

69

REV. SEP 1973

THIS DOCUMENT IS THE PROPERTY OF THE BUREAU OF MINES AND COMPANY. IT IS TO BE USED ONLY IN CONNECTION WITH THE PROJECTS FOR WHICH IT WAS PREPARED. IT IS NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM, WITHOUT PERMISSION IN WRITING FROM THE BUREAU OF MINES.

CONFIDENTIAL

+

PROTECTIVE EQUIPMENT		SAFETY ENGINEERING STANDARD	
RESPIRATORY PROTECTIVE EQUIPMENT		ISSUED	JAN 1964
		THIS PAGE REVISED	JUNE 1975
		STANDARD REAFFIRMED	JUNE 1975
		S 2 H	
		Page 1 of 8	

This standard includes requirements of the Occupational Safety and Health Act of 1970 (OSHA) as published in the Federal Register. OSHA information is printed in red.

1. SCOPE

This standard provides information for the selection, use, and care of respiratory protective equipment (respirators). The term "respirator" in this standard is used inclusively and applies to atmosphere-supplying and air-purifying devices that provide breathable air to the wearer within the limits of the equipment, whatever the source of air. This standard does not apply for exposure to airborne radioactive contamination for which special consideration may be necessary.

2. GENERAL

2.1 Respirators should not be used as a substitute for adequate exhaust ventilation or other engineering control methods.

2.2 Respirators shall be worn at all times where the atmosphere may be harmful to employees due to unusual conditions, and where work is necessary in contaminated or oxygen-deficient, confined areas.

2.2.1 When the air is deficient in oxygen, the symptoms range from increased volume of breathing and acceleration of pulse rate to unconsciousness and death, depending upon oxygen content and the degree of a person's activity. Unconsciousness is immediate when a man breathes pure nitrogen and death may follow in a few minutes.

2.2.2 An oxygen deficiency may indicate a hazard other than inert gas; e.g., flammability (see 4.4), skin toxicity, or absorption through the skin, particularly hydrogen cyanide. Threshold limit values (TLV's) of air contaminants are given in S2T. Portable oxygen and toxic-gas detectors are covered in S3T.

2.3 Pure oxygen shall not be used in atmosphere-supplying respirators.

3. APPROVED RESPIRATORS

3.1 Where schedules for a particular type of equipment have been established, only equipment listed and approved by the Bureau of Mines and the National Institute for Occupational Safety and Health shall be used.

3.1.1 Respirators purchased on or before September 30, 1974 and meeting the following Bureau of Mines Schedules are approved for use until the following dates:

Type of Respirator	Bureau of Mines Approval Schedule	Terminal Use Date
Self contained	13 thru 13E	March 31, 1979*
Gas masks	14F	March 31, 1977
Supplied air	19B	March 31, 1980
Dust, fume, mist	21B	March 31, 1976
Chemical cartridge	23B	March 31, 1976

3.1.2 Respirators purchased after September 30, 1974 shall be manufactured per quality control plan approved under Title 30, Code of Federal Regulations, Part 11 and shall meet the requirements of the Bureau of Mines Schedules shown in 3.1.1. Such equipment will bear an approval label bearing the letters "TC" instead of "BM".

3.1.2.1 Exception, approved respirators purchased after September 30, 1974 and on or before June 30, 1975 may be marked "BM" if NIOSH has approved the vendor's quality control plan under which the respirator was manufactured.

3.1.3 Respirators purchased after June 30, 1975 shall meet the requirements of Chapter 1, Title 30, Code of Federal Regulations Part 11 - Respiratory Protective Devices; Tests for Permeability.

3.2 A list of the respirators and their manufacturers, certified by the National Institute for Occupational Safety and Health (NIOSH) per 3.1.3, may be obtained on request for HEW Publication No. (NIOSH) 75-119 plus cumulative supplements from:

NIOSH Testing and Certification Laboratory
944 Chestnut Ridge Rd
Morgantown, WV 26505

* Certain self-contained breathing apparatus may be upgraded to meet the requirements of 30 CFR, Part 11 and relabeled. Refer to manufacturer.

Portions printed in red are from OSHA regulations, Section 1910.134.

Vendors and merchandise designations are given to describe materials and may not include all acceptable products. Substitutions by suppliers are to be made only on approval of the local authority initiating the use of this standard.

SUSCOMMITTEE NO. 28



DUP 0960508

DU 040718

NIOSH Office of Technical Publications
Post Office Building
Cincinnati, OH 45202

U. S. Bureau of Mines
Health and Safety Research and Testing Center
4800 Forbes Ave
Pittsburgh, PA 15213

3.3 A list of respirators for respiratory protection against certain pesticides may be obtained from the U. S. Department of Agriculture, Pesticide Chemicals Research Branch, Beltsville, MD 20705.

3.4 At the present time, there are no approval schedules for the following equipment:

a. Filter-type respirators for protection against particulate aerosols, such as beryllium dusts and fumes, dusts impregnated with organic phosphorus insecticides (parathion), and radioactive substances.

b. Air-supplied suits.

3.5 A list of the several types of respiratory protective equipment, method of operation, use, limitations, and remarks is given in Table 1. For additional information in this regard, reference should be made to:

Practices for Respiratory Protection, ANSI Z88.2, American National Standards Institute, Inc. 1430 Broadway, New York, NY 10018

Respiratory Protective Equipment, Data Sheet D-344, National Safety Council, 425 North Michigan Avenue, Chicago, IL 60611

Respiratory Protective Devices Manual published by American Industrial Hygiene Association and American Conference of Governmental Industrial Hygienists (copies are available from Braun and Brumfield Inc., Box 1203, Ann Arbor, MI 48106)

4. USES AND LIMITATIONS

4.1 The air-purifying respirators; i.e., canister gas masks, chemical cartridge respirators, and mechanical filter respirators (Table 1C) shall not be used for rescue work, or for emergency work of any nature. This is because these respirators do not supply oxygen and therefore do not protect against possible oxygen deficiencies. Other reasons for this requirement are that:

a. Gas masks are intended for use with no more than 2 percent by volume of most toxic gases, and

b. Chemical cartridge respirators are intended for use in significantly lower toxic gas concentrations than canister gas masks. Limits vary from 0.05 percent maximum to 0.1 percent maximum.

4.2 Users should select canisters and cartridges specifically approved for the toxic gas and concentration to be encountered. Canister masks that bear the label "All-Service," "All-Purpose," or "Universal" should not be used.

4.3 Although self-contained breathing apparatus and hose mask with blower have no concentration limit in regard to toxicity, many toxic gases and vapors are flammable and the user could be exposed to a potential fire or explosion. The 2-percent concentration limits approved for toxic gas removal with canister-type masks is within the flammable range for some gases. Work in atmospheres in or near the flammable range is prohibited. When the possibility of flammable atmospheres exists, a check should be made with an explosimeter and permissible concentrations confirmed prior to entry. Standard F6J provides information and instructions for use of portable flammable vapor and gas detectors.

4.4 Respiratory protection is required for human, experimental, or suspected carcinogens under certain conditions. Refer to OSHA regulations for specific requirements, Section 1910.93 and to S2T.

5. SELECTION

5.1 In selecting a respirator, the following factors (5.1 - 5.1.6.1) and Tables 1 and 2 should be considered.

- a. Nature of the hazard
- b. Severity of the hazard
- c. Type of contaminant
- d. Concentration of the contaminant
- e. Period protection is required
- f. Location of the contaminated area with respect to a source of respirable air
- g. Expected activity of the wearer
- h. Operating characteristics and limitations of the available respirators
- i. Safety regulations of state or local government

5.1.1 Apparatus rated for at least 30-minute service time should be used for entry into an irrespirable atmosphere.

5.1.2 Fifteen-minute units shall be used only for emergency egress and not for rescue work or re-entry.

5.1.3 Operating time for self-contained apparatus is based on moderate work rates. Operating time is reduced by increased respiration required by heavy exertion.

5.1.4 Only self-contained breathing apparatus, combination air-line respirator and self-contained

Portions printed in red are from OSHA regulations, Section 1910.93.

CONFIDENTIAL



DUP 0960509

REV. SEP 1975

REV. SEP 1978

REV. SUP 10/3

CONFIDENTIAL

breathing apparatus, or hose mask with blower shall be used in oxygen-deficient atmospheres or where the contaminant is, or might be, immediately dangerous to life. The latter condition is defined as one from which a worker cannot escape uninjured without respiratory protective equipment. The air in the self-contained unit of the combination air-line respirator and self-contained breathing apparatus shall be used only for escape in event the on-line supply of air is interrupted. The volume of this exit supply may vary for different applications, but shall be ample to allow the worker sufficient air to escape from the contaminated area. In any case, this supply shall not be less than 3 minutes.

5.1.5 An uncontaminated supply of air must be assured when using a hose mask with blower.

5.1.6 Schedule 13E of the U. S. Bureau of Mines on self-contained breathing apparatus requires a remaining service-life indicator or warning for compressed breathing air (except for self-rescue). Some equipment now on plants may not have these alarms. These can and should be obtained from equipment suppliers for apparatus not so equipped.

5.1.6.1 When the device is a combination self-contained breathing apparatus and air-line respirator (supply-air respirator), either a manual or automatic valve(s) shall be provided to change to the self-contained air supply if the air-line supply fails, and to prevent the wearer breathing contaminated air from the outside atmosphere. If a manual valve is provided, it shall be easily operable and located in a position which is convenient to the wearer. If an automatic valve is provided, a warning also shall be provided to alert the wearer that he is breathing from the self-contained air supply, (1) when his normal air-line supply fails, or (2) when the self-contained air supply falls below 95 percent of its full container pressure. A quick disconnect and check valve shall be provided between the apparatus and the air-line supply hose to permit ready escape from the area, and to prevent loss of breathing air from the device or inhaling the surrounding atmosphere, respectively.

6. PRECAUTIONS

6.1 Breathing air shall meet or exceed the requirements of the specification for Grade D breathing air as described in Compressed Gas Association Commodity Specification G-7.1-1966. See Table 3.

6.1.1 It shall be determined through tests, vendor certification or other means, that all cylinder breathing air meets specifications for Grade D breathing air as set forth in Table 3.

6.1.2 Purchased cylinders of breathing air should be analyzed before use, by the site, for percent oxygen and carbon monoxide and odor, per Table 3.

6.1.3 In addition a complete analysis should be conducted periodically to assure compliance with Table 3 specifications.

6.2 An extensive list of instructions in use and precautions for each type of respirator is given in ANSI Z88.2. Some precautions are given in Table 1 under headings of Limitations and Remarks.

6.3 The manufacturer's instructions or precautions of the ANSI standard should be posted with the respiratory device.

6.4 All persons who may have occasion to use respiratory devices, or cause them to be used, should be properly trained in their use before circumstances require that they use them to protect their lives and the property of the Company. Also, in execution of plant disaster plans, proper training in use of respiratory protective equipment will aid in the performance of smooth and safe rescue or repair operations.

6.5 A slight negative pressure occurs inside the facepiece of face-fitting air-purifying respirators (Table 2C). Care must be taken to obtain an effective seal between the facepiece and face to prevent inward contaminant leakage. Also, demand-type air-supplied respirators and demand-type self-contained respirators operate under negative pressure when the wearer inhales; some inward leakage of contaminant may be possible.

6.5.1 A pressure-demand type self-contained respirator should be used in atmospheres containing contaminants which cannot be detected by smell or where special precautions must be taken to prevent the wearer from inhaling any trace of contaminant. In this type equipment a small positive pressure is maintained inside the facepiece at all times, such that if a leak should develop, there would be no leakage of contaminant into the facepiece.

6.6 A proper seal cannot be established if the temple bars of eye glasses extend through the sealing edge of full-face masks.

6.6.1 All eyepieces in full-face masks approved by the Bureau of Mines will pass the ball drop test, but some plastic eyepieces may not pass the needle drop test (S4H). Current schedules of the Bureau of Mines, however, require that eyepieces shall meet the pertinent requirements for impact and penetration specified in the most recent ANSI Z87.1 Safety Code for Eye Protection.

Portions printed in red are from OSHA regulations, Section 1910.134.



DUP 0960510

6.6.2 As a temporary measure with full-face pieces, glasses with short temple bars or without temple bars may be taped to the wearer's head. Full-face masks have been developed with systems for mounting corrective lenses inside the facepiece.

6.6.3 A half-mask facepiece should not interfere with the wearer's use of spectacles or goggles. Proper selection of equipment normally will eliminate any problem of proper fit when using a combination of half-mask facepiece and spectacles or goggles.

6.7 A proper seal may not be established if the respirator user has a heavy beard or sideburns. Restrictions on facial hair on employee assignment may be necessary in areas where the use of respirating protection is required.

6.8 Conventional respirators do not constitute an absolute barrier to transmission of speech. The respirator exhalation valve usually provides a satisfactory pathway for speech transmission over short distances in relatively quiet areas. Speech transmission devices are available. (Caution: check for acceptability of electrical classification for use in hazardous areas.)

6.9 Major problems in the use of full-face masks at low temperatures are poor visibility and freezing of exhalation valves. Antifog compounds can be used to coat the inside of the eyepiece to prevent its fogging down to about 32 F. Below 0 F, however, antifog compound will not prevent severe fogging.

6.10 Hoses for air supply should be selected to resist chemicals to which they may be exposed.

7. CARE

7.1 General. A centralized maintenance, cleaning, and storage station should be used to care for respiratory protective equipment.

7.2 Procedures Applicable to All Respirators

7.2.1 Inspection. All respirators shall be inspected at regular intervals to make sure that they are ready to use.

7.2.1.1 Self-contained breathing apparatus shall be inspected monthly.

7.2.2 Maintenance. When it is necessary to replace worn or deteriorated parts, only those made specifically for the device shall be used; and the repair work shall be accomplished by trained personnel. For most plants, it is

preferable that parts of this type be replaced as a unit or returned to the manufacturer for repair.

7.2.3 Cleaning and Disinfecting. Respiratory protective equipment, except canisters and cartridges, should be cleaned and disinfected after each use, unless assigned to individuals, when they should be cleaned at least after each day's use.

7.2.4 Storage. All respiratory protective equipment shall be stored in a clean, cool, dry place, out of direct sunlight, under conditions of moderate temperature.

7.3 Special Procedures for Maintaining, Cleaning, Disinfecting, and Storing Respirators

7.3.1 Self-Contained Breathing Apparatus. In demand-type (Table 1B), the cylinder pressure should be checked periodically and brought to rated pressure if necessary. (Minimum pressure is 1600 psi at 70 F.) Recharge after each use, following manufacturer's instructions. Follow manufacturer's instructions on tightness tests for self-contained respirators and hydrostatic testing of compressed-air cylinders.

7.3.2 Cylinders shall be tested and maintained as prescribed in the Shipping Container Specification Regulations of the Department of Transportation (49 CFR, Part 178).

7.3.3 Hose Masks. Check the blower periodically for proper operation. Check hose for wear and tear after each use and steam clean when necessary. Keep hose capped when not in use to prevent entrance of dust or other contaminants.

7.3.4 Air-Line Respirators. The facepiece should be serviced after each use, as for all other respirators. The flow control valves should be inspected after each use and cleaned and repaired, if necessary. Air-line hose should be checked for wear and tear after each use and be steam cleaned when necessary. See 5111 on air-supply system.

7.3.5 Self-Rescuers. Frequent inspection is the most important phase of the maintenance program with this type of equipment because the equipment is seldom used but must always be ready.

7.3.6 Chemical Cartridge Respirators

7.3.6.1 Chemical cartridges should be changed when the wearer detects the odor or irritating effect of the contaminant. Where the expected contaminant has no odor or irritating effect, such as carbon monoxide, a new

Portions printed in red are from OSHA regulations, Section 1910.134.

DUP 0960511



REV. NOV 1975

CONFIDENTIAL

DU 040721

cartridge should be installed in the respirator at the start of each day of use. Mouthpiece respirators should not be used for routine protection against gases or vapors, because breathing through the mouth may bypass the odor or irritation warning of an expended cartridge.

7.3.6.2 In plants with centralized maintenance stations, cartridges sometimes are discarded after a given period of use, based upon group experience. In most cases, the wearer is responsible for discarding and replacing cartridges in his respirator. Respirators issued to individuals should be marked with the individual's name.

7.3.6.3 Particular care should be exercised in the storage of chemical cartridges because usually they deteriorate if exposed to excess moisture and to gaseous air contaminants. Cartridges should not be stored in the area where it is necessary for the workmen to use chemical cartridges.

7.3.7 Mechanical Filter Respirators. Mechanical filters of the "throw-away" type should be discarded when the breathing resistance becomes bothersome to the wearer. Some mechanical filter respirators use reusable filters, in which case the filters are cleaned when the respirator is being serviced.

TABLE 1 - TYPES OF RESPIRATORY PROTECTIVE EQUIPMENT

Table 1A - Air-Supplied Suit

Method of Operation	Air supply from supplied-air breathing apparatus. See SH on air-distribution system.
Use	Operating or repair work where there is exposure to substances that are irritating or corrosive to the skin and mucous membranes, but where the atmosphere is not immediately dangerous to life.
Limitations	The wearing of an impervious suit for any extended period is extremely fatiguing and dangerous unless it is well ventilated. The suit must be impervious to the substance encountered.
Remarks	No U. S. Bureau of Mines approval. For additional information, see Fleming, A. J., D'Alonzo, C. A., and Zapp, J. A., "Modern Occupational Medicine," Chapter 7, "Protective Clothing for the Chemical Industry," Lea and Febiger, Philadelphia (1960). A Ranque-Hilsch vortex tube worn as a portable refrigerator can satisfactorily cool compressed air for personnel wearing industrial protective clothing. The vortex tube is light and small, and can be strapped to the belt where it does not interfere with physical movement. The tube operates on 20-25 dm of compressed air at 80 - 100 psi and delivers 15-18 dm of air cooled 50-60 F below the inlet air temperature. The tube can be reversed and used as a heater.

CONFIDENTIAL



DUP 0960512

TABLE 1 - TYPES OF RESPIRATORY EQUIPMENT (CONTD)
Table 1B - Atmosphere Supplying Respirators

Method of operation	Recirculating	Demand Type	Self-Contained Type			Supplied-Air Respirators			Air-Line Respirator (Type C Supplied-Air Respirator)
			Without Blower (Type A Supplied-Air Respirator)	With Blower (Type B Supplied-Air Respirator)	Without Blower (Type A Supplied-Air Respirator)	With Blower (Type B Supplied-Air Respirator)	Continuous Flow Air-Line Resp	Alternate Blowing Resp	Demand Class Air-Line Resp
In Chemicals which vapor reacts with a granular chemical to liberate O ₂ in a canister. CO ₂ also is removed. Purified breath is inhaled through breathing bag.		Air from 7000 psi cylinders supplied to facepiece. Breath exhaled to atmosphere.		Respirable air is forced through a large-diameter flexible hose by a hand blower to a facepiece. (U.S. Bureau of Mines has schedule with electric motor on blower.)		Respirable air is drawn through a large flexible hose by wearer's breathing effort.			Pressurized air supplied through a small-diameter hose to half-mask facepiece, full facepiece, or a loose fitting hood or hood.
Use	Not approved	Required under conditions immediately dangerous to life and limb or distances over 300 ft from a source of respirable air. Protection for limited periods.	Up to 300 ft of travel from source of respirable air. Protection provided for an unlimited period.	No limitation is imposed to travel from source of respirable air. Protection provided for an unlimited period.	See limitations for Type A at left. Not for emergency work. Not approved in any situation where substitution resistance exceeds 2.5 in. H ₂ O or where substitution resistance exceeds 1 in. H ₂ O. (Hose inlet shall be fitted with a line (200) mesh SST screen, and shall be fastened in a cone of clean fresh air.)	See limitations for Type A at left. Not for emergency work. Not approved in any situation where substitution resistance exceeds 2.5 in. H ₂ O or where substitution resistance exceeds 1 in. H ₂ O. (Hose inlet shall be fitted with a line (200) mesh SST screen, and shall be fastened in a cone of clean fresh air.)	Desirable to protect head and face from flying particles (abrasive blasting, spraying of materials or paint).	When used alone, this device is limited to concentrations of gases or vapors that are not immediately dangerous to life, or from which the wearer can escape unharmed without the aid of the respirator. Not to be worn in oxygen deficient atmosphere. Travel is limited by the length of the air-supply hose. Rescue must be received. Absorption through the skin or skin irritation are possible limitations. Combination air-line respirator and self-contained breathing apparatus may be used in an inbreathable atmosphere. (See 5.1.8.)	Desirable to protect head and face from flying particles (abrasive blasting, spraying of materials or paint).
Limitations		No environmental limitation is imposed to travel from source of respirable air. Protection provided for an unlimited period.	No environmental limitation is imposed to travel from source of respirable air. Protection provided for an unlimited period.	No environmental limitation is imposed to travel from source of respirable air. Protection provided for an unlimited period.	See limitations for Type A at left. Not for emergency work. Not approved in any situation where substitution resistance exceeds 2.5 in. H ₂ O or where substitution resistance exceeds 1 in. H ₂ O. (Hose inlet shall be fitted with a line (200) mesh SST screen, and shall be fastened in a cone of clean fresh air.)	See limitations for Type A at left. Not for emergency work. Not approved in any situation where substitution resistance exceeds 2.5 in. H ₂ O or where substitution resistance exceeds 1 in. H ₂ O. (Hose inlet shall be fitted with a line (200) mesh SST screen, and shall be fastened in a cone of clean fresh air.)	Desirable to protect head and face from flying particles (abrasive blasting, spraying of materials or paint).	When used alone, this device is limited to concentrations of gases or vapors that are not immediately dangerous to life, or from which the wearer can escape unharmed without the aid of the respirator. Not to be worn in oxygen deficient atmosphere. Travel is limited by the length of the air-supply hose. Rescue must be received. Absorption through the skin or skin irritation are possible limitations. Combination air-line respirator and self-contained breathing apparatus may be used in an inbreathable atmosphere. (See 5.1.8.)	Desirable to protect head and face from flying particles (abrasive blasting, spraying of materials or paint).
Remarks	Not approved	Approved for 30 min only. See Air Pk 10 example.	Approved for 30 min only. See Air Pk 10 example.	Approved for 30 min only. See Air Pk 10 example.	See limitations for Type A at left. Not for emergency work. Not approved in any situation where substitution resistance exceeds 2.5 in. H ₂ O or where substitution resistance exceeds 1 in. H ₂ O. (Hose inlet shall be fitted with a line (200) mesh SST screen, and shall be fastened in a cone of clean fresh air.)	See limitations for Type A at left. Not for emergency work. Not approved in any situation where substitution resistance exceeds 2.5 in. H ₂ O or where substitution resistance exceeds 1 in. H ₂ O. (Hose inlet shall be fitted with a line (200) mesh SST screen, and shall be fastened in a cone of clean fresh air.)	Desirable to protect head and face from flying particles (abrasive blasting, spraying of materials or paint).	When used alone, this device is limited to concentrations of gases or vapors that are not immediately dangerous to life, or from which the wearer can escape unharmed without the aid of the respirator. Not to be worn in oxygen deficient atmosphere. Travel is limited by the length of the air-supply hose. Rescue must be received. Absorption through the skin or skin irritation are possible limitations. Combination air-line respirator and self-contained breathing apparatus may be used in an inbreathable atmosphere. (See 5.1.8.)	Desirable to protect head and face from flying particles (abrasive blasting, spraying of materials or paint).

(Not approved for use at Company sites)

REV. SFD 107R

b6

DUP 0960513

DU 040723

REV. SEP 1978

TABLE 1 -- TYPES OF RESPIRATORY EQUIPMENT (CONT'D)

Table VC - All Purifying Respirators

	Chemical-Filter Type			Mechanical-Filter Type Respirators	Combination Chemical and Mechanical Filter Respirators
	Canister Gas Mask (Full Facepiece Respirator)	Chemical Cantridge Respirator (Half Mask Respirator)	Self-Contained Breathing Apparatus		
Method of operation	Toxic gases or vapors removed from inspired air by absorption, adsorption, chemical reaction, or catalysis, or a combination of these in a packed ambient bed of the canister or cartridge. Exhausted breath goes to atmosphere.			Respirators remove particulate matter such as dust, fumes, or mist, from inspired air by capture on the filter, which is usually a fibrous pad.	Some gas mask canisters contain special filters which provide respiratory protection against particulate matter, as well as against gases and vapors. Some chemical cantridge respirators contain filters for the same purpose.
Use	Provides respiratory protection against single or combination of 2 or more gases and vapors.		For escape only. Provides greatest protection consistent with size of device.	Designed to provide respiratory protection against a single specific dust, fume, or mist, a single class such as basic dusts or a combination of several classes of particulate matter such as dusts, fumes, and mists. It offers no protection against gases or vapors.	For particulate matter, gases and vapors in concentration within capacity of the device.
Limitations	See Section 4. Cannot be used in atmospheres irritating to the skin. Limited to use in atmospheres containing at least 18% oxygen and to the minimum gas concentration for which the specific canister is recommended (generally 6 1/2% minimum or less). Cannot be used in atmospheres containing too little oxygen or too little air to breathe.	See Section 4. Cannot be used in atmospheres irritating to the skin. Limited to use in atmospheres containing at least 18% oxygen and to the minimum gas concentration for which the specific canister is recommended (generally 6 1/2% minimum or less). Cannot be used in atmospheres containing too little oxygen or too little air to breathe.		Practical limit of concentration is determined by time required to change filter, but these respirators should not be used in high concentrations of particulate matter. Not to be used when flying particles may cause injury, for which condition the abrasive blasting respirator should be used, see Table 1B. Does not protect against oxygen deficiency and toxic vapors or gases.	The limitations of the combination are generally the same as for each type of respirator given on the left. The limitation of dust filters in regard to protection against gases and vapors is mechanical filter type is modified by the protection afforded by the chemical filter respirator against gases and vapors. See Section 4.
Remarks	Canisters are color coded for identification, per ANSI K13.1.	See 7.3.6.	The only Bureau of Mines approved self-rescue type is MSA self-rescue for carbon monoxide. See 7.3.5.		See 7.3.7. U.S. Dept. of Agriculture approves respiratory devices for certain insecticides. See 3.3. Fumes of the pesticides to be filtered out of the air controls the limitations of the filtering element, and none of the strictly tested is a governing factor in selection of equipment. U. S. Bureau of Mines approves mechanical filter respirators according to the following classification: (1) "Pneumoniastis - Producing and Nuisance - Dust Respirators" (2) "Toxic - Dust Respirators (not significantly more toxic than lead)" (3) "Dust Respirators (not significantly more toxic than lead)" (4) "Pure Respirators (not significantly more toxic than lead)"

* Dust - Dispersoids or particulate matter, smaller than 100 microns, formed when solid materials are disintegrated by such processes as crushing, grinding, and abrad-ing.

Fume - Solid dispersoids formed when vapors are condensed from heated metals and other substances.

Notes - Liquid dispersions formed when liquid is disintegrated as in spray, cation, and atomizing.

in 1973 - 1974 as the notes remove when figure 13 was changed all in April, coming, as a result, to:

[illegible]

[REDACTED]

DUP 0960514

DU 040724

TABLE 2 - SELECTION OF RESPIRATORY PROTECTIVE DEVICE

Hazard	Respirator
Oxygen deficiency	Self-contained breathing apparatus Hose mask with blower Combination air-line respirator and self-contained breathing apparatus
Gaseous contaminant Immediately dangerous to life (see 5.1.4)	Self-contained breathing apparatus Hose mask with blower Combination air-line respirator and self-contained breathing apparatus
Not immediately dangerous to life	Air-line respirator Hose mask without blower Chemical-cartridge respirator
Particulate contaminant Immediately dangerous to life (see 5.1.4)	Self-contained breathing apparatus Hose mask with blower Combination air-line respirator and self-contained breathing apparatus
Not immediately dangerous to life	Mechanical filter respirator Air-line respirator Abrasive-blasting respirator Hose mask without blower
Combination gaseous and particulate contaminant Immediately dangerous to life (see 5.1.4)	Self-contained breathing apparatus Hose mask with blower Combination air-line respirator and self-contained breathing apparatus
Not immediately dangerous to life	Air-line respirator Hose mask without Blower Combination chemical and mechanical filter respirators

Note: The self-contained breathing apparatus, combination air-line respirator and self-contained breathing apparatus, and hose mask with blower would give respiratory protection against any of the hazards listed, but these devices are not included in the list of respirators that could be used in the less hazardous situations.

TABLE 3 - BREATHING AIR ANALYSIS†

Gas	Content Analysis
O ₂	19 percent min to 23 percent max
CO	20 ppm max
CO ₂	1,000 ppm max
Hydrocarbons	0.020 mg/liter max (as condensables)
H ₂ O	Dew point less than the lowest probable temperature to be encountered ‡
N ₂	Balance
Odor	Free of all objectionable odors

† See S3T for data on direct reading portable detectors for oxygen and other gases and vapors.

‡ This is necessary to prevent freeze-up and stoppage of air flow to the mask. For tables refer to "Handbook of Compressed Gases."

CONFIDENTIAL

REV. SEP 1978



DUP 0960515

DU 040725