



# Respiratory Protection

Respiratory Protection §1910.134

Memorandum of Understanding

## Background

Respiratory protection is of primary importance since inhalation is one of the major routes of exposure to chemical toxicants. Respiratory protective devices (respirators) consist of a facepiece connected to either an air source or an air-purifying device. Respirators with an air source are called atmosphere-supplying respirators and consist of two types:

- *Self-contained breathing apparatus (SCBAs)* which supply air from a source carried by the user.
- *Supplied-air respirators (SARs)* which supply air from a source located some distance away and connected to the user by an air-line hose. (Supplied-air respirators are sometimes referred to as air-line respirators.)

*Air-purifying respirators*, on the other hand, do not have a separate air source. Instead, they utilize ambient air which is "purified" through a filtering element prior to inhalation.

SCBAs, SARs, and air-purifying respirators are further differentiated by the type of air flow supplied to the facepiece:

- *Positive-pressure respirators* maintain a positive pressure in the facepiece during both inhalation and exhalation. The two main types of positive-pressure respirators are pressure-demand and continuous flow. In pressure-demand respirators, a pressure regulator and an exhalation valve on the mask maintain the mask's positive pressure except during high breathing rates. If a leak develops in a pressure-demand respirator, the regulator sends a continuous flow of clean air into the facepiece, preventing penetration by contaminated ambient air. Continuous-flow respirators (including some SARs and all powered air-purifying respirators (PAPRs)) send a continuous stream of air into the facepiece at all times. With SARs, the continuous flow of air prevents infiltration by ambient air, but uses the air supply much more rapidly than with pressure-demand respirators. Powered air-purifying respirators (PAPRs) are operated in a positive-pressure continuous-flow mode utilizing filtered ambient air. (However, at maximal breathing rates, a negative pressure may be created in the facepiece of a PAPR.)

- *Negative-pressure respirators* draw air into the facepiece via the negative pressure created by user inhalation. The main disadvantage of negative-pressure respirators is that if any leaks develop in the system (i.e., a crack



## Respiratory Protection

in the hose or an ill-fitting mask or facepiece), the user draws contaminated air into the facepiece during inhalation.

When atmosphere-supplying respirators are used, only those operated in the positive-pressure mode are recommended for work at hazardous waste sites.

Different types of facepieces are available for use with the various types of respirators. The types generally used at hazardous waste sites are full facepieces and half masks.

- *Full-facepiece masks* cover the face from the hairline to below the chin. They provide eye protection.
- *Half masks* cover the face from below the chin to over the nose and do not provide eye protection.

Federal regulations require the use of respirators that have been tested and approved by the Mine Safety and Health Administration (MSHA) and NIOSH. Testing procedures are described in 42 CFR Part 84. Approval numbers are clearly written on all approved respiratory equipment.

However, not all respiratory equipment that is marketed is approved. Periodically, NIOSH publishes a list, entitled NIOSH Certified Equipment List of all approved respirators and respiratory components.

### Protection Factor

The level of protection that can be provided by a respirator is indicated by the respirator's protection factor. This number, which is determined experimentally by measuring facepiece seal and exhalation valve leakage, indicates the relative difference in concentrations of substances outside and inside the facepiece that can be maintained by the respirator.

For example, the protection factor for full-facepiece air-purifying respirators is 50. This means, theoretically, that workers wearing these respirators should be protected in atmospheres containing chemicals at concentrations that are up to 50 times higher than the appropriate limits. One source of protection factors for various types of atmosphere-supplying (SCBA and SAR) and air-purifying respirators can be found in American National Standards Institute (ANSI) standard ANSI Z88.2-1980.

At sites where the identity and concentration of chemicals in air are known, a respirator should be selected with a protection factor that is sufficiently high to ensure that the wearer will not be exposed to the chemicals above the applicable limits.



## Respiratory Protection

These limits include the American Conference of Governmental Industrial Hygienists' Threshold Limit Values (TLVs), OSHA's Permissible Exposure Limits (PELs), and the NIOSH Recommended Exposure Limits (RELs). These limits are designed to protect most workers who may be exposed to chemicals day after day throughout their working life. The OSHA PELs are legally enforceable exposure limits, and are the minimum limits of protection that must be met.

It should be remembered that the protection provided by a respirator can be compromised in several situations, most notably, (1) if a worker has a high breathing rate; (2) if the ambient temperature is high or low; or (3) if the worker has a poor facepiece-to-face seal. At high breathing rates, positive-pressure SCBAs and SARs may not maintain positive pressure for brief periods during peak inhalation. Also, at high work rates, exhalation valves may leak. Consequently, positive-pressure respirators working at high flow rates may offer less protection than when working at normal rates.

A similar reduction in protection may result from high or low ambient temperatures. For example, at high temperatures excessive sweat may cause a break in the face-to-facepiece seal. At very low temperatures, the exhalation valve and regulator may become ice-clogged due to moisture in the breath and air. Likewise, a poor facepiece seal – due to such factors as facial hair, missing teeth, scars, lack of or improper fit testing, etc. – can result in the penetration of air contaminants.

### Self-Contained Breathing Apparatus (SCBA)

A self-contained breathing apparatus (SCBA) usually consists of a facepiece connected by a hose and a regulator to an air source (compressed air, compressed oxygen, or an oxygen-generating chemical) carried by the wearer. Only positive-pressure SCBAs are recommended for entry into atmospheres that are immediately dangerous to life and health (IDLH). SCBAs offer protection against most types and levels of airborne contaminants.

However, the duration of the air supply is an important planning factor in SCBA use (see "PPE Use" later in this chapter). This is limited by the amount of air carried and its rate of consumption. Also, SCBAs are bulky and heavy, thus they increase the likelihood of heat stress and may impair movement in confined spaces.

Generally, only workers handling hazardous materials or operating in contaminated zones require SCBAs. Under MSHA regulations in 30 CFR Part 11.70(a), SCBAs may be approved (1) for escape only, or (2) for both entry into and escape from a hazardous atmosphere.



## Respiratory Protection

Escape—only SCBAs are frequently continuous—flow devices with hoods that can be donned to provide immediate emergency protection. Employers should provide and ensure that employees carry an escape SCBA where such emergency protection may be necessary.

Entry-and-escape SCBA respirators give workers untethered access to nearly all portions of the worksite, but decrease worker mobility, particularly in confined areas, due to both the bulk and weight of the units. Their use is particularly advisable when dealing with unidentified and unquantified airborne contaminants.

There are two types of entry-and-escape SCBAs:

- (1) open-circuit and
- (2) closed-circuit.



In an open-circuit SCBA, air is exhaled directly into the ambient atmosphere. In a closed-circuit SCBA, exhaled air is recycled by removing the carbon dioxide with an alkaline scrubber and by replenishing the consumed oxygen with oxygen from a solid, liquid, or gaseous source.

As required by MSHA/NIOSH 30 CFR Part 11.80, all compressed breathing gas cylinders must meet minimum U.S. Department of Transportation requirements for interstate shipment. (For further information, see 49 CFR Parts 173 and 178.) All compressed air, compressed oxygen, liquid air, and liquid oxygen used for respiration shall be of high purity and must meet all requirements of OSHA 29 CFR §1910.134(d). In addition, breathing air must meet or exceed the requirements of Grade D breathing air as specified in the Compressed Gas Association pamphlet G-7.1 and ANSI Z86.1-1973.

### Supplied-Air Respirators (SARs)

Supplied-air respirators (also known as air-line respirators) supply air, never oxygen, to a facepiece via a supply line from a stationary source. SARs are available in positive-pressure and negative-pressure modes. Pressure-demand SARs with escape provisions provide the highest level of protection (among SARs) and are the only SARs recommended for use at hazardous waste sites. SARs are not recommended for entry into IDLH atmospheres (NIOSH/MSHA 42 CFR Part 84) unless the apparatus is equipped with an escape SCBA.

The air source for supplied-air respirators may be compressed air cylinders or a compressor that purifies and delivers ambient air to the facepiece. SARs suitable for use with compressed air are classified as "Type C" supplied-air respirators as defined in NIOSH/MSHA 42 CFR Part 84.



## Respiratory Protection

All SAR couplings must be incompatible with the outlets of other gas systems used on site to prevent a worker from connecting to an inappropriate compressed gas source—OSHA 29 CFR [§1910.134\(d\)](#).

SARs enable longer work periods than do SCBAs and are less bulky. However, the air line impairs worker mobility and requires workers to retrace their steps when leaving the area. Also, the air line is vulnerable to puncture from rough or sharp surfaces, chemical permeation, damage from contact with heavy equipment, and obstruction from falling drums, etc. To the extent possible, all such hazards should be removed prior to use.

When in use, air lines should be kept as short as possible (300 feet (91 meters) is the longest approved hose for SARs), and other workers and vehicles should be kept away from the air line.

The use of air compressors as the air source for an SAR at a hazardous waste site is severely limited by the same concern that requires workers to wear respirators: that is, the questionable quality of the ambient air. Onsite compressor use is limited by OSHA standards 29 CFR §1910.134(d).

### Combination SCBA/SAR

A relatively new type of respiratory protection is available that uses a regulator to combine the features of an SCBA with an SAR. The user can operate the respirator in the SCBA or SAR mode, through either the manual or automatic switching of air sources.

This type of respirator allows entry into and exit from an area using the self-contained air supply, as well as extended work periods within a contaminated area while connected to the air line. It is particularly appropriate for sites where workers must travel an extended distance to a work area within a hot zone and remain within that area for relatively long work periods (e.g., drum sampling).

In such situations, workers would enter the site using the SCBA mode, connect to the air line during the work period, and shift back to the SCBA mode to leave the site.

The combination SCBA/SAR should not be confused with an SAR with escape provisions. The primary difference is the length of air time provided by the SCBA; the combination system provides up to 60 minutes of self-contained air, whereas the escape SCBA contains much less air, generally enough for only 5 minutes. NIOSH certification of the combination unit allows up to 20 percent of the available air time to be used during entry, while the SAR with escape provision is certified for escape only.



# Respiratory Protection

## Respirator Inspection, Cleaning, Maintenance, and Storage §1910.134(f)

Scrupulous respirator maintenance should be made an integral part of the overall respirator program. Manufacturers' instructions for inspection, cleaning, and maintenance of respirators should be followed to ensure that the respirator continues to function properly. Wearing poorly maintained or malfunctioning respirators may be more dangerous than not wearing a respirator at all. The worker wearing a defective device may falsely assume that protection is being provided. Emergency escape and rescue devices are particularly vulnerable to inadequate inspection and maintenance, although they generally are used infrequently, and then in the most hazardous and demanding circumstances. The possible consequences of wearing a defective emergency escape and rescue device are lethal.

The OSHA standards strongly emphasize the importance of an adequate maintenance program, but permit its tailoring to the type of plant, working conditions, and hazards involved. However, all programs are required to include at least:

- inspection for defects (including a leak check);
- cleaning and disinfecting;
- repair; and
- storage.

A proper maintenance program ensures that the worker's respirator remains as effective as when it was new.

### Inspection for Defects

Probably the most important part of a respirator maintenance program is frequent inspection of the devices. If conscientiously performed, inspections will identify damaged or malfunctioning respirators before they can be used. The OSHA requirements outline two primary types of inspection, that while the respirator is in use and that while it is being cleaned. In a small operation, where workers maintain their own respirators, the two types of inspection become essentially one and the same. In a large organization with a central respirator maintenance facility, the inspections differ.





## Respiratory Protection

**Memorandum of Understanding Between the Mine Safety and Health Administration and the National Institute for Occupational Safety and Health Regarding the Respirator Approval Program**

**DEPARTMENT OF LABOR**

**Mine Safety and Health Administration**

**DEPARTMENT OF HEALTH AND HUMAN SERVICE**

**Centers for Disease Control and Prevention**

**AGENCY:** Mine Safety and Health Administration, Labor and National Institute for Occupational Safety and Health, CDC, HHS.

**ACTION:** Notice

**SUMMARY:** This notice is to advise the public of the issuance of a memorandum of understanding (MOU) between the Mine Safety and Health Administration (MSHA), U.S. Department of Labor, and the National Institute for Occupational Safety and Health (NIOSH), Centers for Disease Control, U.S. Department of Health and Human Services. This MOU delineates the roles of both agencies in a new respirator approval program under the provisions of 42 CFR part 84. Concurrently, MSHA is removing 30 CFR part 11 which contained the provisions of the existing respirator approval program. Both the MSHA and NIOSH final rules are published elsewhere in this separate part of the Federal Register.

**DATES:** This MOU will become operative on July 10, 1995.

**FOR FURTHER INFORMATION CONTACT:** Peter M. Turcic, Chief, MSHA Approval and Certification Center, (304) 547-2029, or Richard W. Metzler, Chief, Certification and Quality Assurance Branch, NIOSH Division of Safety Research, (304) 285-5907.

**SUPPLEMENTARY INFORMATION:** On December 10, 1984, MSHA and NIOSH entered into an agreement for consultation, coordination, and cooperation in effectively and efficiently carrying out their respective safety and health functions under the Federal Mine Safety and Health Act of 1977. This MOU supplements the 1984 agreement and, to the extent inconsistent with that agreement, supersedes it. This MOU is being published concurrently with the MSHA and NIOSH final rules addressing the approval of respirators to aid in understanding these rulemakings.



## Respiratory Protection

Dated: May 24, 1995.

**J. Davitt McAteer,**

*Assistant Secretary for Mine Safety and Health, U.S. Department of Labor.*

Dated: May 24, 1995.

**Linda Rosenstock,**

*Director, National Institute for Occupational Safety and Health, Centers for Disease Control and Prevention, U.S. Department of Health and Human Services.*

Memorandum of Understanding Between the Mine Safety and Health Administration and the National Institute for Occupational Safety and Health.

### **I. Introduction**

#### *A. Background*

The Federal Mine Safety and Health Act of 1977 (Mine Act) provides for the protection of the health and safety of our Nation's miners. In furtherance of the goals of the Mine Act, the Secretaries of Health and Human Services (HHS) and Labor coordinate their expertise and activities in the field of mine health and safety. This Memorandum of Understanding (MOU) sets out the procedures to be followed by the Secretaries in coordinating their responsibilities with respect to the joint approval of respirators.

On May 4, 1978, the National Institute for Occupational Safety and Health (NIOSH) of the Department of Health, Education and Welfare, predecessor to HHS, entered into an Agreement with the Mine Safety and Health Administration (MSHA), Department of Labor, to ensure full and effective use of the capabilities and resources of NIOSH and MSHA to assist in planning research and to provide the maximum utilization of technological developments resulting from mine health and safety research. That Agreement was revised on December 10, 1984. This Memorandum of Understanding (MOU) supplements the above mentioned Agreements and, to the extent inconsistent with those Agreements, supersedes them.

#### *B. Purpose*

The purpose of this MOU is to establish procedures to be followed by MSHA and NIOSH in exercising their respective responsibilities for joint approval of certain respirators under the provisions of 42 CFR part 84. It also





## Respiratory Protection

establishes guidelines for interaction between MSHA and NIOSH with respect to issues dealing with respirator certification and related matters. These issues include but are not limited to: certification, quality assurance, and field complaints.

### *C. Authority*

This MOU is consistent with, and is entered into under the authority of, the Mine Act.

## II. Joint Approval of Respirators Used for Mine Rescue and Other Mine Emergencies

### *A. Respirators Subject to Joint Approval*

1. NIOSH will conduct the examinations, inspections and tests of respirators submitted for certification pursuant to the requirements of 42 CFR part 84
2. Except for those respirators used for mine rescue and other mine emergencies, NIOSH is solely responsible to evaluate and certify respirators under the provisions of 42 CFR part 84
3. MSHA and NIOSH will jointly evaluate respirators used for mine rescue and other mine emergencies and subsequently issue a joint certification of approval for such respirators.
4. Respirators used for mine rescue and other mine emergencies include filter self-rescuers (FSRS), self-contained self-rescuers (SCSR), mine rescue apparatus (long duration, closed and open circuit devices), and other self-contained breathing apparatus (SCBA). In the event a new class of respirator is submitted for certification, NIOSH will consult with MSHA concerning the potential for mine use and the need for joint approval.
5. In the event of disagreement as to whether a particular class of respirator is used for mine rescue and other mine emergencies, MSHA will make a final determination.

### *B. Preapproval Procedures*

Prior to MSHA/NIOSH joint approval of respirators used for mine rescue and other mine emergencies, the following procedures will be followed to assist in the determination of whether a candidate respirator has fulfilled the applicable requirements of 42 CFR part 84:

1. MSHA and NIOSH will provide such consultation and assistance to each other as necessary to assure the proper joint approval of respirators and fulfill the intent of 42 CFR part 84
2. MSHA will, by mutual agreement with NIOSH, provide subjects for NIOSH testing of jointly approved respirators in accordance with the pertinent requirements of 45 CFR Part 46 and the Human Subject



## Respiratory Protection

Review Board.

3. As coequals in the joint approval of respirators used for mine rescue and other mine emergencies, MSHA and NIOSH will share access to all examinations, inspections, tests, evaluations and other pertinent information leading to the certification of such respirators.
4. MSHA and NIOSH will jointly evaluate the respirator service life plans and user's manuals for jointly approved respirators.
5. MSHA and NIOSH will jointly establish any limitations to be required for jointly approved respirators.

### *C. Joint Approval*

1. NIOSH will conduct all examinations, inspections and tests of respirators pursuant to the requirements of 42 CFR part 84
2. NIOSH and MSHA will jointly determine whether a candidate respirator intended for mine rescue and other mine emergencies has fulfilled the requirements of 42 CFR part 84. Upon such determination, NIOSH and MSHA will issue a joint respirator approval, which shall include appropriate use limitations.
3. NIOSH and MSHA shall sign the approval certificate and each Agency shall maintain timely processing procedures.

### **III. Quality Assurance**

1. NIOSH and MSHA will notify each other in advance of the intent to conduct audits of respirators and/or manufacturing sites for jointly approved respirators and will invite joint participation in such activities. Care will be taken to prevent duplication or repetition of audit activities.
2. The results of NIOSH or MSHA audits of jointly approved respirators will be shared immediately with the other Agency through established procedures.
3. Discrepancies or nonconformances identified in audits of jointly approved respirators and/or manufacturing sites for jointly approved respirators will be resolved jointly by MSHA and NIOSH.
3. NIOSH will notify MSHA of all respirator discrepancies and nonconformances identified with any respirator bearing the NIOSH certification. If MSHA determines that the respirator in question has significant mine use, MSHA will consult with NIOSH and jointly participate in resolution of mine use problems.



## Respiratory Protection

### IV. Post-Approval Complaints

1. Reports of discrepancies or nonconformances involving jointly approved respirators will be shared immediately between the two agencies and investigations of such discrepancies and nonconformances will be jointly conducted by NIOSH and MSHA.
2. MSHA and NIOSH will jointly participate in the planning and resolution of complaints involving MSHA/NIOSH approved respirators. Such joint participation will include all activities related to product retrofit, recalls, stop sale notices, user notices, and revocation of prior certifications.
3. MSHA and NIOSH will promptly notify each other of respirator field complaints received by either Agency. MSHA will participate with NIOSH in resolution of such complaints only if MSHA determines that the cause of the complaint or its resolution has an impact on the mining industry.

### V. Respirators With Electrical Components

1. Respirators having electrical components and intended for use in mines where methane may be present must be permissible and are subject to the requirements of 30 CFR Part 18. These respirators will be approved for permissibility solely by MSHA. MSHA will independently conduct the examinations, inspections and tests of respirators submitted for certification pursuant to the requirements of 30 CFR Part 18. NIOSH will provide consultation as requested by MSHA.
2. MSHA will independently conduct audits, nonconformance investigations, and resolve nonconformances associated with the electrical components of respirators approved in accordance with 30 CFR Part 18 requirements. A report of all such audit results will be promptly provided to NIOSH by MSHA.
3. MSHA will notify NIOSH in advance of the intent to audit Part 18 respirators. Care will be taken to coordinate audit activities and prevent duplication or unnecessary repetition of audit efforts.

### VI. Administration

This MOU will be administered on behalf of MSHA by the Chief, Approval and Certification Center or by such other representative as the Assistant Secretary for Mine Safety and Health designates in writing to NIOSH.

This MOU will be administered on behalf of NIOSH by the Chief, Certification and Quality Assurance Branch or by such other representative as the Director of NIOSH designates in writing to MSHA.



## Respiratory Protection

### VII. Effective Date, Amendment and Termination

This MOU will become operative on the effective date of 42 CFR part 84 and upon execution of this MOU by both parties. It may be modified or terminated only upon written agreement executed by both parties

