



# RESPIRATORY PROTECTION

By  
Office of Risk Management  
Loss Prevention Unit



# Types of Respirators

Respirators may be either of two types...

1. Air-purifying (filter) respirators:

- Filters (for particulate matter)
- Cartridges (for gases or vapors - may have filters, too)
- Canisters (used with “gas masks” -- large capacity)

Continued...

# Types of Respirators...

## 2. Atmosphere supplying respirators:

- Self-Contained Breathing apparatus (SCBA)
- Supplied air respirators (SAR)
- Combinations of SCBA's and SAR's



# Filter Types

➤ 3 levels of filter efficiency:

- 95% (also referred to as “95”)
- 99% (also referred to as “99”)
- 99.97% (also referred to as “100”)

➤ 3 categories of resistance to filter efficiency degradation:

- N (Not resistant to oil)
- R (Resistant to oil)
- P (Oil Proof)

# Selection of N, R, and P-Series Filters

- If no oil particles are present in the work environment, use a filter of any series.
- If oil particles are present, use R- or P-series filter.
- If oil particles present & filter is used for more than one work shift, use only a P-series filter.
- Choice of facepiece will *depend on level of protection needed*.

# Gas and Vapor Removing Respirators

- Filtering/purifying elements may be housed in cartridges or canisters
- Designed for specific contaminants or classes of contaminants

# Service-Life of Cartridges or Canisters

Depends on:

- Quality *and* quantity of sorbent in the cartridge or canister.
- Packing uniformity and density of the sorbent.
- Exposure conditions and breathing rate.

# Service Life of Cartridges or Canisters

- Relative humidity.
- Temperature.
- Contaminant concentration.
- Presence of other gases and vapors.

# Air-Purifying Respirators (lagniappe)...

Replace cartridges in accordance with the following:

- Daily or after each use. More often if odor, taste, or irritation detected during use.
- As required by service-life indicator, for canisters with “*end of service-life*” indicator.

# Colors for Air-Purifying Respirator Canisters

Colors are used as noted below to indicate the proper use of air-purifying respirator canisters:

- Acid Gas . . . white
- Organic Vapors . . . black
- Ammonia Gas . . . green

# Colors for Air-Purifying Respirator Canisters

- Carbon Monoxide . blue
- Acid Gases & Organic Vapors  yellow
- Acid Gas, Ammonia, & Organic Vapors . brown
- Radioactive Materials purple

# Air-Purifying Respirators (more lagniappe)

Cartridges are also available for air-purifying respirators when working with the following:

- Pesticides
- Carbon Monoxide
- Ethylene Oxide
- Formaldehyde
- Mercury



# Atmosphere-Supplying Respirators

Atmosphere-supplying respirators are of 2 types & sometimes used in combination...

- Supplied-air respirators (**SARs** -- sometimes called air-line respirators)
- Self-contained breathing apparatus (**SCBA**)
- Combination **SCBA** and **SAR**

# Self-Contained Breathing Apparatus (SCBA)

- Typically use bottled air from 2000 to 4500 psi.
- Typically provides a 15 minute to 60 minute air supply.
- Will supply air in these modes: Demand, Pressure Demand, or Continuous Flow.
- Can be used in combination with a supplied air respirator.
- Escape-only types are available in 5, 7, 10 or 15 minute capacities.







# Respirator Selection

When selecting a respirator for use, consider the following:

- Routine use vs. non-routine use
- Workplace hazards
- Physical characteristics of the user
- Physical demands of the work
- Respirator capabilities and limitations



# Exposure Assessments

- Identify airborne contaminants where possible.
- Consider abnormal conditions that may cause concentrations to rise.
- Think in terms of “*worst case*” exposures.
- Communicate information to employees. Discuss signs & symptoms of overexposure and appropriate actions to be taken.
- Keep accurate records.



# Non-Routine Use of Respirators

**“IDLH”**

**Immediately Dangerous to Life or Health**

*“...any atmosphere that poses an immediate, irreversible debilitating effect on health...” (acute effect vs. chronic exposure)*



# Non-Routine Use of Respirators

3 respirator-use applications to avoid **IDLH** situations:

1. Entry into confined spaces.
2. Entry into oxygen-deficient atmospheres.
3. Emergencies.



# Immediately Dangerous to Life or Health (IDLH)

An **IDLH** environment is based on two factors:

1. The inability of workers to escape the environment within 30 minutes **WITHOUT** losing life or suffering permanent health damage; OR
2. The inability of workers to escape the environment **WITHOUT** severe eye or respiratory irritation or other reactions--which could inhibit escape.

Note: If **EITHER** of these conditions exist and cannot be eliminated, the environment will be considered **IDLH**.

# Respirator Decision Logic

In any **IDLH** atmosphere, only 2 types of respirators are acceptable:

1. **SCBA** *pressure-demand*, with  $\geq 15$  minutes air supply, AND
2. **Airline Type C respirator**, either *pressure-demand* or *continuous flow* mode, with an auxiliary escape bottle (minimum air supply capacity of 3 minutes)

*Exception:* In an **IDLH** atmosphere where low oxygen is the only factor causing it to be classified **IDLH**, a demand airline respirator may be used.

factor  
(*negative pressure*)



# Respirator Standards

Respirator *testing, approval* standards:  
42 CFR 84 (NIOSH)

Respirator *use* standards:

- OSHA - 29 CFR 1910.134 (and others)
- ANSI
- MSHA
- NRC

# Respirator Standards (contd.)

The various federal standards require the following of employers:

- Use engineering controls where feasible
- Establishment/implementation of a written respiratory protection program
- Work-site specific procedures and elements for required respirator use AND provision of respirators

# Respirator Standards (contd.)

The various federal standards require the following of employers (contd.)

- Placement of a program administrator
- Medical evaluations of employees
- Employees fit-tested for respirator use



# Respirator Standards (contd.)

- Procedures must be developed for the voluntary use of respirators
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- Employees must be trained in the selection and use of the appropriate respirator for the situation
- Assess exposures (if inassessable, then assume that an **IDLH** environment exists)



# Respirator Standards (contd.)

- A sufficient number of respirators must be available for employees to select from, so that they are able find one that properly fits them
- Employees must be properly trained to change-out respirator cartridges

# Respirator Standards – Medical Evaluations

Medical evaluations must comply with the following:

- Must contain a screening questionnaire
- Must require a follow-up examination if there are any positive answers on the screening questionnaire

# Respirator Standards – Medical Evaluations (contd.)

Medical evaluations must comply with the following:

- The employer must supply the physicians with respirator/work information, a copy of the written program, and the applicable OSHA Respiratory Protection Standard

# Respirator Standards – Medical Evaluations (contd.)

Medical evaluations must comply with the following:

- The employer must supply the employee a *positive-pressure* air-purifying respirator, if a *negative-pressure* respirator is unacceptable AND a *positive-pressure* respirator is acceptable for use in the work environment

# Respirator Standards – Medical Evaluations (contd.)

...additional medical evaluations are required when:

- A report of related medical signs or symptoms is received
- A fit-testing result may require a reevaluation
- A change in the workplace increases the physiological burden on a worker

# Fit Testing

Two types of respirator fit-testing:

1. Qualitative Fit Testing (*QLFT*)

Helps employees select the best fitting respirator by introducing an irritating substance.

# Fit Testing (contd.)

## 2. Quantitative Fit Testing (QNFT)

- Requires use of specialized equipment and
- The wearer performs exercises that could allow leakage.



# User Inspections & Seal Checks

Prior to using respiratory protection, employees must be trained & demonstrate proficiency in the following:

- Visual Equipment Inspection (including the facepiece, straps, valves, filters, cartridges, canisters, air hoses, breathing tubes, regulators, connections, and lenses)

# User Inspections & Seal Checks

Prior to using respiratory protection, employees must be trained & demonstrate proficiency in the following:

- Positive & Negative Checks
- Equipment cleaning and disinfecting
- Equipment storage

# Respirator Fit Testing Standards

Fit testing must be conducted as noted below:

- Except for fit-factor restrictions, qualitative or quantitative methods may be used for tight-fitting respirators.
- **Qualitative** fit testing can only be used with fit factors of 100 or less. **Quantitative** fit testing is required when the fit factor is greater than 100.

# Respirator Fit Testing Standards

Fit testing is required:

- For an employees annual re-fit.
- When their respirator is changed.
- For atmosphere-supplying respirators in the negative pressure mode.

# Respirator Standards (lagniappe)

## Other things to consider...

- An employee shall have **NO facial hair** that can interfere with the facepiece seal.
- Cartridge change-outs cannot be based solely on odor, smell or taste
- Standby personnel, equipped & trained for rescue operations, must be available outside **IDLH** areas.