THE CHLORINE INSTITUTE, INC. 342 MADISON AVE., NEW YORK, N.Y. 10017
212 682-4324

NOVEMBER 3, 1978

TO : PLANT SAFETY COMMITTEE; PACKAGING COMMITTEE; AND
PSC RESPIRATORY EQUIPMENT TASK FORCE

FROM : JAMES H. DOYLE

SUBJECT: OSHA CITATION RE. RESPIRATORY PROTECTION VIOLATIONS

The ATTACHED two examples of recent OSHA citations issued as information items that are cause for concern to producers, packagers, and consumers of chlorine.

The Mead incident was particularly surprising in that it would appear that the regional OSHA office is establishing a precedent in the decision that full-facepiece respirators are the minimum acceptable protection for chlorine releases. The Institute reacted to the citation as noted in the ATTACHED correspondence. Whether the protests registered will prove effective in obtaining a concession by the regional OSHA office remains to be seen.

The other citation further illustrates the strict application of OSHA regulations once an incident occurs. Deficiencies in chlorine detectors, written standards for respirator use and inspection, and chlorine exhaust and scrubbing systems are items which would cause problems for many chlorine handling facilities.

A recommended reference to members needing to become more familiar with OSHA inspectors' evaluation method is Program Directive #300-9. For the cost of reproduction, copies of this directive, which covers the OSHA Standard Method for determination of respiratory protective program acceptability, can be obtained from the Institute offices. This document is issued to OSHA field personnel as a guide in administering the respiratory regulations contained in 29 CFR 1910.134.

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PLAINTIFF'S EXHIBIT
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THE CHLORINE INSTITUTE, INC. 342 MADISON AVE., NEW YORK, N.Y. 10017

212-682-4324

Melvin E. Clark, *President*
J. Roger Hirl, *Vice President*
Robert L. Mitchell, Jr., *Executive Director*
Edmund J. Laubusch, *Technical Manager*

September 21, 1978

Mr. Thomas E. Levenhagen
Area Director, OSHA
U.S. Department of Labor
Federal Office Building, Room 634
200 North High Street
Columbus, OH 43215

Re: Chlorine Leak/Mead Corp. and Subcontractors

Dear Mr. Levenhagen:

We appreciate the materials on the subject file which you have sent to us, most recently on September 5th.

As you know, the mission of our Institute is to promote safety in the manufacture, transfer, packaging and use of chlorine. While our membership does not encompass chlorine consumers such as the Mead Corporation (excluding producers whose output is for captive use), our services extend to anyone concerned with chlorine safety. It is, therefore, essential that our posture in such matters truly reflects an industry consensus, as well as that our understanding of statutes and regulations derived therefrom be correct.

We have read the contents of M 4463-513 and the associated notice of contest as related to 29CFR1926.103(a) [Regulations for Construction]. Our interpretation of Table 4, anent contaminants immediately dangerous to life or health, is that it provides for mouthpiece respirators as a viable personal protection means for escape purposes. We do not interpret that in such circumstances provision for full facepiece respirators is mandated. In fact, it is the universal position of the chlorine industry, based on long years of experience and evaluation, that the mouthpiece respirator is vastly superior to the full facepiece respirator in affording effective and immediate protection in the event of an emission during the course of normal work operations. Our reasons include:

* Facial features, in addition to hair and spectacles, make an adequately tight fit of facepiece respirators essentially impossible.
* Donning time for full facepiece respirators, particularly for the untrained and inexperienced, is too long for workers exposed to high chlorine concentrations;

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Continued...

U.S. DEPARTMENT OF LABOR
Occupational Safety and Health Administration
Columbus Area Office - Region V
Federal Office Bldg., Room 634
200 North High Street
Columbus, Ohio 43215

October 19, 1978

Mr. Edward J. Laubusch, Technical Manager
The Chlorine Institute, Inc.
342 Madison Avenue
New York, NY 10017

Dear Mr. Laubusch:

I found your letter on the use of respiratory protection in areas of chlorine exposure very interesting. Your letter, as you recall, was in reference to an OSHA Citation (M4463-513) for violation of 29 CFR 1926.103 (a). You stated in your letter that your interpretation of Table E-4 under this section does not mandate the use of full-facepiece respirators.

Examination of Table E-4 reveals that under the "Hazard" column, chlorine falls under the classification of "Gas and vapor contaminants immediately dangerous to life and health". The respirator requirement for this hazard category does, indeed, permit the use of a self-rescue mouthpiece respirator for escape purposes. However, it is a recognized hazard that chlorine gas is highly irritating to the eyes. This fact is further supported by the National Institute for Occupational Safety and Health (NIOSH) Recommended Standard for exposure to Chlorine: (HEW Publication No. (NIOSH) 76-170), and Occupational Diseases: A Guide to Their Recognition (D-HEW Publication No. (NIOSH) 77-181).

The reason OSHA has required, in this particular citation, full-facepiece respirators is for eye, as well as, respiratory tract protection. Escape from the area of a chlorine leak may be seriously hindered by the irritating effects of chlorine in the eyes.

Your considerations you have expressed are, in some situations, valid but in the case of chlorine, I believe full-facepiece respirators to be the best means of protection.

Should you have any further comments or questions on this subject, I would be happy to discuss them with you.

Sincerely,

Peter M. Schmitt

For Thomas E. Levenhagen
Area Director

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THE CHLORINE INST. INC.

SDE:dh

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October 31, 1978

Mr. Peter Schmitt
U.S. Department of Labor
Federal Office Building - Rm. 634
200 North High Street
Columbus, OH 43215

Dear Mr. Schmitt:

Thank you for your letter of October 19, 1978 in response to ours of September 21 to Mr. Levenhagen concerning OSHA Citation H4463-513.

While there certainly can be no debate that chlorine *in sufficient concentrations*, is a lachrymator, we believe more significant in this instance is the excellent warning property of chlorine at concentrations well below that which could cause any serious human physiological discomfort or disturbance. The characteristic odor threshold for chlorine is generally accepted to be about 0.35 ppm and even lower among more sensitive individuals; that level, as you are aware, is considerably below the current TLV of 1 ppm. As concentration levels increase, the intensely irritating effect of the gas makes it unlikely that any person will remain in a chlorine contaminated atmosphere unless he is unconscious or trapped.

It is noted that you cite the NIOSH Criteria Document for chlorine to support, at least in part, your posture relative to the citation of issue. (Incidentally, while the document is in the public domain, it has never been published in the Federal Register for public input, and of course no rulemaking procedure to amend 29CFR1910.1000 has ever been proposed.) The Institute is in disagreement with much of the material therein contained, including the sensory-based, recommended 0.5 ppm ceiling value for occupational exposures to chlorine (in lieu of the 1 ppm time-weighted average.) Notwithstanding, the chlorine criteria apply "only to the processing, manufacture, use and handling of chlorine...and any extrapolation beyond occupational exposures is not necessarily warranted."

In your letter, you state "The reason OSHA has required, in this particular citation, full-facepiece respirators is for eye, as well as, respiratory tract protection." And you add that "Escape from the area of a chlorine leak may be seriously hindered by the irratating effect of chlorine in the eyes." We disagree with your reasoning for these reasons, in addition to those cited in our letter of September 21:

Continued...

- If, as is a fact, NIOSH approves of mouthpiece respirators even "for escape purposes only," why should the Mead occurrence entail any more restrictive requirements? That is to say, in *any* catastrophic escape situation, the possibility of lachrymation effects exists.

- While we have no expertise in the general matter of OSHA §1926 standards applicable for construction, we would suppose that such appropriate head and eye protection regulations as necessary would be applicable--or otherwise implied under the general duty clause. And on that basis, goggles providing eye protection from irritants (including chlorine) would probably have been required.

- Especially in tight spaces (ie. in a boiler as was the case in the Mead contractor incident), not only would full facepiece respirators be impractical as to bulk and impediment, but they might very well have become damaged and inoperative, as well as contributing other safety hazard potential.

Again, industry experience in the matter of chlorine emissions and protection therefrom is contrary to your opinion as to the relative merits of escape vs. facepiece respirators. Please refer to the enclosed reprint, "Quantitative Fit Testing of Personnel Utilizing a Mouthpiece Respirator."

In our judgement, your position, in effect, proposes that full facepiece respirators should be provided and used, even for escape purposes, wherever and whenever there exists the *potential* for a chlorine leak. That, we believe, is tantamount to a blanket requirement wherever chlorine is manufactured, packaged, transferred, stored and used. We reppectfully disagree, both in principle and in your interpretation of the OSHA standard.

Very truly yours,

THE CHLORINE INSTITUTE, INC.

Edmund J. Laubusch
EJL/deb
Enclosure.

Cc: [illegible] 186

The Knickerbocker News
ALBANY, N. Y.
D 60,813

OCT 18 1978

Area firm fined in wake of gas leak

By ERIC FREEDMAN

The U.S. Occupational Safety and Health Administration has fined Manning Paper Co. of Green Island $1,500 following a chlorine gas leak that hospitalized 21 persons last Aug. 22.

The administration found four serious violations of safety and health requirements, including an inoperable chlorine detector and no respiratory protection program for the plant's 243 employees. The firm, a division of Hammermill Paper Co., still has time to challenge the citation and penalty.

The leak happened about 10:30 a.m. and led to the evacuation of 200 area residents from their homes near the George Street plant. Eighteen Manning employees and three other persons in the neighborhood were taken to Samaritan and St. Mary's hospitals in Troy.

The administration charged Manning Paper failed to provide a safe place to work. In particular, the citation mentioned two emergency chlorine detectors that were not routinely and adequately inspected, tested and maintained. One detector did not work at all in the bleach house, where the leak occurred.

In addition, the agency found the company had no written standard operating procedure for the use of respirators, that some respirators were not stored properly and were covered with tools, and that respirators, airpacks and gas masks were not thoroughly inspected at least once a month, as required.

The citation also charged the company fails to have suitable emergency facilities for workers to flush their eyes and drench their bodies in case of chemical contamination. The agency also found chlorine gas was not carried away by an exhaust system and was not neutralized before being discharged into the atmosphere.

Chlorine, a corrosive, is used by Manning as part of a bleaching process in papermaking.

At low levels, the gas can cause a stinging and burning sensation of the eyes, nose and throat, nosebleeds, headaches and skin irritation.

In higher concentrations, it can cause lung damage, and exposure to excessive levels may be fatal, according to chemists.

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(ii) Goggles that can be worn over corrective spectacles without disturbing the adjustment of the spectacles.

(iii) Goggles that incorporate corrective lenses mounted behind the protective lenses.

(4) Every protector shall be distinctly marked to facilitate identification only of the manufacturer.

(5) When limitations or precautions are indicated by the manufacturer, they shall be transmitted to the user and care taken to see that such limitations and precautions are strictly observed.

(6) Design, construction, testing, and use of devices for eye and face protection shall be in accordance with American National Standard for Occupational and Educational Eye and Face Protection, Z87.1-1968.

1910.134—RESPIRATORY PROTECTION

(a) Permissible practice.

(1) In the control of those occupational diseases caused by breathing air contaminated with harmful dusts, fogs, fumes, mists, gases, smokes, sprays, or vapors, the primary objective shall be to prevent atmospheric contamination. This shall be accomplished as far as feasible by accepted engineering control measures (for example, enclosure or confinement of the operation, general and local ventilation, and substitution of less toxic materials). When effective engineering controls are not feasible, or while they are being instituted, appropriate respirators shall be used pursuant to the following requirements.

(2) Respirators shall be provided by the employer when such equipment is necessary to protect the health of the employee. The employer shall provide the respirators which are applicable and suitable for the purpose intended. The employer shall be responsible for the establishment and maintenance of a respiratory protective program which shall include the requirements outlined in paragraph (b) of this section.

(3) The employee shall use the provided respiratory protection in accordance with instructions and training received.

(b) Requirements for a minimal acceptable program.

(1) Written standard operating procedures governing the selection and use of respirators shall be established.

(2) Respirators shall be selected on the basis of hazards to which the worker is exposed.

(3) The user shall be instructed and trained in the proper use of respirators and their limitations.

(4) Where practicable, the respirators should be assigned to individual workers for their exclusive use.

(5) Respirators shall be regularly cleaned and disinfected. Those issued for the exclusive use of one worker should be cleaned after each day's use, or more often if necessary. Those used by more than one worker shall be thoroughly cleaned and disinfected after each use.

(6) Respirators shall be stored in a convenient, clean, and sanitary location.

(7) Respirators used routinely shall be inspected during cleaning. Worn or deteriorated parts shall be replaced. Respirators for emergency use such as self-contained devices shall be thoroughly inspected at least once a month and after each use.

(8) Appropriate surveillance of work area conditions and degree of employee exposure or stress shall be maintained.

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(9) There shall be regular inspection and evaluation to determine the continued effectiveness of the program.

(10) Persons should not be assigned to tasks requiring use of respirators unless it has been determined that they are physically able to perform the work and use the equipment. The local physician shall determine what health and physical conditions are pertinent. The respirator user's medical status should be reviewed periodically (for instance, annually).

(11) Approved or accepted respirators shall be used when they are available. The respirator furnished shall provide adequate respiratory protection against the particular hazard for which it is designed in accordance with standards established by competent authorities. The U.S. Department of Interior, Bureau of Mines, and the U.S. Department of Agriculture are recognized as such authorities. Although respirators listed by the U.S. Department of Agriculture continue to be acceptable for protection against specified pesticides, the U.S. Department of the Interior, Bureau of Mines, is the agency now responsible for testing and approving pesticide respirators.

(c) Selection of respirators.

Proper selection of respirators shall be made according to the guidance of American National Standard Practices for Respiratory Protection Z88.2-1969.

(d) Air quality.

(1) Compressed air, compressed oxygen, liquid air, and liquid oxygen used for respiration shall be of high purity. Oxygen shall meet the requirements of the United States Pharmacopoeia for medical or breathing oxygen. Breathing air shall meet at least the requirements of the specification for Grade D breathing air as described in Compressed Gas Association Commodity Specification G-7.1-1966. Compressed oxygen shall not be used in supplied-air respirators or in open circuit self-contained breathing apparatus that have previously used compressed air. Oxygen must never be used with air line respirators.

(2) Breathing air may be supplied to respirators from cylinders or air compressors.

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

(ii) The compressor for supplying air shall be equipped with necessary safety and standby devices. A breathing air-type compressor shall be used. Compressors shall be constructed and situated so as to avoid entry of contaminated air into the system and suitable in-line air purifying sorbent beds and filters installed to further assure breathing air quality. A receiver of sufficient capacity to enable the respirator wearer to escape from a contaminated atmosphere in event of compressor failure, and alarms to indicate compressor failure and overheating shall be installed in the system. If an oil-lubricated compressor is used, it shall have a high-temperature or carbon monoxide alarm, or both. If only a high-temperature alarm is used, the air from the compressor shall be frequently tested for carbon monoxide to insure that it meets the specifications in subparagraph (1) of this paragraph.

(3) Air line couplings shall be incompatible with outlets for other gas systems to prevent inadvertent servicing of air line respirators with nonrespirable gases or oxygen.

(4) Breathing gas containers shall be marked in accordance with American National Standard Method of Marking Portable Compressed Gas Containers to Identify the Material Contained, Z48.1-1954; Federal Specification BB-A-1034a, June 21, 1968, Air, Compressed for Breathing Purposes; or Interim Federal Specification GG-B-00675b, April 27, 1965, Breathing Apparatus, Self-Contained.

(e) Use of respirators.

(1) Standard procedures shall be developed for respirator use. These should include all

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information and guidance necessary for their proper selection, use, and care. Possible emergency and routine uses of respirators should be anticipated and planned for.

(2) The correct respirator shall be specified for each job. The respirator type is usually specified in the work procedures by a qualified individual supervising the respiratory protective program. The individual issuing them shall be adequately instructed to insure that the correct respirator is issued. Each respirator permanently assigned to an individual should be durably marked to indicate to whom it was assigned. This mark shall not affect the respirator performance in any way. The date of issuance should be recorded.

(3) Written procedures shall be prepared covering safe use of respirators in dangerous atmospheres that might be encountered in normal operations or in emergencies. Personnel shall be familiar with these procedures and the available respirators.

(i) In areas where the wearer, with failure of the respirator, could be overcome by a toxic or oxygen-deficient atmosphere, at least one additional man shall be present. Communications (visual, voice, or signal line) shall be maintained between both or all individuals present. Planning shall be such that one individual will be unaffected by any likely incident and have the proper rescue equipment to be able to assist the other(s) in case of emergency.

(ii) When self-contained breathing apparatus or hose masks with blowers are used in atmospheres immediately dangerous to life or health, standby men must be present with suitable rescue equipment.

(iii) Persons using air line respirators in atmospheres immediately hazardous to life or health shall be equipped with safety harnesses and safety lines for lifting or removing persons from hazardous atmospheres or other and equivalent provisions for the rescue of persons from hazardous atmospheres shall be used. A standby man or men with suitable self-contained breathing apparatus shall be at the nearest fresh air base for emergency rescue.

(4) Respiratory protection is no better than the respirator in use, even though it is worn conscientiously. Frequent random inspections shall be conducted by a qualified individual to assure that respirators are properly selected, used, cleaned, and maintained.

(5) For safe use of any respirator, it is essential that the user be properly instructed in its selection, use, and maintenance. Both supervisors and workers shall be so instructed by competent persons. Training shall provide the men an opportunity to handle the respirator, have it fitted properly, test its face-piece-to-face seal, wear it in normal air for a long familiarity period, and, finally, to wear it in a test atmosphere.

(i) Every respirator wearer shall receive fitting instructions including demonstrations and practice in how the respirator should be worn, how to adjust it, and how to determine if it fits properly. Respirators shall not be worn when conditions prevent a good face seal. Such conditions may be a growth of beard, sideburns, a skull cap that projects under the facepiece, or temple pieces on glasses. Also, the absence of one or both dentures can seriously affect the fit of a facepiece. The worker's diligence in observing these factors shall be evaluated by periodic check. To assure proper protection, the facepiece fit shall be checked by the wearer each time he puts on the respirator. This may be done by following the manufacturer's facepiece fitting instructions.

(ii) Providing respiratory protection for individuals wearing corrective glasses is a serious problem. A proper seal cannot be established if the temple bars of eye glasses extend through the sealing edge of the full facepiece. As a temporary measure, glasses with short temple bars or without temple bars may be taped to the wearer's head. Wearing of contact lenses in contaminated atmospheres with a respirator shall not be allowed. Systems have been developed for mounting correc-

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tive lenses inside full facepieces. When a workman must wear corrective lenses as part of the facepiece, the facepiece and lenses shall be fitted by qualified individuals to provide good vision, comfort, and a gas-tight seal.

(iii) If corrective spectacles or goggles are required, they shall be worn so as not to affect the fit of the facepiece. Proper selection of equipment will minimize or avoid this problem.

(f) *Maintenance and care of respirators.*

(1) A program for maintenance and care of respirators shall be adjusted to the type of plant, working conditions, and hazards involved, and shall include the following basic services:

(i) Inspection for defects (including a leak check),

(ii) Cleaning and disinfecting,

(iii) Repair,

(iv) Storage

Equipment shall be properly maintained to retain its original effectiveness.

(2)

(i) All respirators shall be inspected routinely before and after each use. A respirator that is not routinely used but is kept ready for emergency use shall be inspected after each use and at least monthly to assure that it is in satisfactory working condition.

(ii) Self-contained breathing apparatus shall be inspected monthly. Air and oxygen cylinders shall be fully charged according to the manufacturer's instructions. It shall be determined that the regulator and warning devices function properly.

(iii) Respirator inspection shall include a check of the tightness of connections and the condition of the facepiece, headbands, valves, connecting tube, and canisters. Rubber or elastomer parts shall be inspected for pliability and signs of deterioration. Stretching and manipulating rubber or elastomer parts with a massaging action will keep them pliable and flexible and prevent them from taking a set during storage.

(iv) A record shall be kept of inspection dates and findings for respirators maintained for emergency use.

(3) Routinely used respirators shall be collected, cleaned, and disinfected as frequently as necessary to insure that proper protection is provided for the wearer. Each worker should be briefed on the cleaning procedure and be assured that he will always receive a clean and disinfected respirator. Such assurances are of greatest significance when respirators are not individually assigned to workers. Respirators maintained for emergency use shall be cleaned and disinfected after each use.

(4) Replacement or repairs shall be done only by experienced persons with parts designed for the respirator. No attempt shall be made to replace components or to make adjustment or repairs beyond the manufacturer's recommendations. Reducing or admission valves or regulators shall be returned to the manufacturer or to a trained technician for adjustment or repair.

(5)

(i) After inspection, cleaning, and necessary repair, respirators shall be stored to protect against dust, sunlight, heat, extreme cold, excessive moisture, or damaging chemicals. Respirators placed at stations and work areas for emergency use should be quickly accessible at all times and should be stored in compartments built for the purpose. The compartments should be clearly marked. Routinely used respirators, such as dust respirators, may be placed in plastic bags. Respirators should not be stored in such places as lockers or tool boxes unless they are in carrying cases or cartons.

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(ii) Respirators should be packed or stored so that the facepiece and exhalation valve will rest in a normal position and function will not be impaired by the elastomer setting in an abnormal position.

(iii) Instructions for proper storage of emergency respirators, such as gas masks and self-contained breathing apparatus, are found in "use and care" instructions usually mounted inside the carrying case lid.

(g) Identification of gas mask canisters.

(1) The primary means of identifying a gas mask canister shall be by means of properly worded labels. The secondary means of identifying a gas mask canister shall be by a color code.

(2) All who issue or use gas masks falling within the scope of this section shall see that all gas mask canisters purchased or used by them are properly labeled and colored in accordance with these requirements before they are placed in service and that the labels and colors are properly maintained at all times thereafter until the canisters have completely served their purpose.

(3) On each canister shall appear in bold letters the following:

(i)—

Canister for .....
(Name for atmospheric contaminant)
or
Type N Gas Mask Canister

(ii) In addition, essentially the following wording shall appear beneath the appropriate phase on the canister label: "For respiratory protection in atmospheres containing not more than ..... percent by volume of ..... ."

(iii) All of the markings specified above should be placed on the most conspicuous surface or surfaces of the canister.

(4) Canisters having a special high-efficiency filter for protection against radionuclides and other highly toxic particulates shall be labeled with a statement of the type and degree of protection afforded by the filter. The label shall be affixed to the neck end of, or to the gray stripe which is around and near the top of, the canister. The degree of protection shall be marked as the percent of penetration of the canister by a 0.3-micron-diameter dioctyl phthalate (DOP) smoke at a flow rate of 85 liters per minute.

(5) Each canister shall have a label warning that gas masks should be used only in atmospheres containing sufficient oxygen to support life (at least 16 percent by volume), since gas mask canisters are only designed to neutralize or remove contaminants from the air.

(6) Each gas mask canister shall be painted a distinctive color or combination of colors indicated in Table I-1. All colors used shall be such that they are clearly identifiable by the user and clearly distinguishable from one another. The color coating used shall offer a high degree of resistance to chipping, scaling, peeling, blistering, fading, and the effects of the ordinary atmospheres to which they may be exposed under normal conditions of storage and use. Appropriately colored pressure sensitive tape may be used for the stripes.

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TABLE I-1

Atmospheric contaminants to be protected against	*Colors assigned**
Acid gases	White.
Hydrocyanic acid gas	White with ½-inch green stripe completely around the canister near the bottom.
Chlorine gas	White with ½-inch yellow stripe completely around the canister near the bottom.
Organic vapors	Black.
Ammonia gas	Green.
Acid gases and ammonia gas	Green with ½-inch white stripe completely around the canister near the bottom.
Carbon monoxide	Blue.
Acid gases and organic vapors	Yellow.
Hydrocyanic acid gas and chloropicrin vapor	Yellow with ½-inch blue stripe completely around the canister near the bottom.
Acid gases, organic vapors, and ammonia gases.	Brown.
Radioactive materials, excepting tritium and noble gases.	Purple (Magenta).
Particulates (dusts, fumes, mists, fogs, or smokes) in combination with any of the above gases or vapors.	Canister color for contaminant, as designated above, with ½-inch gray stripe completely around the canister near the top.
All of the above atmospheric contaminants	Red with ½-inch gray stripe completely around the canister near the top.

*Gray shall not be assigned as the main color for a canister designed to remove acids or vapors.

NOTE: Orange shall be used as a complete body, or stripe color to represent gases not included in this table. The user will need to refer to the canister label to determine the degree of protection the canister will afford.

1910.135—OCCUPATIONAL HEAD PROTECTION

Helmets for the protection of heads of occupational workers from impact and penetration from falling and flying objects and from limited electric shock and burn shall meet the requirements and specifications established in American National Standard Safety Requirements for Industrial Head Protection, Z89.1-1969.

1910.136—OCCUPATIONAL FOOT PROTECTION

Safety-toe footwear for employees shall meet the requirements and specifications in American National Standard for Men's Safety-Toe Footwear, Z41.1-1967.

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American National Stds. Institute

the wearer in carrying out his work should be considered in respirator selection.

Air-purifying respirators present minimal interference with the wearer's movement. Supplied-air respirators with trailing hoses severely restrict the area the wearer can cover and present a potential hazard where the trailing hose can come in contact with machinery. Self-contained breathing apparatus present a size and weight penalty which may restrict climbing and movement in tight places.

The wearer's work rate determines his respiratory minute volume, maximum inspiratory flow rate, and inhalation and exhalation breathing resistance. The respiratory minute volume is of great significance in self-contained and air-line respirators operated from cylinders since it determines their operating life. Useful life under moderate work conditions may be one-third that under rest conditions.

Peak airflow rate is important in the use of constant-flow air-line equipment. The air-supply rate should always be greater than the peak inspiratory flow rate to maintain the respiratory enclosure under positive pressure.

High breathing resistance of air-purifying respirators under conditions of heavy work can result in distressed breathing.

6.5.3 *Vision.* All facepieces will restrict, to some degree, the wearer's vision. This may increase accident potential. Other problems include wearing of prescription glasses and fogging of the respirator lens (see 9.1, 9.2, and 9.3).

6.5.4 *Communications.* Effective speech communication may be required in jobs for which the respirator is being selected. Section 9.5 provides information in this subject.

6.5.5 *Temperature Extremes.* The ability to cope with stress caused by temperature extremes is especially important in emergency situations when only immediately available respirators can be used. See 9.3 and 9.4 for further details on use of respirators in temperature extremes.

6.5.6 *Eye Protection.* Where required, full-facepiece respirator eyepieces and eye protection worn with half-mask facepieces shall meet the pertinent requirements of American National Standard Practice for Occupational and Educational Eye and Face Protection, Z87.1-1968.

6.6 Employee Acceptance and Face Fit. These factors are of prime importance in respirator selection. The wearer's acceptance of a particular respirator depends on the lack of facepiece discomfort, interference with vision, weight of the device, breathing resistance, and individual physical condition and psychological factors. The ability to form a good facepiece-to-face seal depends on respirator design and facial features, and is usually the most important factor in obtaining proper protection with an air-purifying respirator, particularly of the half-mask type. See 7.5 for a discussion of face-fit tests and procedures.

7. Use of Respirators

7.1 Operating Procedures. Standard procedures shall be developed for respirator use. These should include all information and guidance necessary for their proper selection, use, and care. Possible emergency and routine uses of respirators should be anticipated and planned for.

7.2 Issuance of Respirators. The correct respirator shall be specified for each job. The respirator type is usually specified in the work procedures by a qualified individual supervising the respiratory protective program. The individual issuing them shall be adequately instructed to insure that the correct respirator is issued. Each respirator permanently assigned to an individual should be durably marked to indicate to whom it was assigned. This mark shall not affect the respirator performance in any way. The date of issuance should be recorded.

7.3 Use in Dangerous Atmospheres. Written procedures shall be prepared covering safe use of respirators in dangerous atmospheres that might be encountered in normal operations or in emergencies. Personnel shall be familiar with these procedures and the available respirators.

In areas where the wearer, with failure of the respirator, could be overcome by a toxic or oxygen-deficient atmosphere, at least one additional man shall be present. Communications (visual, voice, or signal line) shall be maintained between both or all individuals present. Planning shall be such that one individual will be unaffected by any likely incident and have the proper rescue equipment to be able to assist the other(s) in case of emergency. See 6.3.1 and 6.3.2 for guidance on selection of respirators for use in dangerous atmospheres.

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7.4 Training and Education in Proper Use. For safe use of any respirator, it is essential that the user be properly instructed in its selection, use, and maintenance. Both supervisors and workers shall be so instructed by competent persons.

Minimum training shall include the following:

(1) Instruction in the nature of the hazard, whether acute, chronic, or both, and an honest appraisal of what may happen if the respirator is not used.

(2) Explanation of why more positive control is not immediately feasible. This shall include recognition that every reasonable effort is being made to reduce or eliminate the need for respirators.

(3) A discussion of why this is the proper type of respirator for the particular purpose.

(4) A discussion of the respirator's capabilities and limitations.

(5) Instruction and training in actual use of the respirator (especially a respirator for emergency use) and close and frequent supervision to assure that it continues to be properly used.

(6) Classroom and field training to recognize and cope with emergency situations.

(7) Other special training as needed for special use.

Training shall provide the men an opportunity to handle the respirator, have it fitted properly, test its facepiece-to-face seal, wear it in normal air for a long familiarity period, and, finally, to wear it in a test atmosphere.

7.5 Facepiece Fit Tests and Procedures. Every respirator wearer shall receive fitting instructions including demonstrations and practice in how the respirator should be worn, how to adjust it, and how to determine if it fits properly. Respirators shall not be worn when conditions prevent a good face seal. Such conditions may be a growth of beard, sideburns, a skull cap that projects under the facepiece, or temple pieces on glasses. Also, the absence of one or both dentures can seriously affect the fit of a facepiece. The worker's diligence in observing these factors shall be evaluated by periodic checks.

To assure proper protection, the facepiece fit shall be checked by the wearer each time he puts on the respirator. This may be done by following the manufacturer's facepiece-fitting instructions such as these two simple field tests:

(1) Positive Pressure Test. Close the exhalation valve and exhale gently into the facepiece. The face fit is considered satisfactory if a slight positive pressure can be built up inside the facepiece without any evidence of outward leakage of air at the seal. For most respirators, this method of leak testing requires that the wearer first remove the exhalation valve cover and then carefully replace it after the test.

(2) Negative Pressure Test. Close off the inlet opening of the canister or cartridge(s) by covering with the palm of the hand(s) or by replacing the seal(s), inhale gently so that the facepiece collapses slightly, and hold the breath for ten seconds. If the facepiece remains in its slightly collapsed condition and no inward leakage of air is detected, the tightness of the respirator is probably satisfactory.

Potential users of respirators should also be required to test their facepiece fit by wearing the respirator under realistic test conditions. A concentration of 100 parts per million isoamyl acetate vapor (obtained by vaporizing 17.3 milliliters of isoamyl acetate for each 1,000 cubic feet of room volume) may be prepared in a special chamber, a small plastic enclosure, or in a vacant room. If the person wearing the respirator can enter and remain in this test atmosphere without detecting the odor of isamyl acetate, he has a good fit. If he detects the odor, he should retreat to fresh air, readjust the facepiece, and repeat the test. If leakage is still noted, it can be concluded that this particular respirator will not protect the wearer. The wearer should not continue to tighten the headband straps until they are uncomfortably tight, simply to achieve a gas-tight face fit. If fitted too tightly, the wearer will not wear the respirator or will wear it fitting comfortably loose and will not have a gas-tight seal.

Particulate-filter respirators can frequently be adapted for use with chemical cartridges and may also be tested for face fit in isoamyl acetate.

To check the fit of a respirator equipped with a high-efficiency particulate filter, an irritant smoke tube (glass tube 12 centimeters long by 1 centimeter diameter, filled with stannic chloride-impregnated pumice) produces a very irritating smoke when air is blown through it. The smoke is directed at the facepiece seal and leakage is indicated by irritation of the throat and lungs. (When testing half-mask facepieces,

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do not direct the smoke into the eyes and instruct the wearer to keep his eyes closed during the test.) Freshly produced smoke particles from this tube range from less than 0.1 to 3 microns in diameter. The glass tube is scored at each end for easy breaking. A squeeze bulb with a short rubber tube aspirates air through the tube; visible smoke is immediately formed by contact with moisture in the air. The irritant is hydrochloric acid absorbed on the particulate. A similar smoke is produced with a sulfur trioxide or titanium tetrachloride tube.

Several methods of determining facepiece fit are described in detail in the *Respiratory Protective Devices Manual*, published by the American Industrial Hygiene Association and the American Conference of Governmental Industrial Hygienists in 1963.

8. Maintenance and Care of Respirators

8.1 General. A program for maintenance and care of respirators shall be adjusted to the type of plant, working conditions, and hazards involved, and shall include the following basic services:

(1) inspection for defects (including a leak check)

(2) cleaning and disinfecting

(3) repair

(4) storage.

Equipment shall be properly maintained to retain its original effectiveness.

8.2 Inspection. All respirators shall be inspected routinely before and after each use. A respirator that is not routinely used but is kept ready for emergency use shall be inspected after each use and at least monthly to assure that it is in satisfactory working condition.

Self-contained breathing apparatus shall be inspected monthly. Air and oxygen cylinders shall be fully charged according to the manufacturer's instructions. It shall be determined that the regulator and warning devices function properly.

Respirator inspection shall include a check of the tightness of connections and the condition of the facepiece, headbands, valves, connecting tube, and canisters. Rubber or elastomer parts shall be inspected for pliability and signs of deterioration. Stretching and manipulating rubber or elastomer parts with a massaging action will keep them pliable and flexible and prevent them from taking a set during storage.

A record shall be kept of inspection dates and findings for respirators maintained for emergency use.

8.3 Cleaning and Disinfection. Routinely used respirators shall be collected, cleaned, and disinfected as frequently as necessary to insure that proper protection is provided for the wearer. Each worker should be briefed on the cleaning procedure and be assured that he will always receive a clean and disinfected respirator. Such assurances are of greatest significance when respirators are not individually assigned to workers. Respirators maintained for emergency use shall be cleaned and disinfected after each use.

The following procedure is recommended for cleaning and disinfecting respirators:

(1) Remove any filters, cartridges, or canisters.

(2) Wash facepiece and breathing tube in cleaner-disinfectant or detergent solution (see following paragraphs). Use a hand brush to facilitate removal of dirt.

(3) Rinse completely in clean, warm water.

(4) Air dry in a clean area.

(5) Clean other respirator parts as recommended by manufacturer.

(6) Inspect valves, headstraps, and other parts; replace with new parts if defective.

(7) Insert new filters, cartridges, or canisters; make sure seal is tight.

(8) Place in plastic bag or container for storage.

Cleaner-disinfectant solutions are available that effectively clean the respirator and contain a bactericidal agent. The bactericidal agent is generally a quaternary ammonium compound. The respirator may be immersed in the solution, rinsed in clean, warm water, and air dried.

Alternatively, respirators may be washed in a liquid detergent solution, then immersed in: 1) a hypochlorite solution (50 parts per million of chlorine) for 2 minutes; 2) an aqueous iodine solution (50 parts per million of iodine) for 2 minutes; or 3) a quaternary ammonium solution (200 parts per million of quarternary ammonium compounds in water with less than 500 parts per million total hardness).

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