



Respirator Awareness

Overview of Respiratory Standard and Considerations
for Choosing a Respirator

Focusing on Non-IDLH; Air Purifying Respirators



OSHA's Office of Training and Education wishes to acknowledge 3M Occupational Health and Safety Division, MSA, North Safety Products and TSI for contributing some of the graphics used in this program. Appearance of their products does not imply endorsement by the U.S. Department of Labor.



Agenda

Respiratory Standard Overview

What is Required When Choosing A Respirator?

How Do I Know I Am Being Protected?



Respiratory Protection Basics

Preferred Hierarchy of Controls

- ✓ Removal or substitution of hazard or process.
- ✓ Isolation of the hazard.
- ✓ Engineering methods.
- ✓ Safe Work Practices, including PPE/respirators.

Determining Exposure Levels

- ✓ Industrial hygiene monitoring surveys.



Hazard removal/substitution

Some measure for collection care

- Safer solvents
- Integrated Pest Management
- Non-chemical treatments
 - Anoxic environments (CO₂, inert gas)
 - Temperature (freezing, low heat)
- Decontaminate objects with residual pesticides, detritus
- Use of scavenger products in storage.
- Replicate, digitize or replace



Isolating the Hazard

- **Enclose**

- in well-sealed containers,
- under acrylic drawer tops, or
- in vitrines for handling or display



Mercury ores in Marvelseal bags,
NMNH

Engineering controls

Ventilation

- fume hoods,
- down draft tables or
- snorkel trunk capture hoods



Iraqi Jewish Archive (<http://www.ija.archives.gov>)

Safe practices + protective equipment



NMNH Anthropology, k.makos

Minimize dust and hazardous particulates
HEPA-filtered vacuums on objects, case interiors and drawers.

Properly selected respirators, gloves,
chemical protective clothing.



College Art Association (<http://www.collegeart.org>)

EQ

29CFR1910.134

Organization of Standard

- (a) Permissible practice
- (b) Definitions
- (c) Respirator program
- (d) Selection of respirators
- (e) Medical evaluation
- (f) Fit testing
- (g) Use of respirators
- (h) Maintenance and care
- (i) Breathing air quality and use
- (j) Identification of filters, cartridges, and canisters
- (k) Training and information
- (l) Program evaluation
- (m) Recordkeeping
- (n) Dates
- (o) Appendices (mandatory)
 - A: Fit Testing Procedures
 - B-1: User Seal Checks
 - B-2: Cleaning Procedures
 - C: Medical Questionnaire
 - D: Information for Employees Wearing Respirators When Not Required Under the Standard



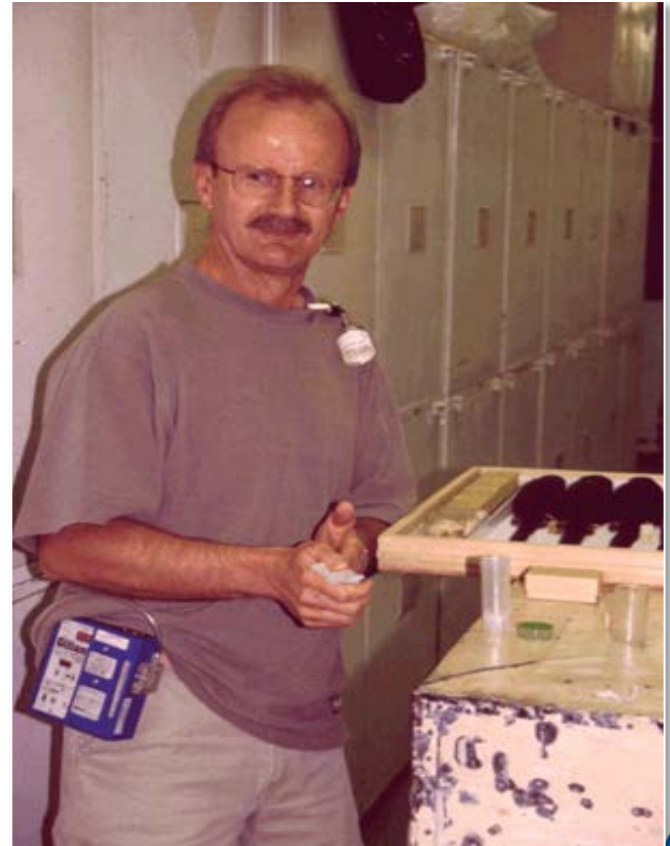
Employee Exposure

Exposure to a concentration of an airborne contaminant that would occur if the employee were not using respiratory protection.



Exposure Monitoring

- Evaluate your workplace to identify potential sources and chemicals
- Obtain data to determine if an exposure exists



Mammals Div curation, NMNH

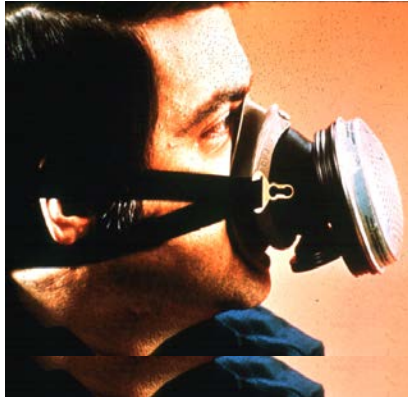
Types of Respirators

Respiratory Inlet Covering

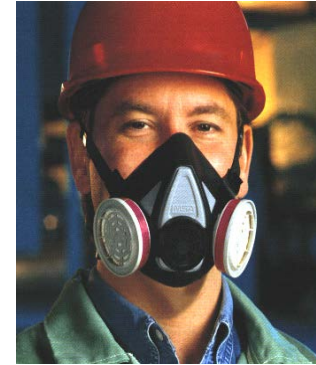
That portion of a respirator that forms the protective barrier between the user's respiratory tract and an air-purifying device or breathing air source, or both



Tight -Fitting Coverings



Quarter Mask



Half Mask



Full Facepiece



Mouthpiece/Nose Clamp
(no fit test required)

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Loose-Fitting Coverings



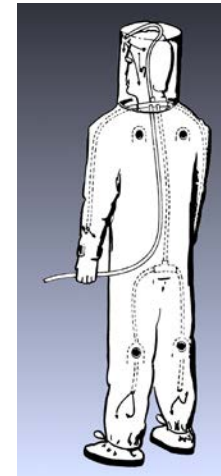
Hood



Helmet



**Loose-Fitting
Facepiece**



Full Body Suit

Filter

A component used in respirators to remove solid or liquid aerosols from the inspired air. Also called **air purifying element**.



Canister or Cartridge

A container with a filter, sorbent, or catalyst, or combination of these items, which removes specific contaminants from the air passed through the container.



Identification of Filters, Cartridges, and Canisters

- All filters, cartridges and canisters used in the workplace must be labeled and color coded with the NIOSH approval label
- The label must not be removed and must remain legible
- “TC number” is no longer on cartridges or filters (Part 84)
- Marked with “NIOSH”, manufacturer’s name and part number, and an abbreviation to indicate cartridge or filter type (e.g., N95, P100, etc.)
- Matrix approval label supplied, usually as insert in box





**PART 84 MATRIX APPROVAL LABEL
FOR P100 FILTER**



DEF MANUFACTURING COMPANY
ANYWHERE, USA
1-800-555-1234

THESE RESPIRATORS ARE APPROVED ONLY IN THE FOLLOWING CONFIGURATIONS:

TC-	PROTECTION ¹	RESPIRATOR	CAUTIONS AND LIMITATIONS ²
84A-00X	P100	HALO 2000	ABC/MNO

1. PROTECTION

P100-Particulate Filter (99.97% filter efficiency level) is effective against all particulate aerosols.

2. CAUTIONS AND LIMITATIONS

- A—Not for use in atmospheres containing less than 19.5% oxygen.
- B—Not for use in atmospheres immediately dangerous to life or health.
- C—Do not exceed maximum use concentrations established by regulatory standards.
- J—Failure to use and maintain this product properly could result in injury or death.
- M—All approved respirators shall be selected, fitted, used, and maintained in accordance with MSHA, OSHA, and other applicable regulations.
- N—Never substitute, modify, add, or omit parts. Use only exact replacement parts in the configuration specified by the manufacturer.
- O—Refer to user instructions and/or maintenance manuals for information about use and maintenance of these respirators.

PART 11 LABEL FOR HEPA FILTER

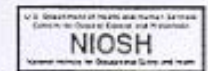
PERMISSIBLE

PERMISSIBLE PARTICULATE FILTER RESPIRATOR FOR DUSTS, FUMES, AND MISTS, INCLUDING ASBESTOS-CONTAINING DUSTS AND MISTS, AND RADIONUCLIDES

MINE SAFETY AND HEALTH ADMINISTRATION
NATIONAL INSTITUTE FOR OCCUPATIONAL
SAFETY AND HEALTH



APPROVAL NO. TC-21C-XXX



ISSUED TO
ABC Company
Anywhere, USA

LIMITATIONS

Approved for respiratory protection against dusts, fumes, and mists having a time-weighted average less than 0.05 milligram per cubic meter, including asbestos-containing dusts and mists, and radionuclides.

Not for use in atmospheres containing toxic gases or vapors.

Not for use in atmospheres immediately dangerous to life or health. Not for use in atmospheres containing less than 19.5% oxygen.

CAUTION

In making renewals or repairs, parts identical with those furnished by the manufacturer under the pertinent approval shall be installed.

Follow the manufacturer's instructions for changing filters. This respirator shall be selected, fitted, used, and maintained in accordance with the regulations of the Mine Safety and Health Administration, the Occupational Safety and Health Administration, and other applicable agencies.

MSHA/NIOSH Approval TC-21C-XXX
Issued to ABC Co. February 31, 1990

The approved assembly consists of the following part numbers:

- 000-000
- 000-000
- etc.



Filtering Facepiece (Dust Mask)

A negative pressure particulate respirator with a filter as an integral part of the facepiece or with the entire facepiece composed of the filtering medium.



Negative Pressure Respirator

A respirator in which the air pressure inside the facepiece is **negative during inhalation** with respect to the ambient air pressure outside the respirator.



Air-Purifying Respirator (APR)

A respirator with an air-purifying filter, cartridge, or canister that removes specific air contaminants by passing ambient air through the air-purifying element.



Positive Pressure Respirator

A respirator in which the pressure inside the respiratory inlet covering exceeds the ambient air pressure outside the respirator.



Powered Air-Purifying Respirator (PAPR)

An air-purifying respirator that uses a blower to force the ambient air through air-purifying elements to the inlet covering.



Atmosphere-Supplying Respirator

- A respirator that supplies the user with breathing air from a source independent of the ambient atmosphere
- Includes supplied-air respirators (SARs) and self-contained breathing apparatus (SCBA) units



Escape-Only Respirator

A respirator intended to be used only for emergency exit.



Respirator Program

- Must develop a **written program** with **worksite-specific procedures** when respirators are necessary or required by the employer
- Must update program as necessary to reflect changes in workplace conditions that affect respirator use

Note: OSHA has prepared a *Small Entity Compliance Guide* that contains criteria for selection of a program administrator and a sample program.



Respirator Program Elements

1. Selection
2. Medical evaluation
3. Fit testing
4. Use
5. Maintenance and care
6. Breathing air quality and use
7. Training
8. Program evaluation



Selection of Respirators

Employer must select and provide an appropriate respirator based on the respiratory hazards to which the worker is exposed and workplace and user factors that affect respirator performance and reliability.



Selection of Respirators (cont'd)

- Select a **NIOSH-certified respirator** that shall be used in compliance with the conditions of its certification
- Identify and evaluate the respiratory hazards in the workplace, including a reasonable estimate of employee exposures and identification of the contaminant's chemical state and physical form

Selection of Respirators cont'd.

- Where exposure cannot be identified or reasonably estimated, the atmosphere shall be considered **Immediately Dangerous to Life or Health (IDLH)**
- Select respirators from a sufficient number of models and sizes so that the respirator is acceptable to, and correctly fits, the user

Immediately Dangerous to Life or Health (IDLH)

- An atmosphere that poses an immediate threat to life, would cause irreversible adverse health effects, or would impair an individual's ability to escape from a dangerous atmosphere.
- An atmosphere with an oxygen content **below 19.5%** by volume

Assigned Protection Factor (APF)

- The **workplace level** of respiratory protection that a respirator or class of respirators is expected to provide to employees when the employer implements a continuing, effective respiratory protection program as specified in this section.

- Use Table 1 for selecting

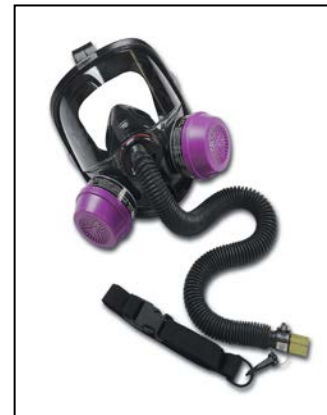


TABLE 1 – ASSIGNED PROTECTION FACTORS⁵

Respirator Type ^{1, 2}	Quarter Mask	Half Mask	Full Face	Helmet/Hood	Loose-Fitting
Air Purifying	5	³ 10	50	-----	-----
PAPR	----- --	50	1,000	⁴ 25/1,000	25
SAR					
Demand	-----	10	50	-----	-----
Continuous Flow	--	50	1,000	⁴ 25/1,000	-
Pressure Demand/ other (+) pressure	----- -- ----- --	50	1,000	-----	25 ----- -
SCBA					
Demand	-----	10	50	50	-----
Pressure Demand/ other (+) pressure	-- ----- --	----- --	10,000	10,000	----- ----- --



Table Notes

¹May use respirators assigned for higher concentrations in lower concentrations or when required use is independent of concentration.

²These APF's are only effective when employer has a continuing, effective respirator program per 1910.134.

³This APF category includes filtering facepieces and elastomeric facepieces.

⁴Must have manufacturer test evidence to support an APF of 1,000 or else these respirators receive an APF of 25.

⁵These APFs do not apply to escape-only respirators. Escape respirators must conform to 1910.134(d)(2)(ii) or OSHA's substance specific standards, if used with those substances.



Maximum Use Concentration (MUC)

- The maximum atmospheric concentration of a hazardous substance from which an employee can be expected to be protected when wearing a respirator, and is determined by the **assigned protection factor** of the respirator or class of respirators and the **exposure limit** of the hazardous substance
- ***MUC = APF x OSHA Exposure Limit¹***

¹ When no OSHA exposure limit is available for a hazardous substance, the employer must determine an MUC on the basis of relevant available information and informed professional judgment.



MUC cont'd.

- Must select a respirator that maintains exposure to the hazardous substance, when measured outside the respirator, at or below the MUC
- Must not apply MUCs to conditions that are IDLH; instead must use respirators listed for IDLH conditions per paragraph (d)(2)

MUC Example

What is the MUC for an employee wearing a half-mask air purifying respirator (APF=10) in an atmosphere of sulfur dioxide gas (PEL=5 ppm)?

$$MUC = APF \times OSHA \text{ Exposure Limit}$$

$$MUC = 10 \times 5 \text{ ppm} = 50 \text{ ppm}$$

Note that this calculated value does not exceed the IDLH level for sulfur dioxide (100 ppm), so that the MUC for this example would be 50 ppm.



End-of-Service-Life Indicator (ESLI)

A system that warns the user of the approach of the **end of adequate respiratory protection**; e.g., the sorbent is approaching saturation or is no longer effective.



Currently, cartridges to absorb Mercury Vapor are only ones with an ESLI.

Respirators for Atmospheres Not IDLH Gases and Vapors

- Atmosphere-supplying respirator, or
- Air-purifying respirator, provided that:
 - **end-of-service-life indicator (ESLI)** certified by NIOSH for the contaminant; or
 - Cartridge change schedule



NIOSH Respirator Certification Requirements

42 CFR Part 84

- On July 10, 1995, 30 CFR 11 (“Part 11”) was replaced by 42 CFR 84 (“Part 84”)
- Only certifications of **nonpowered, air-purifying, particulate-filter respirators** are affected by this change
- Remaining portions of Part 11 were incorporated into Part 84 without change



Respirators for Atmospheres

Not IDLH

Particulates

- Atmosphere-supplying respirator; or
- Air-purifying respirator equipped with
 - Particulate
 - HEPA
 - NIOSH certified



Classes of Nonpowered Air-Purifying Particulate Filters

Nine classes: three levels of filter efficiency, each with three categories of resistance to filter efficiency degradation due to the presence of oil aerosols

<u>N</u>	<u>R</u>	<u>P</u>
100	100	100
99	99	99
95	95	95

N for *Not* resistant to oil

R for *Resistant* to oil

P for oil *Proof*



High Efficiency Filters (HEPA)

- Filter that is at least 99.97% efficient in removing monodisperse particles of 0.3 micrometers in diameter. (HEPA filter per NIOSH 30 CFR 11)
- Equivalent NIOSH 42 CFR 84 particulate filters are the N100, R100, and P100 filters.



Physician or Other Licensed Health Care Professional (PLHCP)

An individual whose legally permitted scope of practice (i.e., license, registration, or certification) allows him/her to independently provide, or be delegated the responsibility to provide, some or all of the health care services required by paragraph (e), *Medical evaluation*.



Medical Evaluation Procedures

- Identify PLHCP
- Complete BEFORE fit testing
- Complete BEFORE use
- Questionnaire
- May require follow-up medical exams

Medical Evaluation

Procedures cont'd.

- Medical evaluation must obtain the information requested by the questionnaire in Sections 1 and 2, Part A of App. C
- Follow-up medical examination is required for an employee who gives a positive response to any question among questions 1 through 8 in Section 2, Part A of App. C or whose initial medical examination demonstrates the need for a follow-up medical examination



Medical Evaluation

Additional Medical Evaluations

- **Annual review** of medical status is **not required**
- At a minimum, employer must provide additional medical evaluations if:
 - Employee reports medical signs or symptoms related to the ability to use a respirator
 - PLHCP, supervisor, or program administrator informs the employer that an employee needs to be reevaluated



Medical Evaluation

Additional Medical Evaluations

- Information from the respirator program, including observations made during fit testing and program evaluation, indicates a need
- Change occurs in workplace conditions that may substantially increase the physiological burden on an employee



Fit Testing

Before an employee uses any respirator with a **negative or positive pressure tight-fitting facepiece**, the employee must be fit tested with the same make, model, style, and size of respirator that will be used.



Qualitative Fit Test (QLFT)

A pass/fail fit test to assess the adequacy of respirator fit that relies on the individual's response to the test agent.



Quantitative Fit Test (QNFT)

An assessment of the adequacy of respirator fit by numerically measuring the amount of leakage into the respirator.



Fit Testing (cont'd)

- Employees using tight-fitting facepiece respirators must pass an appropriate qualitative fit test (QLFT) or quantitative fit test (QNFT):
 - prior to initial use,
 - whenever a different respirator facepiece (size, style, model or make) is used, and
 - at least annually thereafter



Fit Testing (cont'd)

- Must conduct an additional fit test whenever:
 - visual observations of, changes in the employee's physical condition that could affect fit
 - facial scarring,
 - dental changes,
 - cosmetic surgery, or
 - obvious change in body weight)

OSHA Fit Testing Protocols Appendix A

Qualitative Fit Testing Protocol

- Isoamyl acetate
- Saccharin
- Bitrex
- Irritant smoke

Quantitative Fit Testing Protocol

- Generated Aerosol (corn oil, salt, DEHP)
- Condensation Nuclei Counter (PortaCount)
- Controlled Negative Pressure (Dynatech FitTester 3000)
- Controlled Negative Pressure (CNP) REDON



Fit Factor

A **quantitative** estimate of the fit of a particular respirator to a specific individual, and typically estimates the ratio:

Concentration of a substance in ambient air

Concentration inside the respirator when worn

Quarter of half face must have a minimum FF of 100
Full face APR must have a minimum FF of 500



Use of Respirators

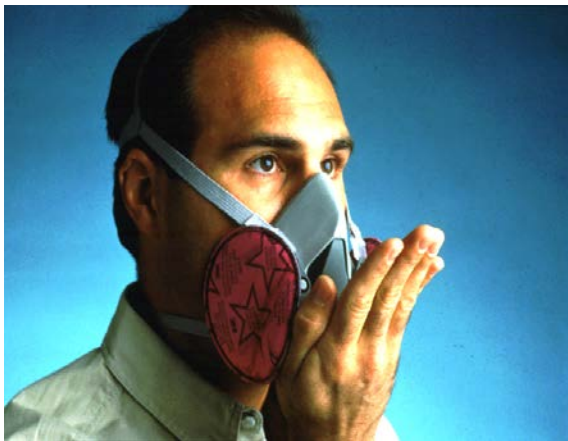
Facepiece Seal Protection

- Tight-fitting facepieces must not be worn interferes with the face-to facepiece seal or valve function:
 - facial hair
 - corrective glasses or goggles
- Must perform a user seal check **each time they put on the respirator**
 - Appendix B-1 or equally effective manufacturer's procedures



User Seal Check

An action conducted by the respirator user to determine if the respirator is properly seated to the face.



**Positive Pressure
Check**



**Negative Pressure
Check**

Maintenance and Care

- Provide each user with a respirator that is clean, sanitary and in good working order
- Use procedures in Appendix B-2 or equivalent manufacturer's recommendations
- Clean and disinfect at the following intervals:
 - as often as necessary when issued for exclusive use
 - before being worn by different individuals when issued to more than one employee
 - after each use for emergency respirators and those used in fit testing and training



Training and Information

Employers must provide effective training to employees who are required to use respirators.



Training and Information

- Employees who are required to use respirators must be trained such that they can demonstrate knowledge of at least:
 - **why** the respirator is necessary and **how** improper fit, **use**, or **maintenance and storage** can compromise its protective effect
 - **limitations and capabilities** of the respirator
 - recognition of **medical signs and symptoms** that may limit or prevent effective use
 - effective use in **emergency** situations
 - how **to inspect, put on and remove, use and check the seals**
 - General requirements of the standard



Training and Information (cont'd)

- Retraining is required annually, and when:
 - changes in the workplace or type of respirator render previous training obsolete
 - there are inadequacies in the employee's knowledge or use
 - any other situation arises in which retraining appears necessary
- Volunteer use = Appendix D

Program Evaluation

Discuss with employees to identify effectiveness

Factors to be assessed include, but are not limited to:

- respirator fit (including effect on workplace performance)
- appropriate selection
- proper use
- proper maintenance



Recordkeeping

- Records of medical evaluations must be retained and made available per 29 CFR 1910.1020
- A record of fit tests must be established and retained until the next fit test is administered
- A written copy of the current program must be retained
- Written materials required to be retained must be made available upon request to affected employees and OSHA



What is Required When Choosing A Respirator?

Summary:

- Know what the hazards are
- Know the level of the hazard
- Identify the correct respirator type/cartridge
- Obtain medical evaluation
- Obtain fit test
- Obtain training

How Do I Know I Am Being Protected?

- Evaluate workplace with changes in processes, chemicals, structure
- Ensure ventilation controls are working properly
- Properly maintain, clean, store respirator
- Ensure cartridge change schedules are followed
- Ensure Seal Checks are conducted before use
- Understand signs and symptoms of exposure
- Utilize respirator that has been fit tested





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