

USE AND SERVICING OF RESPIRATORS
July 15, 1976

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DEPARTMENT OF
SAFETY AND
TECHNICAL EMPLOYMENT

Salt Lake City, Utah
July 15, 1976

TO ALL MANAGERS
AND SAFETY MEN
ASARCO, FEDERATED AND U.S. MINES

RE: THE USE AND SERVICING OF RESPIRATORS

On April 19, 1974 a list was sent from this department to all recipients of this letter advising that certain ANSI Standards should be purchased as they were part of OSHA Standards. Z88.2-1969 - Practices for Respiratory Protection was one of those listed. If you have not purchased this particular standard, please do so immediately.

The following information is given to you as a guideline in the servicing and issuing of respirators.

1. Each man should be issued his own respirator. It should be marked plainly and durably. Cartridges should be marked with the same number. They should be used as a unit.
2. Enclosed is part of Z88.2 which gives the outline for a training and education program and also facepiece fit tests and maintenance and care of respirators. The training and fitting procedures as outlined should be followed. Our training program and fitting should be written up for OSHA Inspectors. It could be copied from material enclosed from Z88.2-1969.

The maintenance and care of respirators is very important. We were recently cited at the East Helena Plant for not following a good cleaning and disinfecting procedure which is also enclosed in this writeup as it is part of Z88.2.

In talking with the OSHA people in Washington, D.C. regarding respirator servicing, it was suggested that we have four separate washing compartment tubs, one for soaking with a quality detergent, the second for a hand washing, the third for a disinfectant, and the fourth for rinsing. If Numbers 2 and 3 are combined, it may be possible to get by with 3 tubs.

Respirators after being cleaned and dried should be placed in plastic bags and properly stored. They should not be crowded or bent or stored in any manner which could deform the facepiece. Also for your information refer to Section C, Sub Part 1, Personal Protective Equipment under 1910.132 OSHA Standards. This again refers to the use of Z88.2 to facilitate the drying of respirators.

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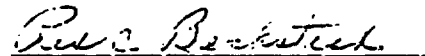
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Am enclosing material from Grieve Corporation on portable electric bench drying ovens. Some of the plants have used this equipment and it has proven very satisfactory. However we did not purchase all of the necessary additional attachments to make for the best drying procedure. Under Specifications would order Model PL-225.

Under Additional Equipment, you will note I have checked certain features which should be added. We should also order the oven stands and exhaust chamber as this would remove moisture from the cleaning area. Delivery is from four to six weeks, terms net 30 days. You will note the need for the removable sliding shelves.

In addition to this information, we are investigating Ultrasonic Cleaning Equipment. As soon as definite information and facts are available regarding same, we will make it available to you.

From information available, OSHA plans to inspect all of the lead smelters and refineries during the year, 1976. The inspections may involve the health problems only. Information for the lead smelters and refineries will be made available on new respirator cartridges which may be approved for SO₂ combination of toxic fumes and dust within the next 3 months.



REX C. BECKSTEAD
Director

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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 isoamyl 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,

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 quaternary ammonium compounds in water with less than 500 parts per million total hardness).

Different concentrations of quaternary ammonium salts are required to achieve a disinfecting solution with waters of varying hardness. Also, dermatitis may occur if the quaternary ammonium compounds are not completely rinsed from the respirator. The hypochlorite and iodine solutions are not stable; they age rubber parts, and are corrosive to metallic parts. Therefore, immersion times should not be extended and the disinfectants shall be thoroughly rinsed from the respirator parts.

Strong cleaning and disinfecting agents can damage respirator parts. Temperatures above 185 degrees Fahrenheit and vigorous mechanical agitation should not be used. Solvents which affect elastomer or rubber parts should be used with caution.

Respirators may be contaminated with toxic materials (that is, organic phosphate pesticides and radionuclides). If the contamination is light, normal cleaning procedures should provide satisfactory decontamination; if heavy, a separate decontamination step may be required before cleaning.

For complete decontamination against phosphate pesticides, the respirator should be washed with alkaline soap and rinsed with 50 percent alcohol (ethyl or isopropyl).

Respirators used to protect against radioactive contaminants should be decontaminated to levels not exceeding 100 disintegrations per minute per 100 square centimeters fixed alpha and 0.2 millirad per hour of beta-gamma above background at contact. There should be no detectable removable activity using standard swipe techniques.

8.4 Repair. 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.

8.5 Storage. 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 stored in compartments built for the purpose, be quickly accessible at all times, and be clearly marked. Rout-

inely 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.

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.

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.

9. Special Problems

9.1 Corrective Lens with Full Facepiece. 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 corrective 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.

9.2 Eyewear with Half-Mask Facepiece. 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.

9.3 Respirator Use in Low Temperatures. Major problems in the use of full facepieces at low temperatures are poor visibility and freezing of exhalation valves. All full facepieces are designed so that the incoming fresh air sweeps over the inside of the lens to reduce fogging. Otherwise, it would be impossible to wear a full facepiece in ordinary room temperatures without severe fogging. Antifog compounds can be used to coat the inside of the lens to prevent fogging at room temperatures and down to temperatures approaching 32 degrees Fahrenheit. However, below zero degrees Fahrenheit, antifog compounds will not prevent severe fogging.