Types of Respirators – Quick Tips

Many employers use different types of respirators to help reduce employee exposure to potentially damaging air contaminates as their first line of defense. However, the Occupational Safety and Health Administration (OSHA) states in 29 Code of Federal Regulations (CFR) 1910.134(a)(1), "In the control of those occupational diseases caused by breathing air contaminated with harmful dusts, fogs, fumes, mists, gases, smokes, sprays or vapors, the primary objective shall be to prevent atmospheric contamination. This shall be accomplished as far as feasible by accepted engineering control measures (for example, enclosure or confinement of the operation, general and local ventilation, and substitution of less toxic materials). When effective engineering controls are not feasible, or while they are being instituted, appropriate respirators shall be used pursuant to this section."

Respirators are among the most important pieces of protective equipment when working in hazardous environments. Selecting the right respirator requires an assessment of all the workplace operations, processes and environments. The identity of the hazard and its airborne concentrations need to be determined before choosing a respirator. This assessment should be done by experienced safety personnel or by an industrial hygienist.

Three primary agencies are responsible for researching and establishing contaminant exposure limit levels for hazardous substances. The American Conference of Governmental Industrial Hygienists (ACGIH) is a voluntary organization of safety professionals that develops and reviews occupational exposure limits as threshold limit values (TLVs). The National Institute for Occupational Safety and Health (NIOSH) is a federal agency that conducts research on safety and health concerns. NIOSH is responsible for developing and revising recommended exposure limits (RELs) for hazardous substances. The recommendations must then be accepted via OSHA's legislative process before any REL is

enforced as an OSHA permissible exposure limit (PEL).

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Once a workplace assessment has been completed and engineering controls have been ruled out, the respirator selection process can begin. Respirators protect users in two basic ways resulting in two primary categories of respirators. The first category of respirators functions by removing contaminates from the air. These are known as air-purifying respirators. They have filters, cartridges, canisters or a combination of filters and cartridges/canisters that remove contaminants from the air by passing the ambient air through the air-purifying element before it reaches the user. The second category of respirators supplies clean breathing air from another source. These are known as atmosphere-supplying respirators. Each category of respirators is further sub-divided into three types of respirators.

Air-Purifying Respirator Types:

- **Particulate**
    1. Capture particles in the air, such as dusts, mists and fumes
    2. Do not protect against gases or vapors
    3. Generally become more effective as particles accumulate on the filter and plug spaces between the fibers
    4. Filters should be replaced when user finds it difficult to breathe
- **Gas and Vapor**
    1. Are normally used when there are only hazardous gases and vapors in the air
    2. Use chemical cartridges or canisters to remove specific gases or vapors
    3. Do not protect against airborne particles
    4. Provide protection only as long as the filter’s absorbing capacity is not depleted

- **Combination**

    1. Are normally used in atmospheres that contain hazards of both particulates and gases and vapors

Atmosphere-Supplying Respirator Types:

- **Air-Supplied (Airline)**

    1. Make use of an airline hose to deliver clean, breathable air from an uncontaminated source
    2. Provide clean, breathable air for long periods of time and are lightweight
    3. Limit the range of user mobility and may fail due to hose damage
    4. Are normally used when there are extended work periods required in atmospheres that are not immediately dangerous to life and health (IDLH)

- **Combination**

    1. Have an auxiliary self-contained air supply that can be used if the primary supply fails
    2. Auxiliary self-contained portion is generally small since it only needs to supply enough air for escape
    3. Can be used for entry into confined spaces
    4. Are normally used when there are extended work periods required in atmospheres that are or may be immediately dangerous to life and health (IDLH)

- **Self-Contained Breathing Apparatus (SCBA)**

    1. Consist of a wearable, clean air supply pack
    2. Do not restrict movement with a hose connection
    3. The closed-circuit type can provide air up to four hours
    4. The open-circuit type only provides air for 30–75 minutes
    5. Are normally used when there is a short-time need to enter and escape from atmospheres which are or may be immediately dangerous to life and health (IDLH)

Material Types

Respirators can be made from a variety of materials. The most popular facepiece materials are silicone, neoprene and natural rubber. In general, natural rubber and neoprene are rigid, durable materials. Silicone is preferred for its comfort, flexibility and ease in cleaning. Full-face respirators are available with five- or six-strap harnesses or ratchet suspensions. The harness type can be worn with hard hats, while ratchet suspensions are generally easier to adjust, making donning and doffing easier.

Optional Features

Various features are available for full-face respirators to help customize respirators to suit your employees and the specific hazards they encounter. For example, nose cups reduce lens fogging and lens covers help protect the lens from paint, minor chemical splash and scratches. Spectacle kits are available for employees who require prescription eyewear. The frame mounts into the full-face mask and the wearer’s optometrist makes the prescription lenses. This allows the wearer to maintain a proper respirator fit and still wear prescription lenses.

Commonly Asked Questions

Q: What is a powered air-purifying respirator (PAPR)?

A: A PAPR has a powered blower that pulls air through attached filters and/or cartridges. The blower then pushes the filtered air into the facepiece, which can either be a loose-fitting or tight-fitting type.

Q: What is a tight-fitting respirator?

A: Tight-fitting respirators require a tight seal between the respirator and the wearer’s face in order to work properly. If the respirator’s seal leaks, contaminated air will be pulled into the facepiece and can be breathed in.

Q: What is a loose-fitting respirator?

A: Loose-fitting respirators do not depend on a tight seal with

the face to provide protection. Typically it is a hood draped over the head and shoulders used in a PAPR or supplied-air configuration.

Sources

Respiratory Protection, 29 CFR 1910.134

Air Contaminants Standard, 29 CFR 1910.1000

ANSI/ASSE Z88.2-2015 American National Standard Practices for Respiratory Protection

Occupational Safety and Health Administration, Respiratory Protection eTool, OSHA

Occupational Safety and Health Administration, Respiratory Types, OSHA Respiratory Protection Video Series