



UCSC Industrial Hygiene Services
Providing a little slug of information on...

Filtering Facepiece Respirators

(Particle Masks N-95 to P-100)

Disposable filtering facepiece (dust, mist, and fume) respirators are designed to reduce inhalation exposure to particulate contaminants. In general industry, these respirators are used to decrease exposure to particulates such as wood dust, animal dander, and pollen. More recently, health care facilities have been using N-95 filtering facepiece respirators as part of their tuberculosis infection control program. In this context, Health Care Workers use them for protection from infectious aerosolized droplets released from sick patients.

Like any respirator, N-95 filtering facepieces have limitations, advantages and an assigned protection factor.

Respirator Description

Filtering facepieces are negative pressure air purifying particulate respirators that differ from other respirators because the filtering media itself is the mask. To be a *certified* filtering facepiece respirator, the mask must be NIOSH approved, double strapped and clearly labeled with both a letter designation (N, R, P) indicating resistance to oil degradation and a filtering efficiency (95, 99, 100). Single strap varieties of “nuisance particle” masks are not certified by NIOSH and should not be considered an approved respirator. You should also be aware most surgical masks do not meet the definition of an N-95 respirator and should not be considered adequate for protection from aerosolized infectious droplets.

Limitations

- Difficult to establish a good face seal.
- Difficult to check whether the face seal is adequate.
- Cannot be used by individuals with facial hair.
- Contaminant leakage into the mask as a result of negative pressure created during inhalation.
- Release of infectious droplets from patients wearing masks equipped with exhalation valves. Do not provide filtering facepieces with exhalation valves to infected patients.

Advantages

- Lightweight
- Disposable
- Comfortable
- Cheap

Assigned Protection Factor (APF)

All filtering facepiece respirators have an APF of 10. Mathematically, this means you can expect the respirator to reduce your exposure to a contaminant by a factor of 10. In practice, the amount of reduction depends on factors such as how well the mask fits your face, the particle size of the contaminant and the environmental conditions of use. Different types of respirators have different APF's and the higher the APF the more protective the respirator. See the definitions section for more detailed information on APF's.

Respiratory Protection Terms and Definitions

Air-Purifying Respirator

A respirator which cleans contaminants from the air via cartridges and/or filters before the air is inspired by the wearer. These are the most commonly used respirators and are available in half-mask, full-face or powered units.

Approved Respirators

Tested and listed as satisfactory, by the National Institute for Occupational Safety and Health (NIOSH), or jointly by the Mine Safety and Health Administration (MSHA). 42 CFR 84 adopted in July 1995 gives NIOSH primary responsibility for certifying most respirators.

Assigned Protection Factor (APF)

The minimum expected workplace level of respiratory protection that would be provided by a properly functioning respirator, to a stated percentage of properly fitted and trained users. The overall protection afforded by a certain type of respirator is defined by the ratio of the concentration of contaminant outside a face mask or hood to that inside the mask while in a contaminated atmosphere. For example, if a half-mask respirator has a protection factor of 10, it may provide adequate protection in atmospheres where the contaminant concentration is up to 10 times the permissible exposure limit (PEL) for that specific contaminant.

Exhalation Valve

A device that allows exhaled air to leave a respiratory device and prevents outside air from entering through the valve.

Facepiece

The portion of a respirator that covers the wearer's nose and mouth (a full-facepiece also covers the eyes). The facepiece should make a gas-tight or dust-tight seal with the face. The facepiece is supported by headbands, and contains inhalation valves, exhalation valves and connectors for the air-purifying cartridges or filters.

Filter

A fibrous medium used in respirators to remove solid or liquid particulates from the air before it enters the facepiece (this term may be used interchangeably with cartridge).

High-Efficiency Particulate Air (HEPA) Filter

A filter designed to remove 99.97% of particulates which are 0.3 microns in diameter. HEPA filters are often referred to as absolute filters and are used to remove toxic respirable sized particles from contaminated air.

Inhalation Valve

A device that allows air to enter the facepiece through the filtering media but prevents exhaled air from leaving the facepiece through the intake openings.

Particulate Matter

A suspension of fine solid or liquid particles in air, i.e. dust, fog, fume, smoke or sprays. Particulate matter suspended in air is commonly known as an aerosol.

Particulate Filter Series N - P - R

New criteria eliminates classification of particulate filters according to hazard such as "dust mist fume" and provides for three levels of filter efficiency (95%, 99%, 99.97%). These efficiencies are available in a series of filter types known as N, R, and P (see the table below). These new respirators will afford a higher level of protection to a variety of workers including particulate protection for carpenters, painters, and farmers as well as hospital employees needing protection from infectious tuberculosis.

Efficiency	NaCl Test Aerosol (not oil resistant)	DOP Test Aerosol (oil resistant)	DOP Test Aerosol (very oil resistant)
95%	N95	R95	P95
99%	N99	R99	P99
100(99.97%)	N100	R100	P100