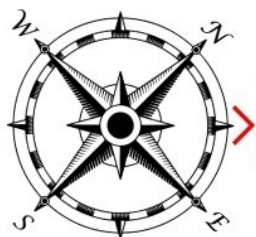


# Respirator Training



**NATIONAL**  
*Safety Services*

# Two Classes of Respirators

- 1) *Air-purifying respirators* - respirators with an air-purifying device that remove air contaminants (such as dusts, fumes, mists, vapors, or fibers) before the air is inhaled. The dirty air is drawn through an air-purifying element and “cleaned” before it reaches the lungs.
- 2) *Atmosphere-supplying respirators* - provide clean breathing air from an uncontaminated source



# Two Operational Modes

- 1) *Negative Pressure* – A type of respirator where wearer has to do the work of breathing in and drawing the dirty air through the cleaning element.
- 2) *Positive Pressure* - A type of respirator where flow of clean air is supplied into the facepiece/mask via a blower/airline.



## Air Purifying Respirators

- Tight-fitting respirator
- Negative pressure
- Only for use against **particles**
- One of most common types used in construction



**“Dust Mask” or “N95” or “Particulate Filtering Facepiece”**  
**OSHA APF = 10**

# Air Purifying Respirators



- Tight-fitting respirator
- Negative pressure
- Uses replaceable **filters**, canisters, or cartridges
- 2<sup>nd</sup> most common type

Half Mask  
OSHA APF = 10

## Air Purifying Respirators

- Tight-fitting respirator
- Negative pressure
- Uses replaceable **filters**, canisters, or cartridges
- Provides eye protection

**Full Face Respirator**  
**OSHA APF = 50**



# Air-Purifying Respirator



PAPR (helmet)  
OSHA APF = 25 or 1000

Loose-fitting respirator

Positive Pressure

Uses replaceable filter (mounted in helmet)

Provides head protection

Powered Air Purifying Respirator (PAPR)



**A Program is REQUIRED:**

1) respirators are necessary due to air contaminant overexposure  
2) When respirators are required by the employer



3) If another OSHA Standard requires respirator use – i.e. the silica standard



Must **update program** as necessary to reflect changes in workplace conditions that affect respirator use



Must designate a **program administrator**

**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**

Conducted annually

Address:

- Procedures for selecting appropriate respirators
- Medical evaluations for respirator users
- Fit-test procedures for tight fitting respirators
- Procedures for proper routine and/or emergency use respirators
- Cleaning, storing, inspecting, repairing, & maintenance
- Ensure adequate quality, quantity, and flow of breathing air
- Respiratory hazards to which employees are exposed
- How to wear, use, and care for their respirators

Employer may provide respirators at employee's request or permit employees to use their own respirators, if employer determines that such use in itself will not create a hazard

If voluntary use of only "disposable filtering face-pieces/N95s/Dust masks" is permissible, employer must at minimum provide users with the information contained in Appendix D (at minimum)

- Voluntary use of any other type of respirator beyond a disposable filtering face-piece requires full implementation of Respiratory Protection Program

# Respiratory Protection- Employer Roles

Employers are required to:

Maintain a written respiratory protection program

Provide instruction on respiratory hazards employees are exposed to

Provide instruction on the uses and limitations of respiratory protection

Instruct and demonstrate to employees how to properly wear respirators

Allow employees to practice procedures

Provide user seal check instructions

Fit test each employee for a respirator

Instruct employees in procedures for maintenance and storage

Inform employees how to recognize medical signs/symptoms that may limit or prevent effective use of respirator

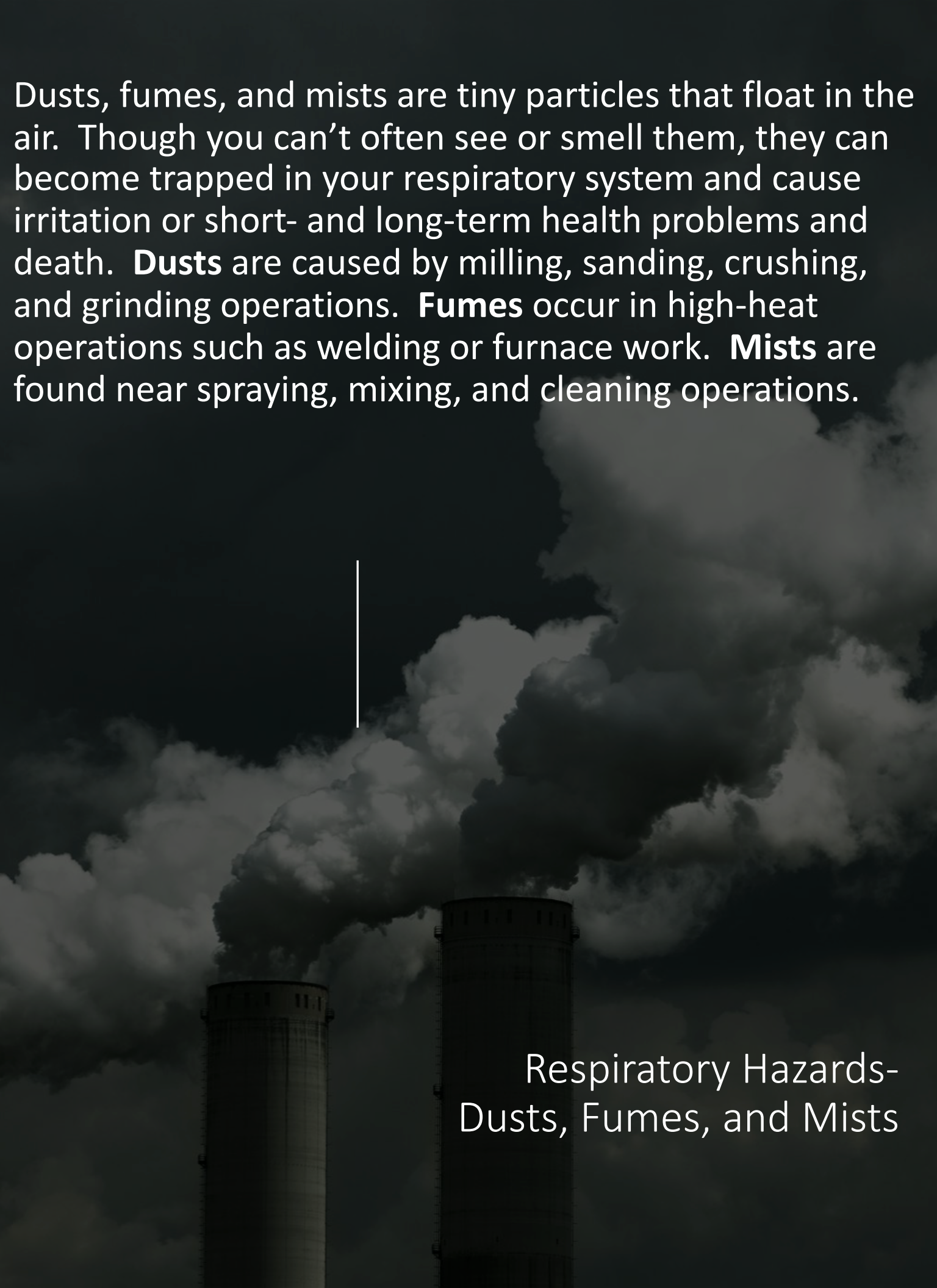
Document fit testing and training for all employees

# When are respirators needed?



- Your health depends on breathing clean air, but in an industrial environment, respiratory hazards may be present.
- These hazards include:
  - Dusts, fumes, and mists
  - Gases and vapors
  - Oxygen deficiency
  - Temperature extremes

Dusts, fumes, and mists are tiny particles that float in the air. Though you can't often see or smell them, they can become trapped in your respiratory system and cause irritation or short- and long-term health problems and death. **Dusts** are caused by milling, sanding, crushing, and grinding operations. **Fumes** occur in high-heat operations such as welding or furnace work. **Mists** are found near spraying, mixing, and cleaning operations.



Respiratory Hazards-  
Dusts, Fumes, and Mists

# Respiratory Hazards- Oxygen Deficiency and Temperature

Oxygen deficiency is simply a lack of oxygen in the air. Oxygen deficiency can cause you to lose consciousness or die in minutes. Oxygen deficiency may occur in enclosed areas.

Temperature extremes may damage your respiratory system. They may occur in high-heat furnaces or freezing processes.



## Uses and Limitations

- Reusable Half Mask and Vapor Respirators
  - These are air-purifying devices that cover your nose, mouth, and chin.
  - Gas and vapor respirators have unique, replaceable cartridges that capture gases and vapors from the air. A prefilter may be attached to the cartridge to trap dusts, fumes, or mists.

# Respirators

## Donning and Adjusting

Instructions for fitting the  
half mask N95

1. Slightly bend the nose  
wire to form a gentle  
curve.

2. Find the two headbands  
and separate using your  
index fingers and thumbs.

3. While holding the  
headbands with your  
index fingers and thumbs,  
cup the respirator under  
your chin.

4. Pull the headbands up  
over your head.



# Respirators- Donning and Adjusting

## Release

- Release the lower headband from your thumbs and position it at the base of your neck.

## Position

- Position the remaining headband on the crown of your head.

## Conform

- Conform the nosepiece across the bridge of your nose by firmly pressing down with your fingers.

## Continue

- Continue to adjust the respirator and secure the edges until you feel you have achieved a good facial fit.



## Performing a Seal Check

- After fitting the respirator, perform a seal check. The shape of your face, presence of facial hair, missing dentures, and certain skin conditions can prevent a proper fit.

# Performing a Seal Check

## Positive Fit Check

With palms over exhalation valve openings, exhale gently into the mask. You should feel pressure in the face piece.



## Negative Fit Check

Place palms over cartridge openings and inhale for 10 seconds. You should feel the mask pull in toward your face.



# Maintenance and Storage

## Half Mask

- If mask becomes clogged, wear a new one then throw away when done.



## Reusable Half Mask

- Wash your respirator in warm water with mild detergent and sanitize. Inspect your respirator regularly for damage. Store it in an air-tight container in a clean, cool, dry place. Replace cartridges as needed and notify your supervisor if repairs are needed.



# 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.

# 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.



# 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
- 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.

## Oxygen Deficient Atmosphere

- An atmosphere with an oxygen content **below 19.5%** by volume
- All oxygen deficient atmospheres are considered IDLH

# Respirators for IDLH Atmospheres



**Full Facepiece Pressure Demand SCBA certified by NIOSH for a minimum service life of 30 minutes**



**Combination Full Facepiece Pressure Demand SAR with Auxiliary Self-Contained Air Supply**

Respirators provided only for escape from IDLH atmospheres shall be NIOSH-certified for escape from the atmosphere in which they will be used.

**Exception:** Employers may use any atmosphere-supplying respirator, provided they can demonstrate, under all foreseeable conditions, that oxygen levels in the work area can be maintained within the ranges specified in Table II (i.e., between 19.5% and a lower value that corresponds to an altitude-adjusted oxygen partial pressure equivalent to 16% oxygen at sea level).

# Assigned Protection Factors (APF's)


Must use the APF's listed in **Table 1** to select a respirator that meets or exceeds the required level of protection

When using a **combination respirator** (e.g., airline with an air-purifying filter), must ensure that the APF is **appropriate to the mode of operation** in which the respirator is being used



**TABLE 1 – ASSIGNED PROTECTION FACTORS<sup>5</sup>**

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



## 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.



# 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



## Selection and Use

- If no oil particles are present, use any series (N, R, or P)
- If oil particles are present, use **only** R or P series
- Follow the respirator filter manufacturer's service-time-limit recommendations

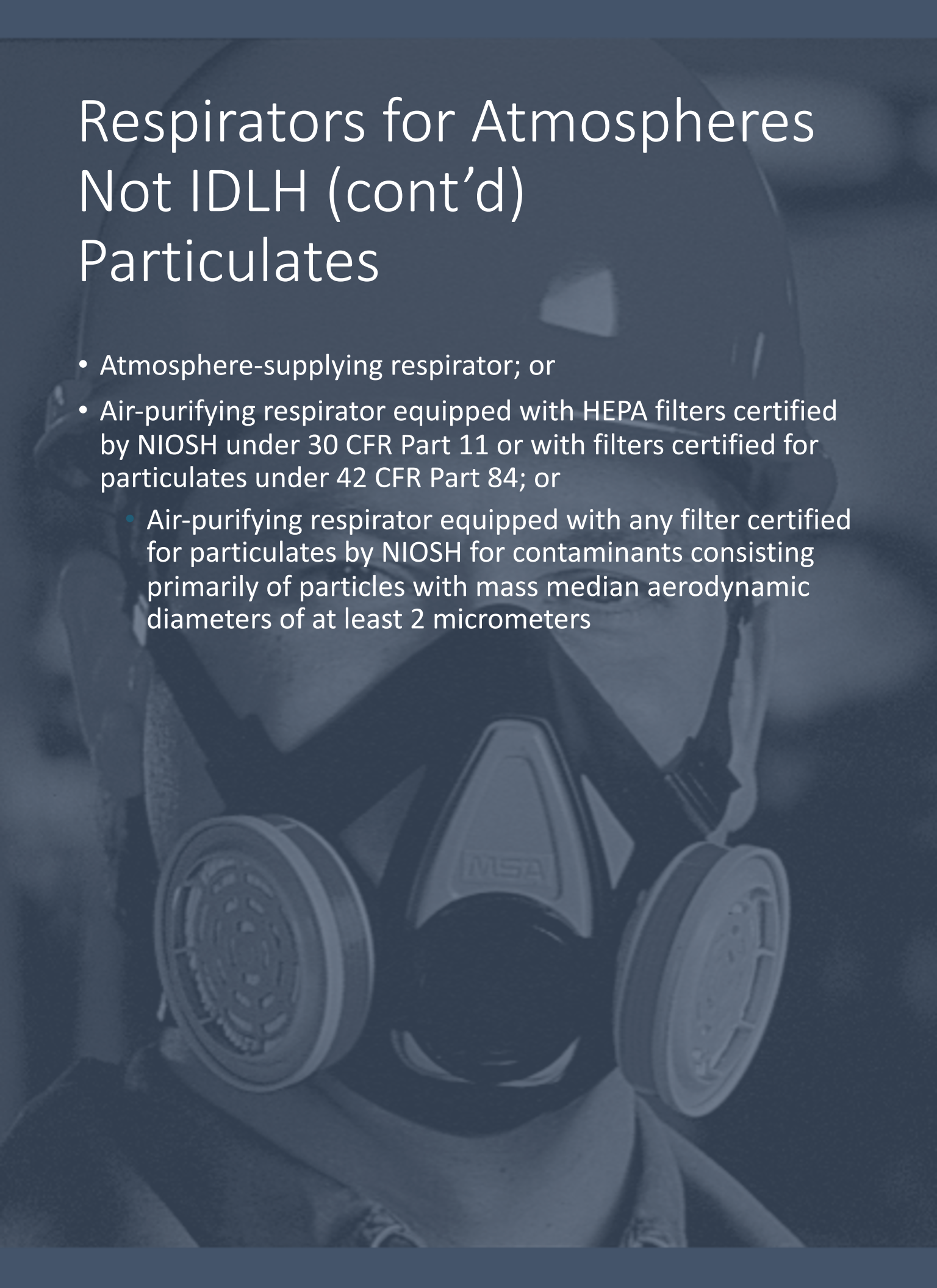


## High Efficiency Filters

- 
- 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)

# Respirators for Atmospheres Not IDLH (cont'd) Particulates

- Atmosphere-supplying respirator; or
- Air-purifying respirator equipped with HEPA filters certified by NIOSH under 30 CFR Part 11 or with filters certified for particulates under 42 CFR Part 84; or
  - Air-purifying respirator equipped with any filter certified for particulates by NIOSH for contaminants consisting primarily of particles with mass median aerodynamic diameters of at least 2 micrometers



# 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)

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

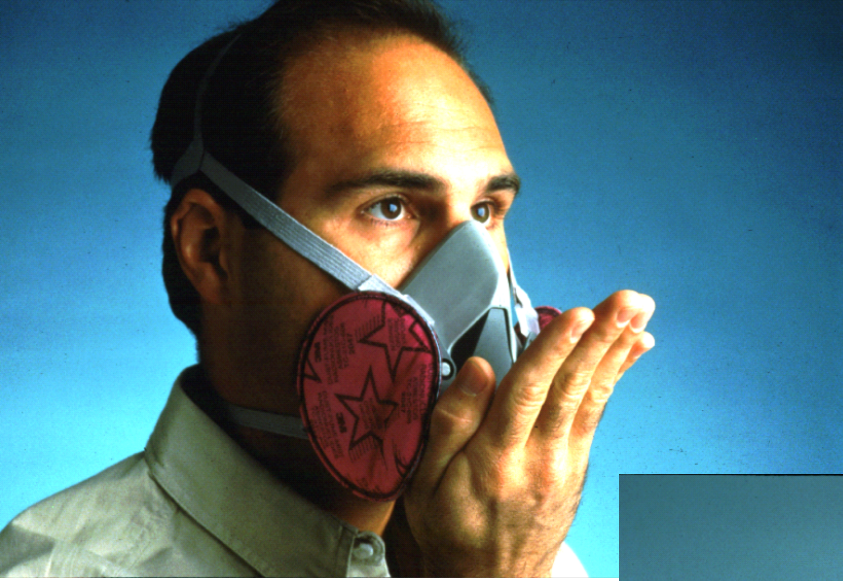
# Fit Testing

- 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
- Must conduct an additional fit test whenever the employee reports, or the employer or PLHCP makes visual observations of, changes in the employee's physical condition (e.g., facial scarring, dental changes, cosmetic surgery, or obvious change in body weight) that could affect respirator fit



The fit test must be administered using an OSHA-accepted QLFT or QNFT protocol contained in Appendix A

- QLFT Protocols:
  - Isoamyl acetate
  - Saccharin
  - Bitrex
  - Irritant smoke
- QNFT Protocols:
  - Generated Aerosol (corn oil, salt, DEHP)
  - Condensation Nuclei Counter (PortaCount)
  - Controlled Negative Pressure (Dynatech FitTester 3000)
  - Controlled Negative Pressure (CNP) REDON



## Use of Respirators

### Facepiece Seal Protection

- Respirators with tight-fitting facepieces must not be worn by employees who have facial hair or any condition that interferes with the face-to-facepiece seal or valve function
- Corrective glasses or goggles or other PPE must be worn in a manner that does not interfere with the face-to-facepiece seal
- Employees wearing tight-fitting respirators must perform a user seal check **each time they put on the respirator** using the procedures in Appendix B-1 or equally effective manufacturer's procedures



## Respirator Effectiveness

- Maintain appropriate surveillance of work area conditions and degree of exposure or stress; reevaluate the respirator's effectiveness when it may be affected by changes in these
- Employees must leave the respirator use area:
  - to wash their faces and respirator facepieces as necessary
  - if they detect vapor or gas breakthrough, changes in breathing resistance, or leakage of the facepiece
  - to replace the respirator or filter, cartridge, or canister
- If employee detects vapor or gas breakthrough, changes in breathing resistance, or leakage of the facepiece, employer must replace or repair the respirator before allowing employee to return to the work area



# 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



## Identification of Filters, Cartridges, and Canisters

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

Must conduct evaluations of the workplace as necessary to ensure effective implementation of the program

Must regularly consult employees required to use respirators to assess their views on program effectiveness and to identify and correct any problems



## Teamwork

Your employer is doing everything possible to protect you from respiratory hazards. For the safety program to work, wear your respirator, take good care of it, and talk over any problems with your supervisor.