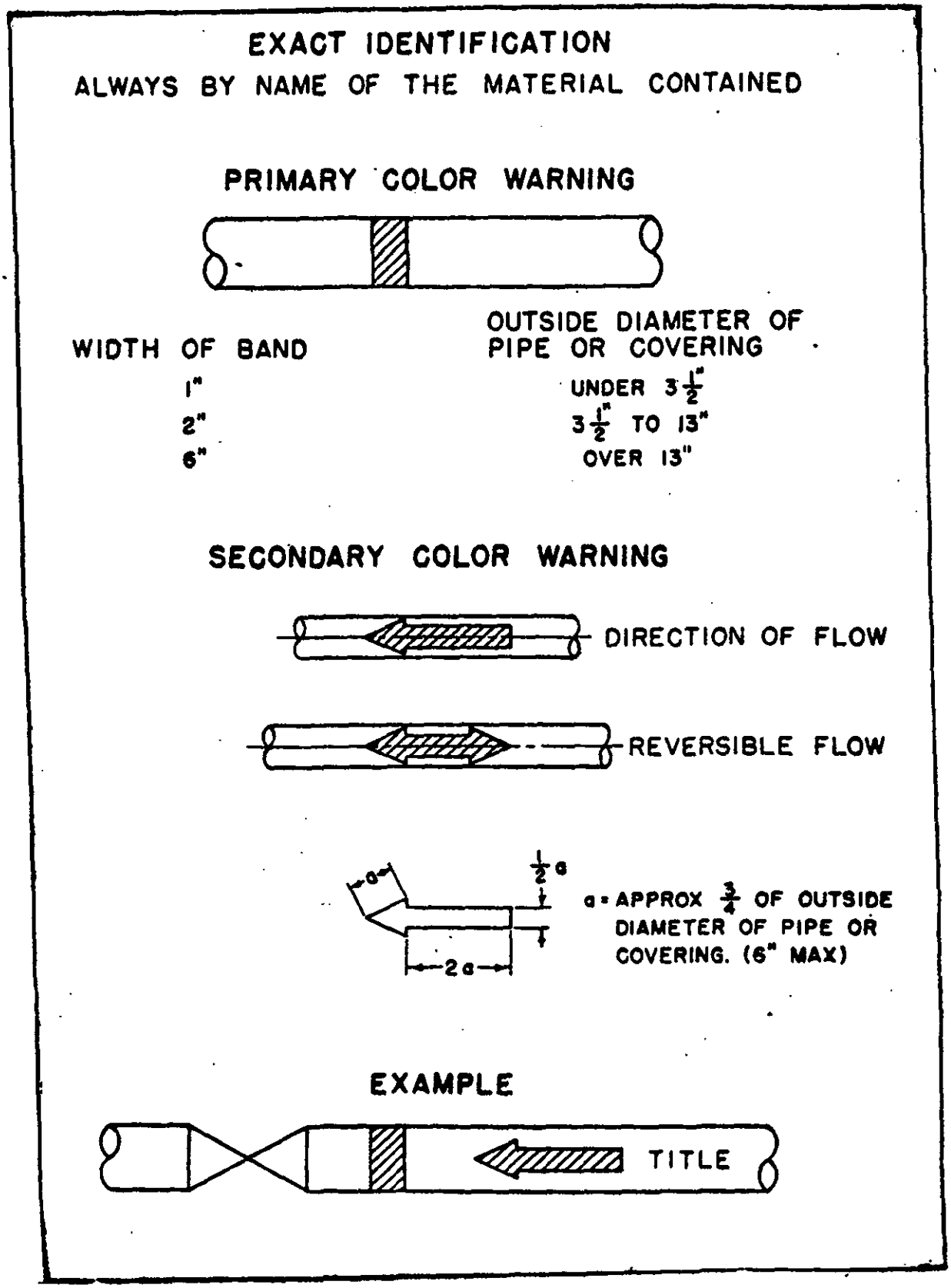

Figure 2-1. Piping Systems, Color Warnings

Table 2-2. Classification, Identification, and Color Codes for Hazards

Hazard	Identification	Color
Flammable Materials. All materials known ordinarily as flammable or combustibles.	FLAM	Yellow
Toxic and Poisonous Materials. All materials extremely hazardous to life or health, under normal conditions, as toxics or poisons.	TOXIC	Brown
Anesthetics and Harmful Materials. All materials productive of anesthetic vapors and all liquid chemicals and compounds hazardous to life and property but not normally productive of dangerous quantities of fumes or vapors.	AAHM	Blue
Oxidizing Materials. All materials which readily furnish oxygen for combustion and fire producers which react explosively or with evolution of heat in contact with other materials.	OXYM	Green
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 pressure or temperature.	PHDAN	Gray
Fire Protection Materials. All materials provided in piping systems exclusively for use in fire protection.	FPM	Red

tape(s) of 1/2 inch minimum width. When painted or appearing on tags or bands, the hazard shall be the last word(s) in the identification following the direction of flow arrow, if applicable. Hazards associated with various line contents shall be in accordance with primary and secondary warning designations. However, for application under this standard, words and abbreviations are to be substituted for colors to identify specific classes of hazards as indicated in Table 2-2. To facilitate cross-referencing, colors applicable to all hazards are indicated opposite the identification markings. Thus, it will only be necessary to refer to the color shown in Table 2-2 for a particular content, then subsitute applicable words or abbreviations.

2.4 CLASSIFICATION

The classification of materials in a piping system shall be in accordance with Table 2-3. Not Otherwise Specified (NOS) refers to materials of like name and hazardous properties. When no secondary color warning is specified, the arrow may be the same color as the primary warning or black or white, as preferred. Arrows on the systems marked (1) in Table 2-3 may be the same colors as the primary warning, or black or white, as needed for contrast.

2.5 IDENTIFICATION

2.5.1 PRESSURE. Working pressures that exceed 60 pounds per square inch gage (psig) shall be identified by the standard psi method on all piping systems (working pressures below 60 psig are exempted). On tags and painted title legends, the pressure shall be given immediately beneath the contents, using the same letter size and color. Where function is identified with tapes, the pressure may be given with either tapes or decals, provided that they are not less than 1/2 inch wide and the letters and figures they contain are the same size as those appearing on associated tapes and decals.

Fire protection and related potable water piping systems could be pressurized at varying ranges, and additional labeling is not considered justified. Steam, flammable gases, and other hazardous materials should be labeled at all pressures.

2.5.2 TAGS. Where conventional markings are likely to be damaged by extreme temperatures or hidden by a covering of frost, a stainless steel (type 316) identification tag shall be securely fastened at the same locations given for color bands in paragraph 2.2.2.2. These tags shall be at least 1-1/2 inches in length and width with engraved or stamped markings at least 1/4 inch high. Such tags shall be secured by the stand off attachments. Where piping is too small or not readily accessible, identification tags may be used in lieu of paint or tape.

2.5.3 PANEL/COMPONENT. Each panel-mounted component shall be identified on the face of the panel by a plate mounted adjacent to the component (beneath the component if practicable). The legend on this plate shall provide clear, concise, and positive component identification, including the component's name, find number, media, and pressure. The plate shall be 1/8 inch thick (nominal) laminated phenolic plastic

Table 2-3. Classification of Materials in Piping Systems
(Sheet 1 of 4)

Material	Primary warning (band color)	Secondary warning (arrow color)	Material	Primary warning (band color)	Secondary warning (arrow color)
Acetaldehyde (Ethyl aldehyde)	Yellow	Blue	Boron trichloride	Brown	Yellow
Acetic acid, aqueous solution	Blue	Yellow	Boron trifluoride	Brown	(1)
Acetic acid, glacial	Blue	Yellow	Bromine	Brown	Gray
Acetic anhydride	Blue	Yellow	Bromine Pentafluoride	Brown	Green
Acetone (Acrylonitrile)	Yellow	(1)	Bromine Trifluoride	Brown	Green
Acetone oils	Yellow	(1)	Bromoacetone	Brown	(1)
Acetyl chloride	Blue	(1)	Bromobenzene	Yellow	(1)
Acetylene	Yellow	Yellow	Bromochloromethane	Gray	(1)
Acids, liquid, (NOS)	Blue	(1)	Bromochloromethane, Fire	Red	(1)
Acrolein	Brown	Yellow	Bromotrifluoromethane	Gray	(1)
Aerosol insecticide	Gray	(1)	Bromotrifluoromethane, Fire	Red	(1)
Aerozine 50 (UDMH/ Hydrazine Mixture)	Brown	Yellow	Butadiene	Yellow	(1)
Air, breathing[2]	Green	Black	Butane (See: Petroleum gas)	Yellow	(1)
Air, compressed - psig	Gray	Green	Butyl acetate	Yellow	(1)
Air, instrument - psig	Green	Gray	Butyl ether	Yellow	(1)
Alcohol, allyl, liquid	Yellow	Brown	Camphor oil	Yellow	(1)
Alcohol, amyl, butyl, ethyl, propyl, (NOS)	Yellow	(1)	Carbon bisulfide (Cargon disulfide)	Yellow	Brown
Alcohol, methyl	Yellow	Blue	Carbon dioxide	Gray	(1)
Alkaline corrosive liquids, (NOS)	Blue	(1)	Carbon dioxide, Fire	Red	(1)
Aluminum Borohydride	Yellow	Brown	Carbon monoxide	Yellow	Brown
Ammonia, anhydrous	Brown	Yellow	Carbon tetrachloride	Blue	(1)
Amyl acetate	Yellow	(1)	Caustic potash, liquid (Potassium hydroxide)	Blue	(1)
Aniline (oil) liquid	Brown	Yellow	Caustic soda, liquid (Sodium hydroxide)	Blue	(1)
Argon	Gray	(1)	Chlorine	Brown	(1)
Argon-Oxgen	Green	(1)	Chlorine trifluoride	Brown	Green
Arsenic trichloride	Brown	Blue	Chloroacetone	Brown	(1)
Arsenical acids and liquids, (NOS)	Brown	Blue	Chloroacetyl chloride	Blue	(1)
Benzaldehyde	Yellow	(1)	Chlorodifluoromethane (F-22)	Gray	(1)
Benzene (Benzol, coal tar light oil)	Yellow	Brown	Chloroheptafluorocyclo-butane (F-C-317)	Gray	(1)
Benzine (Petroleum ether, Petroleum naphtha)	Yellow	(1)	Chloropentafluoroethane (F-115)	Gray	(1)
Benzoyl chloride	Blue	(1)	Chloropicrin	Brown	(1)
Benzyl chloride	Blue	Yellow	Chloropropane (n-Propyl Chloride)	Yellow	Blue
Boron Hydrides (Alkyl Decaborane, Alkyl Pentaborane, Diborane, Dihydrotetraborane, Hexaborane, Penta-borane, Pentaboranes, etc., (NOS)	Brown	Yellow	Chlorosulfonic acid	Blue	Green
			Chlorotetrafluoroethane (F-124A)	Gray	(1)
			Chlorotrifluoromethane (F-13)	Gray	(1)
			Chromic acid solutions	Blue	Green

See footnotes at end of table.

Table 2-3. Classification of Materials in Piping Systems
(Sheet 2 of 4)

Material	Primary warning (band color)	Secondary warning (arrow color)	Material	Primary warning (band color)	Secondary warning (arrow color)
Coal gas (See: (Manufactured gas)	Yellow	Brown	Ethyl benzene	Yellow	(1)
Coal Tar Distillates, (NOS)	Yellow	Brown	Ethyl bromide	Yellow	Blue
Crotonaldehyde	Blue	Yellow	Ethyl butyl acetate	Yellow	(1)
Crude oil, petroleum[3]	Yellow	(1)	Ethyl butyrate	Yellow	(1)
Cyanide, liquid Potassium, Sodium, solutions, (NOS)	Brown	Brown	Ethyl chloride	Yellow	Blue
Cyanogen gas	Brown	Yellow	Ethyl chloroacetate	Yellow	(1)
Cyclopropane	Yellow	Blue	Ethylene chlorohydrin	Yellow	(1)
Decalin (Decahydronaphthalene)	Yellow	(1)	Ethylenediamine	Yellow	Blue
Dibromodifluoromethane	Gray	(1)	Ethylene dichloride	Yellow	Blue
Dibromidifluoromethane, Fire	Red	(1)	Ethylene glycol	Yellow	(1)
Dichlorodifluoromethane (F-12)	Gray	(1)	Ethylene glycol - water mixtures	Yellow	(1)
Dichlorofluoromethane (F-21)	Gray	(1)	Ethylene oxide	Yellow	Blue
Dichlorohexafluorocyclo-butane (F-C-316)	Gray	(1)	Ethyl hexaldehyde	Yellow	(1)
Dichloropentane	Yellow	(1)	Ethyl lactate	Yellow	(1)
Dichlorotetrafluoroethane (F-114)	Gray	(1)	Ethyl methyl ketone	Yellow	Blue
Diethanolamine	Yellow	(1)	Ethyl nitrate	Yellow	Blue
Diethylenetriamine (DETA)	Yellow	(1)	Ethyl nitrite	Yellow	(1)
Difluorochloroethane	Gray	Yellow	Ethyl silicate	Yellow	(1)
Difluoroethane	Gray	Yellow	Fluorine	Brown	Green
Diisobutyl Ketone	Blue	(1)	Formaldehyde	Yellow	Brown
Dimethylamine, anhydrous	Yellow	Blue	Formic Acid	Blue	Yellow
Dimethyl ether	Yellow	Brown	Fuel oil, (NOS)[3]	Yellow	(1)
Dimethyl sulfate	Brown	Blue	Fuels, (JP-RP-RJ, Diesels), (NOS)	Yellow	(1)
Dimethyl sulfide	Yellow	Blue	Fumigant, Carbon dioxide-Ethylene oxide	Gray	Blue
Diphenyl-Diphenyl oxide (Dowtherm A)	Gray	(1)	Furfural	Blue	Yellow
Dispersant (Dichorodi-(Dichorodifluoromethane -Difluoroethane Mix)	Gray	(1)	Gasoline (motor fuel)[3]	Yellow	(1)
Drain Sewer	Black	White	Helium	Gray	(1)
Electrolyte acids, (NOS)	Blue	(1)	Hydraulic fluid	Yellow	Gray
Ethane	Yellow	Blue	Hydrazine	Brown	Yellow
Ethers, anesthetic, diethyl, ethyl, isopropyl, (NOS)	Yellow	Blue	Hydrocarbons, Heavy (Hexanes, Heptanes, Octanes, etc.), (NOS)	Yellow	(1)
Ethyl acetate	Yellow	(1)	Hydrochloric acid (Muriatic acid)	Blue	(1)
Ethylamine	Yellow	Blue	Hydrocyanic acid	Brown	(1)
			Hydrofluoric acid	Blue	(1)
			Hydrofluorosilicic acid	Blue	(1)
			Hydrogen	Yellow	Yellow
			Hydrogen bromide	Brown	(1)
			Hydrogen chloride, anhydrous	Brown	(1)
			Hydrogen cyanide, anhydrous	Brown	Yellow

See footnotes at end of table.

Table 2-3. Classification of Materials in Piping Systems
(Sheet 3 of 4)

Material	Primary warning (band color)	Secondary warning (arrow color)	Material	Primary warning (band color)	Secondary warning (arrow color)
Hydrogen fluoride, anhydrous	Brown	Green	Nicotine compounds and liquids	Brown	(1)
Hydrogen, Liquid	Yellow	Gray	Nitrating Acid (Mixed Acid)	Blue	Green
Hydrogen peroxide (dioxide)	Green	Blue	Nitric acid	Blue	Green
Hydrogen sulfide	Yellow	Brown	Nitric Acid, Fuming	Brown	Green
Ink, (solvent type), (NOS)	Yellow	(1)	Nitrobenzene liquid	Brown	Yellow
Insecticide, liquid, (NOS)	Brown	Yellow	Nitrogen	Gray	(1)
Iodine Heptafluoride	Brown	Green	Nitrogen dioxide (Peroxide, Tetroxide)	Brown	Green
Isopentane	Yellow	Blue	Nitrogen-Helium	Gray	(1)
JP-3 (Jet Propulsion-3)[3]	Yellow	(1)	Nitrogen-Oxygen	Gray	Green
Kerosene (Kerosine, Kerozene)[3]	Yellow	(1)	Nitrogen Trifluoride	Blue	Green
Krypton	Gray	(1)	Nitromethane	Yellow	Blue
Lacquer, paint or varnish compounds, (NOS)	Yellow	(1)	Nitrosyl chloride	Brown	(1)
Manufactured gas (coal, oil, pintsch, producer, water), (NOS)	Yellow	Brown	Nitrous oxide	Blue	(1)
Mercaptans (Thio-alcohols), (NOS)	Yellow	(1)	Octafluorocyclobutane (F-C-318)	Gray	(1)
Mercury (Compound Solutions), (NOS)	Brown	(1)	Oil, Lubricating (NOS)[3]	Yellow	(1)
Methane	Yellow	(1)	Oils, (fish, vegetable, edible), (NOS)	Yellow	(1)
Methyl acetate	Yellow	(1)	Oxygen	Green	(1)
Methyl acetone	Yellow	(1)	Oxygen-carbon dioxide mixture	Gray	Green
Methylamine	Yellow	Brown	Oxygen, Electrolytic	Green	(1)
Methyl amyl acetate	Yellow	(1)	Oxygen, Fluoride	Brown	Green
Methyl amyl ketone	Yellow	(1)	Oxygen, Liquid (LOX)	Green	Gray
Methyl bromide	Brown	(1)	Ozone	Green	Brown
Methyl bromide, Fire	Red	Brown	Paint, lacquer or varnish	Yellow	(1)
Methyl chloride	Yellow	Brown	Paraldehyde	Yellow	(1)
Methyl cyanide (Acetonitrile)	Brown	(1)	Pentane	Yellow	(1)
Methylene chloride	Blue	Gray	Pentene-1	Yellow	(1)
Methyl formate	Yellow	Blue	Perchloric acid	Green	Blue
Methylhydrazine (MMH)	Brown	Yellow	Petroleum gas (Acetogen Butane - Propane Mix, Butene-1, Cyclopropane, Isobutane, Neopentane), (NOS)	Yellow	(1)
Methyl mercaptan	Yellow	Brown	Phenylcarbylamine chloride	Brown	Gray
Methyl sulfide	Yellow	Brown	Phosgene	Brown	(1)
Natural gas (fortified), (NOS)	Yellow	Brown	Phosphorus oxychloride	Blue	Green
Neon gas	Gray	(1)	Phosphrous tribromide	Blue	Green
Nickel carbonyl	Yellow	Brown	Phosphorus trichloride	Blue	Green
			Pintsch gas (See: Manufactured gases)	Yellow	Brown

See footnotes at end of table.

Table 2-3. Classification of Materials in Piping Systems
(Sheet 4 of 4)

Material	Primary warning (band color)	Secondary warning (arrow color)	Material	Primary warning (band color)	Secondary warning (arrow color)
Potassium Permanganate Solution	Green	(1)	Trichlorotrifluoroethane (F-113)	Gray	(1)
Propylene	Yellow	Gray	Triethylamine	Brown	Yellow
n-Propyl Nitrate	Yellow	Brown	Trimethylamine, anhydrous	Yellow	Blue
Propyne	Yellow	Gray	Turpentine	Yellow	(1)
Pyrosulfuryl chloride (Silicon chloride)	Blue	(1)	Unsymmetrical Dimethyl Hydrazine (UDMH)	Brown	Yellow
Shellac, liquid	Yellow	(1)	Vacuum (noncontaminated)[4]	Gray	(1)
Solvents, (NOS)	Yellow	(1)	Varnish	Yellow	(1)
Steam pressure - psig	Gray	Black	Vinyl Bromide	Blue	(1)
Steam exhaust	Gray	Black	Vinyl chloride	Yellow	Brown
Stoddard Solvent	Yellow	(1)	Vinyl methyl ether	Yellow	(1)
Storm sewer	Black	White	Waste Acid (Spent Nitrating Acid)	Blue	Yellow
Sulfur chloride (Mono and di)	Blue	(1)	Water boiler feed	Black	White
Sulfur dioxide	Brown	Gray	Water, chilled	Red	Black
Sulfur Hexafluoride	Gray	(1)	Water, high temperature hot water	Green	Black
Sulfuric acid (oil of vitriol)	Blue	(1)	Water, condensate	Black	White
Sulfuric acid, fuming (Oleum)	Brown	Green	Water, condensing, return	Black	White
Sulfur trioxide	Blue	(1)	Water, condensing, supply	Black	White
Tetrachlorodifluoro-ethane (F-112)	Gray	(1)	Water, fire	Red	(1)
Tetraethyl lead, liquid	Brown	(1)	Water, heating system, return	Gray	Black
Tetrafluoromethane (F-14)	Gray	(1)	Water, heating system, supply	Gray	Black
Thionyl chloride	Brown	(1)	Water, make-up	Black	White
Tin Tetrachloride, anhydrous	Blue	Blue	Water, nonpotable, hot	Gray	Black
Titanium tetrachloride	Blue	(1)	Water, potable, hot	White	Black
Toluene (Toluol)	Yellow	Brown	Water, potable[5]	White	(4)
Triamylamine	Brown	Yellow	Water, raw	Black	White
Tributylamine	Yellow	Blue	Water, treated	Brown	White
1,1,1, Trichloroethane	Brown	(1)	Waxes, liquid	Yellow	(1)
Trichloroethylene	Brown	(1)	Xenon	Gray	(1)
Trichlorofluoromethane (F-11)	Gray	(1)	Xylene (Xylol)	Yellow	Brown
			Xylidine	Brown	Yellow

NOTE
(1) Arrows on these systems may be the same color as the primary warning or black or white, as preferred.
(2) Piping for breathing air should bear the title, BREATHING AIR (20-25% OXYGEN).
(3) See also "fuels".
(4) If contaminated, color shall correspond to hazard of material handled in the system.
(5) See paragraph 6.1.1.

engraving stock, with a white engraved legend on a black nonreflective surface. The plate must be rectangular in shape, with beveled edges, and be securely mounted to the panel with a suitable adhesive. Each complete panel containing components (valves, gages, bulkhead connection points, etc.) shall in turn be identified on the face of the panel by a plate which clearly defines the purpose of the panel (3/16-inch letter size recommended).

SECTION III
VARIANCES, EXEMPTIONS, WAIVERS, AND DEVIATIONS

Variances, exemptions, waivers, and deviations from the requirements of this Standard shall be requested in writing from the Director, Safety, R&QA, and Protective Services.