

# A Quick Guide to Air Purifying Respirators for Respiratory Protection

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The use of respiratory protection is necessary when workers must enter confined spaces in which toxic gases, vapors, or harmful particles are present, or in an environment of oxygen deficiency. Many devices have been designed to protect workers based upon the nature of the hazard as well as regulatory and industry requirements. Choice and the selection of appropriate products for a given application are critical. Workers also could find their safety to be greatly compromised if the selected equipment is used beyond the scope of its design.

Two major respirator classes can be identified, based upon the level of protection offered; air-purifying respirators (APR) which are filtering devices for use in contaminated air; and supplied air respirators (SAR), breathing apparatus which deliver breathable air from an independent source. This guide will discuss air-purifying respirators options for facepiece, filter and chemical cartridges, and powered vs. non-powered versions.

## Air-Purifying Respirators

Air-purifying respirators range from the simple, filtering type to the powered full-facepiece versions. Filtering facepieces are contoured half-masks with head and chin straps, where the facepiece itself functions as a filter. Tight-fitting facepieces are either half-mask (covering the nose and mouth), or full-face, covering the nose, mouth and eyes) and employ particulate filters and/or chemical cartridges.

Particulate filters, chemical cartridges, and combinations used with APRs should be chosen in full accordance with the requirements of the given application and regulatory standards, such as OSHA (Occupational Safety & Health Administration) or NIOSH (National Institute of Occupational Safety & Health). APR components (facepiece, filter and cartridges) from the same manufacturer have been tested together, approved as a complete unit, and must not be interchanged with another manufacturer's APR components.

Air-purifying respirators do not supply breathable air and must not be used in oxygen-deficient atmospheres. Particulate filters and cartridges are separated into basic groups for clarification:

- Particulate filters catch dust, mists and fumes, but not gases or vapors. When numerous particles have accumulated within the filter media, breathing becomes more labored and the filter must be replaced. Different classes of filters are divided up by filter efficiency (95%, 99%, and 99.97%), and resistance to oil (N-, R-, and P-series).
- Chemical cartridges or canisters are used with APRs to remove hazardous gases or vapors from the air, but do not filter out airborne particles. Cartridge and canister media consists of active carbon granules which trap gas and vapor molecules. Once saturated, the media lets through the gas or vapor, a stage known as *breakthrough*.
- APRs may also be used with combinations of particulate filters and gas/vapor cartridges, when a given atmosphere contains both particulate and gas hazards. Many filter cartridge options and combinations are available for use with air-purifying respirators, as applications vary tremendously.

## Powered Air Purifying Respirators

Powered air purifying respirators (PAPR) are air-purifying respirators that use a motor blower to force ambient air through air-purifying elements. These units are designed to protect workers from hazardous particles, gases and vapors.

With a PAPR, breathing resistance is reduced as compared to that of a non-powered APR, resulting in less worker stress and fatigue, and usually leading to increased productivity. A motor blower helps to draw air through the filter, with its flow electronically regulated for added comfort. PAPRs are used with tight-fitting facepieces (full- or half-mask) or with hoods covering head and neck.

As with non-powered APRs, PAPRs do not supply breathable air and must not be used in oxygen-deficient atmospheres. Use of PAPRs, filters, cartridges, and combinations must be chosen in full accordance with the requirements of regulatory standards that pertain to a specific application.

When the presence of a contaminant or its airborne concentration within the confined space cannot be verified, SAR must be used rather than APR. The following conditions must be known prior to choosing respiratory protection:

- Properties and airborne concentration of the contaminant
- Oxygen content of the confined space (minimum 19.5%)
- Regulatory requirements for respiratory protection when the above has been ascertained

*Typical APR applications include:*

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|----------------------|------------------------|-------------------------|
| • Asbestos abatement | • Agriculture          | • Chemical, oil and gas |
| • HazMat cleanup     | • Spray painting       | • Marine                |
| • Landfills          | • Welding and smelting | • Pulp and paper        |
| • Power plants       | • Construction         |                         |

This paper is intended to provide an overview of respiratory protection requirements and options, and is not intended to be the sole guide for complying with 29 CFR Part 1920.134 (OSHA) and 42 CFR Part 84 (NIOSH). For more detailed information regarding recognizing respiratory workplace hazards, please see the following published bulletin and federal regulatory websites:

*Key Elements of a Sound Respiratory Protection Program* (MSA bulletin#1000-61)

*NIOSH Pocket Guide to Chemical Hazards:* [www.cdc.gov/niosh/npg/](http://www.cdc.gov/niosh/npg/)

*NIOSH Guide to the Selection and Use of Particulate Respirators:* [www.cdc.gov/niosh/userguid.html](http://www.cdc.gov/niosh/userguid.html)

*OSHA Safety and Health Topics, Respiratory Protection:* [www.osha-slc.gov/SLTC/respiratoryprotection/index.html](http://www.osha-slc.gov/SLTC/respiratoryprotection/index.html)

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