Who Was That Masked Worker?

How to Develop an Effective Respiratory Protection Program

Anne Bracker, MPH, CIH
CONN-OSHA Program Manager
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Occupational Health & Safety:
A privilege for none, a right for all

Labor Occupational Health Program

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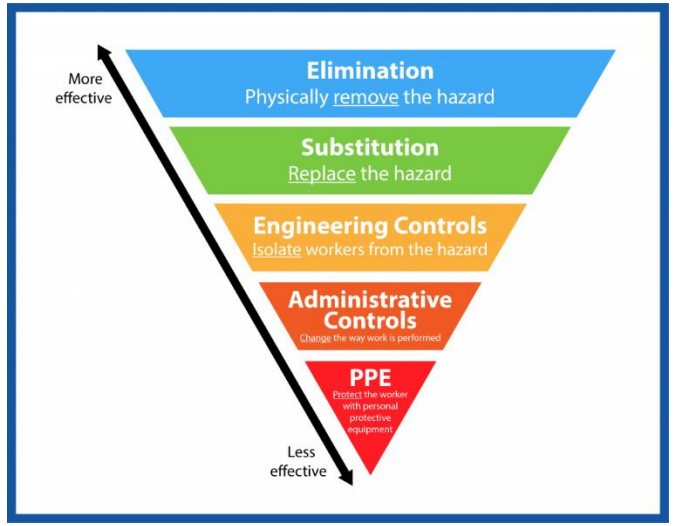
Hierarchy of Controls

- Respirators should only be used as a "last line of defense" when engineering control systems are not feasible.
- Engineering control systems, such as local exhaust ventilation or containment should be used to negate the need for respirators.



Respirators

- Respirators protect the user in two basic ways.
  - The first is by the removal of contaminants from the air.
    - Particulate respirators, which filter out airborne particles
    - "gas masks" which filter out chemicals and gases.
  - Other respirators protect by supplying clean respirable air from another source.
    - Airline respirators
    - Self-contained breathing apparatus (SCBA)

Outline

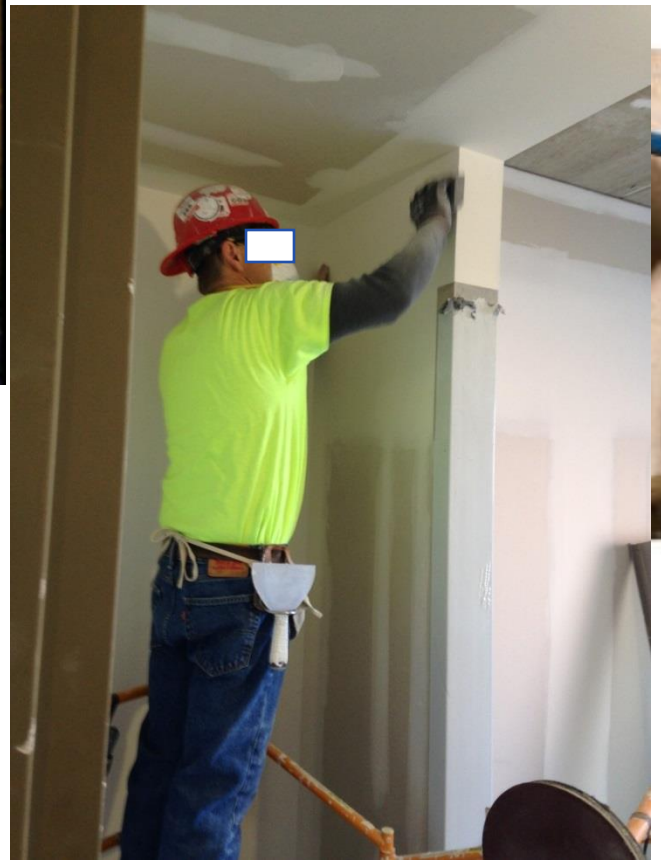
- Respirator Terminology
- OSHA's Respiratory Protection Standard
  - Selection
  - Medical Clearance
  - Fit Testing
  - Maintenance
  - Training
- Consultation Resources

Respirator Terminology

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
- Loose Fitting
  - Hood or Helmet

Tight Fitting



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Loose Fitting

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Mechanisms of Protection

- Air Purifying
  - Particle Removing- Filters
    - **N**ot Resistant to Oil
    - **R**esistant to Oil
    - Oil **P**roof

      95%, 99%, 99.97% efficiency

    - Sedimentation, impaction, interception, diffusion

Classes of Filters

42 CFR Part 84 establishes three series of filters, and each has three levels of efficiency.

	95	99	100
N	N95	N99	N100
R	R95	R99	R100
P	P95	P99	P100

P100 Respirators

- Air purifying
- Tight fitting or loose fitting
- P: oil proof
- **100**: Filter that is at least 99.97% efficient in removing monodisperse particles of 0.3 micrometers in diameter. Known as High Efficiency Particulate Air (HEPA) filter.

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N95 Respirators

- Air purifying
- Tight fitting
- N: not resistant to oil
- 95: 95% effective at reducing exposure to 0.3 micron particles

Can be used to protect workers from airborne infectious agents

Multiple Configurations and Manufacturers

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Surgical masks are not respirators

appropriate for cough etiquette and source control

Hospital Respiratory Protection Program Toolkit

Resources for Respirator Program Administrators

Published in MAY 2015 (updated APRIL 2022)

U.S. Department of Labor

OSHA Occupational Safety and Health Administration

CDC Centers for Disease Control and Prevention

NIOSH National Institute for Occupational Safety and Health

Mechanisms of Protection

- Air Purifying
  - Gas/Vapor Removing
    - Chemical removal mechanisms
    - Maximum use concentration
    - Need good warning properties or ESLI
    - Efficiency declines over time

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Mechanisms of Protection

- Atmosphere Supplying
  - Supplied Air
    - OK for IDLH or <19.5% oxygen
    - Grade D air
    - Need all components

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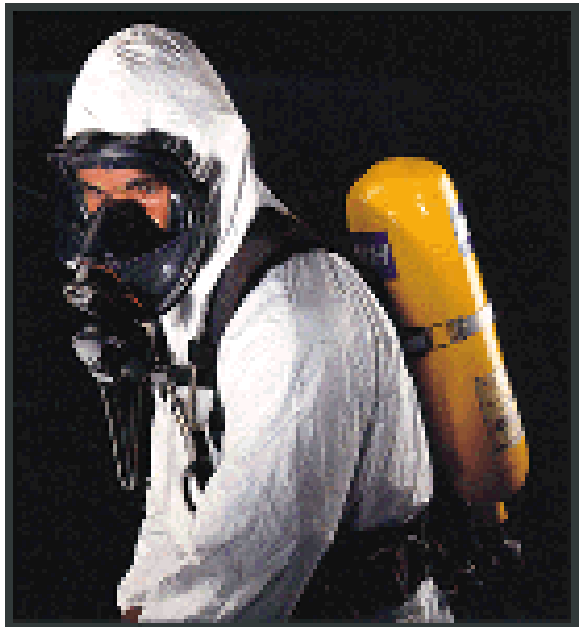
Mechanisms of Protection

- Atmosphere Supplying
  - SCBA
    - Entry into and escape
    - Demand and pressure demand



OSHA's Respiratory Protection Standard- 1910.134

a) Permissible Practice
b) Definitions
c) Respiratory Protection Program
d) Selection of Respirators
e) Medical Evaluation
f) Fit Testing
g) Use of Respirators
h) Maintenance and Care of Respirators
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

(www.osha.gov)

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(c) Respiratory Protection Program

If respirators required:

Written Program
Selection
Medical Evaluation
Fit Testing
Cleaning & Inspection
Training

If NOT required (Voluntary Use)

Written Program

Medical Evaluation

Cleaning and Inspection

Training (Appendix D)

If NOT required

(voluntary use of filtering facepieces (dust masks):

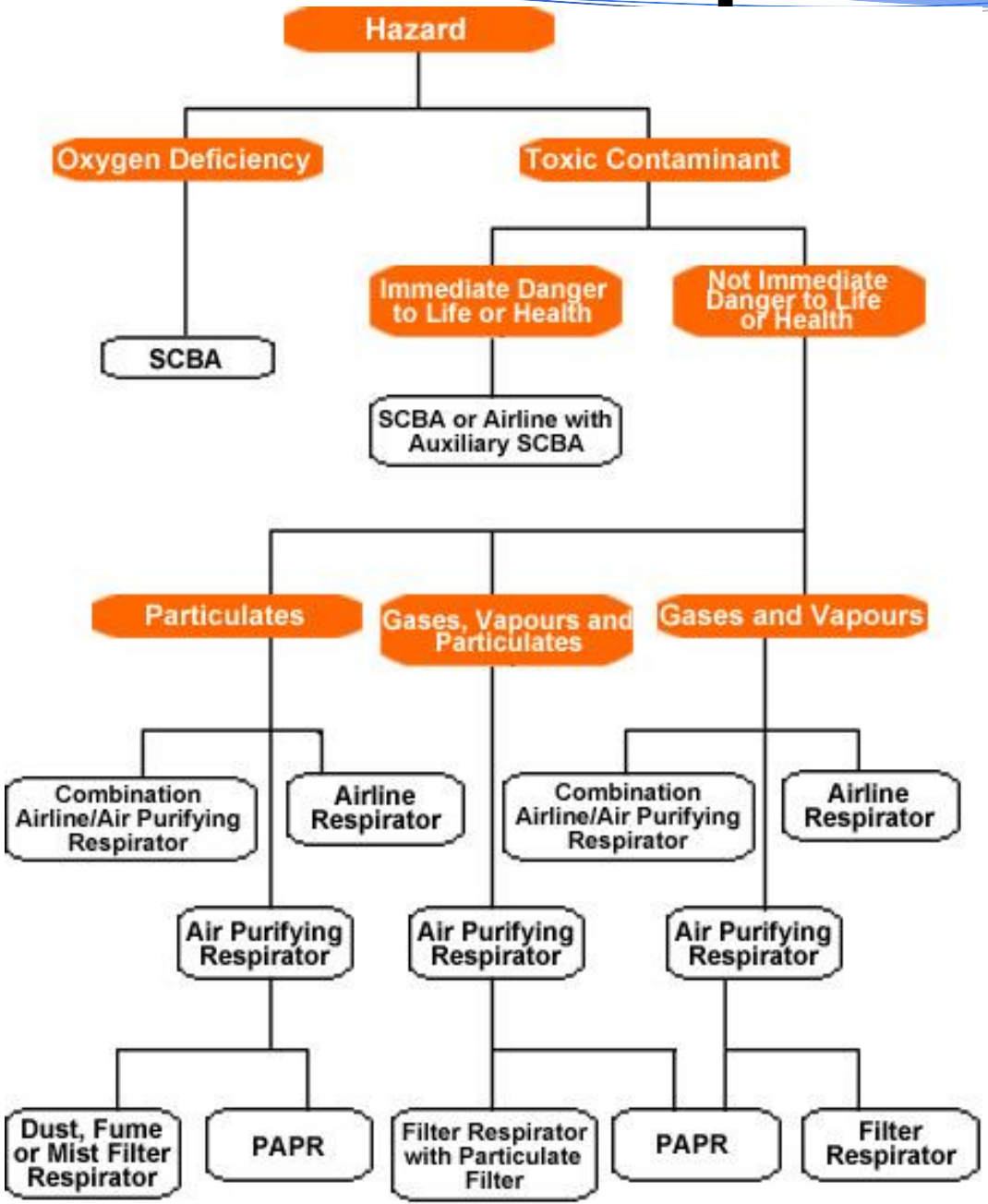
Dust Mask Definition: A negative pressure particulate respirator with a filter as an integral part of the facepiece or with the entire facepiece composed of the filtering medium

Training (Appendix D)

(d) Selection: Respiratory Hazards

- Particulates
  - dusts
  - fumes
  - mists
  - fibers
- Gases and Vapors
- Oxygen Deficiency

(d) Selection of Respirators



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(d) Selection- Protection Factors

$\frac{C_o}{C_i}$ = Protection Factor (PF)

C_o = Concentration Outside the Mask

C_i = Concentration Inside the Mask

Selection- Assigned Protection Factors

Table 1. -- Assigned Protection Factors[5]

Type of respirator[1], [2]	Quarter mask	Half mask	Full facepiece	Helmet/ hood	Loose-fitting facepiece
1. Air-Purifying Respirator	5	[3]10	50	.....	.....
2. Powered Air-Purifying Respirator (PAPR)	.....	50	1,000	[4]25/1,000	25
3. Supplied-Air Respirator (SAR) or Airline Respirator					
• Demand mode	.....	10	50	.....	.....
• Continuous flow mode	.....	50	1,000	[4]25/1,000	25
• Pressure-demand or other positive-pressure mode	.....	50	1,000	.....	.....
4. Self-Contained Breathing Apparatus (SCBA)					
• Demand mode	.....	10	50	50	.....
• Pressure-demand or other positive-pressure mode (e.g., open/closed circuit)	.....	.....	10,000	10,000	.....

Protection Factor Exercise

- 100 µg/m^3 lead dust in workplace
- Employee has a fitted ½ face respirator with P100 cartridges. What is the concentration of lead inside the mask?

C_o= _____

PF= _____

C_i= _____

Selection- Assigned Protection Factors

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Type of respirator[1], [2]	Quarter mask	Half mask	Full facepiece	Helmet/ hood	Loose-fitting facepiece
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Protection Factor Exercise

- 100 µg/m^3 lead dust in workplace
- Employee has a fitted ½ face respirator with P100 cartridges. What is the concentration of lead inside the mask?

C_o= 100 µg/m^3

PF= 10

C_i= _____

$$\frac{C_o}{C_i} = \text{Protection Factor (PF)}$$

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Protection Factor Exercise

- 100 µg/m^3 lead dust in workplace
- Employee has a fitted ½ face respirator with P100 cartridges. What is the concentration of lead inside the mask?

C_o= 100 µg/m^3

PF= 10

C_i= 10 µg/m^3

➢ Will this respirator provide the worker with enough protection?

$$\frac{C_o}{C_i} = \text{Protection Factor (PF)}$$

Protection Factor Exercise

- 100 µg/m^3 lead dust in workplace
- Employee has a fitted ½ face respirator with P100 cartridges. What is the concentration of lead inside the mask?

C_o= 100 µg/m^3

PF= 10

C_i= 10 µg/m^3

➢ Will this respirator provide the worker with enough protection?

OSHA Lead PEL: 50 µg/m^3 - YES

$$\frac{C_o}{C_i} = \text{Protection Factor (PF)}$$

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(e) Medical Evaluation

- Must provide a medical evaluation to determine employee's ability to use a respirator, before fit testing and use

- Must identify a PLHCP (Physician or Licensed Health Care Professional) to perform medical evaluations using a medical questionnaire (Appendix C) or an initial medical examination that obtains the same information

- Confidential

Medical Evaluation

In determining the employee's ability to use a respirator, the employer must:

- Obtain a written recommendation from the PLHCP including:
  - any limitations on use relating to the medical condition of the employee or to workplace conditions
  - the need, if any, for follow-up medical evaluations
  - statement that the PLHCP has provided the employee with a copy of the PLHCP's written recommendation
- If the PLHCP finds a medical condition that may place the employee's health at increased risk by using a negative pressure respirator, employer must provide a PAPR if the medical evaluation finds the employee can use one

Additional Medical Evaluations

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

(f) Fit Testing

- Fit Check and either:
- Qualitative
  - Irritant smoke
  - Banana oil
  - Saccharin, Bitrex®
- Quantitative

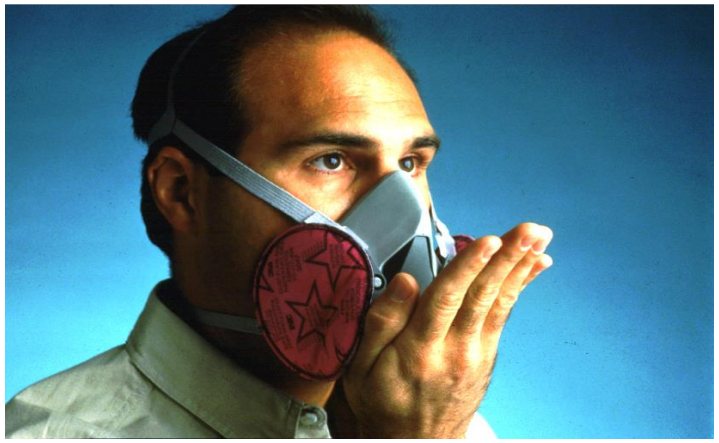
(f) Fit Testing

What is a Fit Test?

The use of a protocol to *qualitatively* or *quantitatively* evaluate the fit of a respirator on an individual.

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

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Reasons for Fit Testing

- Select brand, model and size for each user
- Comfort
- Compatibility with other PPE

- Features that compromise fit:
  - Beard growth
  - Sweat
  - Facial disfigurement
  - Improper donning
  - Eyeglasses

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Respirators Requiring Fit Testing

All tight-fitting facepieces:

- Negative pressure
  - Air purifying (APR)
  - Demand SCBA & SAR
- Positive pressure
  - PAPR
  - Pressure demand SCBA & SAR
  - Continuous flow SAR

When is Fit Testing Required?

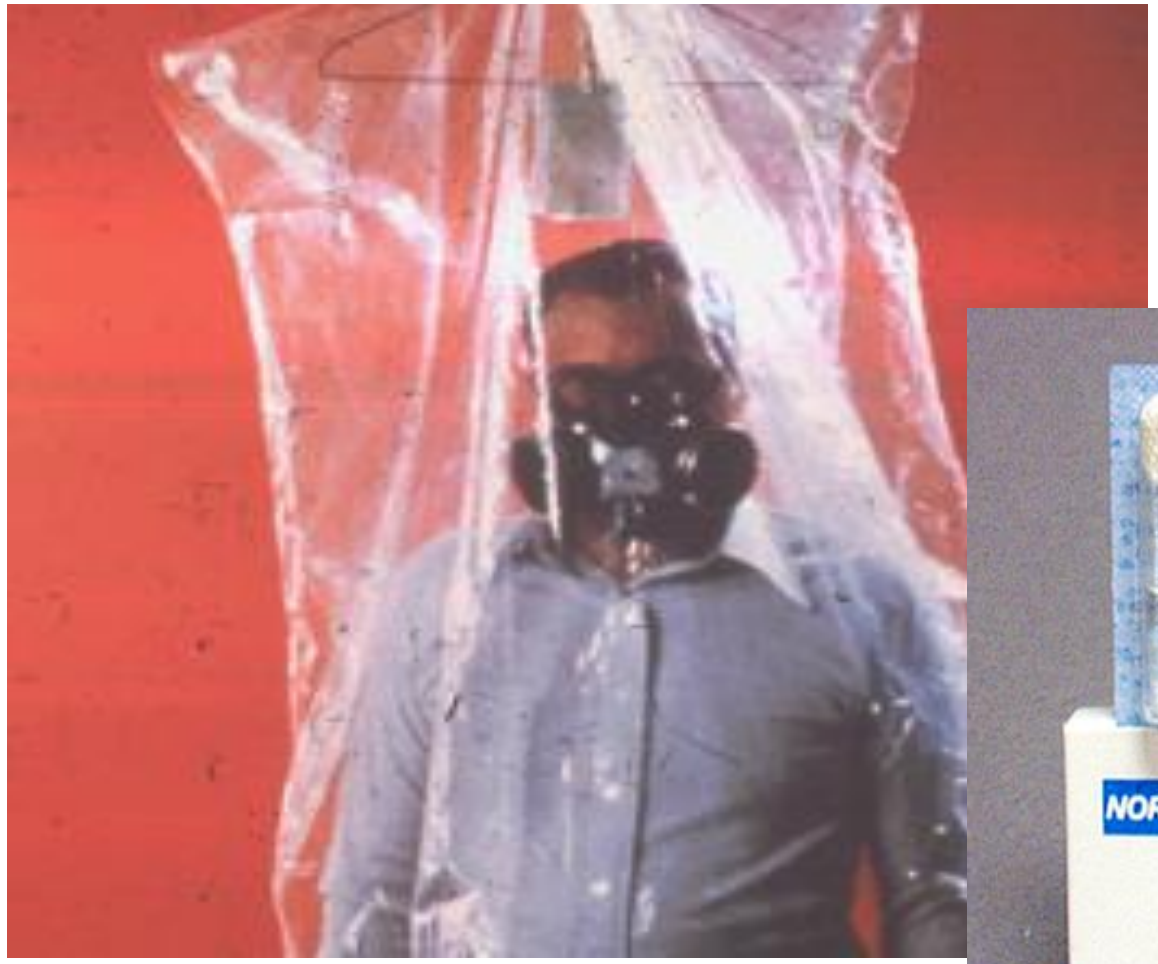
- Prior to initial use of respirator
- At least annually
- When a different make, model, style, or size is used
- If employee, employer or PLHCP makes visual observation of physical change that could affect fit
- If employee notifies employer or PLHCP that current respirator is unacceptable

Qualitative Fit Tests

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

Bitrex/ Saccharin

Banana Oil




NORTH
7002
Respirator Fit-Test Ampules
10 each
1/2 cc Swabs
Made in U.S.A.

Irritant Smoke

When is QNFT Required?

When workers are wearing *full facepiece negative pressure* respirators and exposure levels are greater than 10 times the PEL.

This includes:

- APRs
- Demand SARs
- Demand SCBAs

Quantitative Fit Test (QNFT)

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

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

Quantitative Fit Testing

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QLFT

- Advantages
  - cheap
  - fast
  - simple
- Disadvantages
  - subjective
    - dishonesty
    - power of suggestion
  - individual variability
    - odor threshold screening
    - olfactory fatigue
    - colds/heavy smoker

QNFT

- Advantages
  - objective
  - facilitates recordkeeping
  - assists training
- Disadvantages
  - expensive
  - high fit factors may lead to false sense of security
  - QNFFs have not been shown to correlate with WPFs

(h) Maintenance and Care

(k) Training and Information

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

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Resources

OSHA® Occupational Safety and Health Administration

www.osha.gov

Small Entity Compliance Guide for the Respiratory Protection Standard

OSHA 3384 09 2011

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OSHA Region 1 Onsite Consultation Programs

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A Safe and Healthy Workplace is Everyone's Business

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How to Contact Your State's Consultation Program

- Connecticut: 860-263-6900/ CONN-OSHA
- Maine: 1-877-SAFE-345/ Safety Works Maine
- Massachusetts: 617-626-6504/ Massachusetts Dept of Labor Standards
- New Hampshire: 603-358-2411/ Workwise New Hampshire
- Rhode Island: 401-222-7745/ Work Safer Rhode Island
- Vermont: 888-SAFE-YES/ Vermont Project Worksafe

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