

# **Respiratory Protection**



## **Training Guide**



The basis of the standard has to do with identifying the particular hazard and putting together the correct combination of PPE based on the probable impact and exposure to that substance. The document categorizes hazards and PPE levels on the following criteria:

■ **Level A** -To be selected where the hazards are unknown or unquantifiable or when the greatest level of skin, respiratory and eye protection is required.

■ **Level B**-The highest level of respiratory protection is necessary but a lesser level of skin protection is needed.

■ **Level C**-The concentration(s) and type(s) of airborne substances is known and the criteria for using air-purifying respirators are met. Currently, no single personal protective ensemble can protect the wearer from exposure to all hazards. It is important that the appropriate combination of respirator, protective ensemble and other equipment be selected based on a conclusive hazard assessment at the scene.

### **What is Particle?**

Particles 1 – 5 microns in diameter can enter upper airways

0.1 – 1 micron particles enter lower lungs and alveolar ducts

Examples of particle size: Viruses 0.02 to 0.3 microns

Bacteria 0.5 to 10 microns

Mold spores 1 to 70 microns

Fungi 2 to >200 microns

Particulate filter efficiency is based on ability to remove particles greater than 0.3 microns in diameter (medial aerodynamic diameter of 0.3 um)

**Dust:** Produced when solid materials are broken down into fine particles. The longer dust remains on the air, the easier it is to inhale

**Mist:** Tiny liquid droplets formed by atomization and condensation processes such as spraying. Often a combination of several hazardous ingredients.

**Fume:** Occurs when metals are vaporized under high heat. The vapor cools quickly and condenses into very fine particles that float in the air. When welding, in addition to the weld fume, Ozone may be given off during MIG and TIG processes. Ozone may cause nausea sickness and headaches.

**Gases:** are materials that exist as individual molecules in the air at room temperature. Examples are welding gases, such as acetylene and nitrogen, and carbon monoxide produced from internal combustion engines.

**Vapors:** are the gaseous form of substances that are normally in the solid or liquid state at room temperature and pressure. They are formed by evaporation. Most solvents produce vapors. Examples include toluene and methylene chloride.

**Biological hazards:** Include living organisms such as bacteria, viruses, fungi and other organism. As well as dead organisms or parts of organisms.

One of the principal routes by which chemicals can enter the body is through inhalation. If an individual is exposed to an excessive airborne concentration of a chemical over a long period of time, undesirable health effects can result.

The Occupational Safety and Health Administration (OSHA) has set maximum exposure standards for many airborne toxic materials. The Office of Environmental Health and Safety (EHS) can assist in determining whether a worker's exposure to chemicals and/or particulates with which he or she works exceeds these standards. If the permissible exposure limit is exceeded, the exposure must be reduced to acceptable levels through the use of engineering and/or administrative controls.

**Engineering controls** include the following:

- substitution with a less toxic material
- change in process to minimize contact with hazardous chemicals
- isolation or enclosure of a process or work operation
- wet methods to reduce the generation of dust, when applicable
- general dilution ventilation
- local exhaust, including the use of chemical fume hoods or other types of specialized ventilation systems

**Administrative controls** include employee training, use of standard operating procedures, and work scheduling to minimize the length of exposure.

Respirators and other personal protective equipment may be used where engineering controls are not feasible or cannot reduce exposure to acceptable levels, or while engineering controls are being installed. The need for a respirator is dependent upon the type of operations and the nature and quantity of the materials in use and must be assessed on a case by case basis.

## What is an N95 respirator?

The NIOSH respiratory protection approval regulation (42 CFR 84) defines the term “N95” to refer to a filter class, not a respirator.

## Certified under 42 CFR Part 84

This rule addresses NIOSH and the Department of Labor/Mine Safety and Health Administration (MSHA) certification requirements for Respiratory Protective Devices.

## Classes of filters

Filters are classified by efficiency and performance characteristics against non-oil and oil-containing hazards.

There are nine classes of filters. Three levels of filter efficiency, each with three categories of resistance to filter efficiency degradation:

## Filter efficiency

Levels of filter efficiency are 95%, 99%, and 99.97% Under NIOSH criteria, filter materials are tested at a flow rate of 85 lpm for penetration by particles with a medial aerodynamic diameter of 0.3 um and if certified are placed in one of the following categories:

Type 100 (99.7% efficient) Type 99 (99% efficient) Type 95 (95% efficient)

## Categories of filters

Categories of resistance to filter efficiency degradation are labeled:

N (Not resistant to oil) R (Resistant to oil) P (Oil proof)

Use of the filter will be clearly marked on the filter, filter package, or respirator box (e.g., N95 means N-series filter at least 95% efficient)

## NIOSH-Approved Particulate Filtering Facepiece Respirator

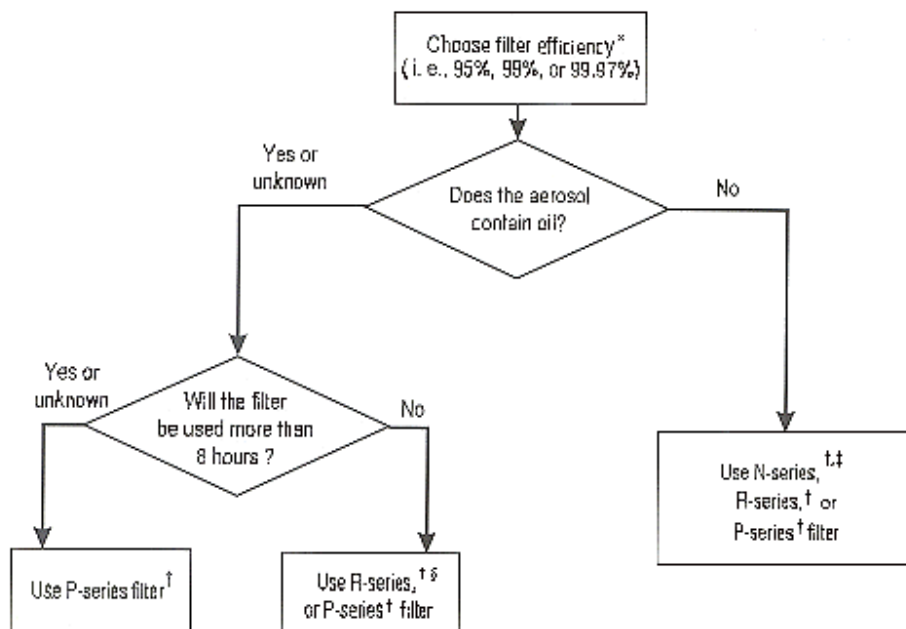
There are seven classes of filters for NIOSH-approved filtering facepiece respirators available at this time. Ninety-five percent is the minimal level of filtration that will be approved by NIOSH. The N, R and P designations refer to the filter's oil resistance as described below.

**N95, N99, N100** - Filters at least 95%, 99%, 99.97% of airborne particles. Not resistant to oil.

**R95, R99, R100** - Filters at least 95%, 99%, 99.97% of airborne particles. Somewhat resistant to oil.

**P95, P99, P100** - Filters at least 95%, 99%, 99.97% of airborne particles. Strongly resistant to oil.

## Flow Chart for Selecting Part 84 Particulate Filters



The service life of all filters is limited by considerations of hygiene, damage, and breathing resistance. All filters should be replaced whenever they are damaged, soiled, or causing noticeably increased breathing resistance.

**N-series filters** generally should be used and reused subject only to considerations of hygiene, damage, and increased breathing resistance. However, for dirty workplaces that could result in high filter loading (i.e., 200 mg), service time for N-series filters should only be extended beyond 8 hours of use (continuous or intermittent) by performing an evaluation in specific workplace settings that demonstrates:

- (a) that extended use will not degrade the filter efficiency below the efficiency level specified in Part 84, or
- (b) that the total mass loading of the filter(s) is less than 200 mg. These determinations would need to be repeated whenever conditions change or modifications are made to processes that could change the type of particulate generated in the user's facility.

**R-series filters** should be used only for a single shift (or for 8 hours of continuous or intermittent use) when oil is present. However, service time for the R-series filters can be extended using the same two methods described above for N-series filters. These determinations would need to be repeated whenever conditions change or modifications are made to processes that could change the type of particulate generated in the user's facility.

**P-series filters** should be used and reused in accordance with the manufacturer's time-use limitation recommendations when oil aerosols are present. P-series filters should be used and reused subject only to considerations of hygiene, damage, and increased breathing resistance if oil aerosols are not present.

### **Cautions and Limitations**

- \*Not for use in atmospheres containing less than 19.5% oxygen
- \*Not for use in atmospheres immediately dangerous to life or health
- \*Do not exceed maximum use concentrations established by regulatory standards
- \*Failure to use and maintain this product properly could result in injury or death
- \*All approved respirators shall be selected, fitted, used and maintained in accordance with MSHA, OSHA and other applicable regulations
- \*Never substitute, modify, add or omit parts. Use only exact replacement parts in the configuration specified by the manufacturer
- \*Refer to user instructions and/or maintenance manuals for information about use and maintenance of these respirators

### **Manufacturer's Donning Procedure**

Fitting Instructions must be followed each time respirator is worn.



### **Molded Conical Mask:**

#### **Fitting Instructions**

- 1) Hold the respirator under your chin with nosepiece up. Pull the bottom strap over your head and position it around the neck below the ears.
  - 2) Pull the top strap over your head positioning it high at the top back of your head.
  - 3) Place your fingertips from both hands at the top of nosepiece. Using two hands, form the nose area to the shape of your nose by pushing inward while moving your fingertips down both sides of the nosepiece.
  - 4) User seal check. Place both hands completely over the respirator and exhale. If air leaks around nose, readjust the nosepiece as described in step 3. If air leaks at the respirator edges, work the straps back along the sides of your head.
- If you cannot achieve proper seal, do not enter the contaminated area. See your supervisor.

#### **Removal Instructions**

Hold the respirator to maintain position on face. Pull bottom strap over head, still holding respirator in position. Pull top strap over head and remove respirator.



## **Pleated Earloop Mask:**

### **Fitting Instructions**

- 1) Gently open the mask completely by pulling the top and bottom of the mask from the middle until the pleats are open.
- 2) Place the mask over your face with the pre-formed nosepiece positioned over the bridge of your nose.
- 3) Stretch the earloops over your ears.
- 4) Using your forefingers, press the nosepiece along your cheeks until you achieve a secure and tight fit. Check for blow-by and adjust nosepiece if necessary.

### **Removal Instructions**

- Pull the earloop from behind one ear, and then the other.
- Hold soiled mask by earloop and discard in proper container.
- Never touch the front of mask.

## **Respirators**

Respirators protect the user in two basic ways. The first is by the removal of contaminants from the air. Respirators of this type include particulate respirators, which filter out airborne particles; and "gas masks" which filter out chemicals and gases. Other respirators protect by supplying clean respirable air from another source. Respirators that fall into this category include airline respirators, which use compressed air from a remote source; and self-contained breathing apparatus (SCBA), which include their own air supply.

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

NIOSH issues recommendations for respirator use. Industrial type approvals are in accordance to the NIOSH federal respiratory regulations 42 CFR Part 84. Development of respirator standards are in concert with various partners from government and industry.

**NIOSH = National Institute for Occupational Safety and Health**

## **Particulate Respirators**

Assigned protection <sup>1</sup> factor	Type of Respirator
5	Quarter mask respirator
10	Any air-purifying elastomeric half-mask respirator equipped with appropriate type of particulate filter. <sup>2</sup> Appropriate filtering facepiece respirator. <sup>2,3</sup> Any air-purifying full facepiece respirator equipped with appropriate type of particulate filter. <sup>2</sup> Any negative pressure (demand) supplied-air respirator equipped with a half-mask.
25	Any powered air-purifying respirator equipped with a hood or helmet and a high efficiency (HEPA) filter. Any continuous flow supplied-air respirator equipped with a hood or helmet.
50	Any air-purifying full facepiece respirator equipped with N-100, R-100, or P-100 filter(s). Any powered air-purifying respirator equipped with a tight-fitting facepiece (half or full facepiece) and a high-efficiency filter. Any negative pressure (demand) supplied-air respirator equipped with a full facepiece. Any continuous flow supplied-air respirator equipped with a tight-fitting facepiece (half or full facepiece). Any negative pressure (demand) self-contained respirator equipped with a full facepiece.
1,000	Any pressure-demand supplied-air respirator equipped with a half-mask.
2,000	Any pressure-demand supplied-air respirator equipped with a full facepiece.
10,000	Any pressure-demand self-contained respirator equipped with a full facepiece. Any pressure-demand supplied-air respirator equipped with a full facepiece in combination with an auxiliary pressure-demand self-contained breathing apparatus.

### Gas/Vapor Respirators

Assigned protection <sup>1</sup> factor	Type of Respirator
10	Any air-purifying half mask respirator equipped with appropriate gas/vapor cartridges. <sup>2</sup> Any negative pressure (demand) supplied-air respirator equipped with a half mask.
25	Any powered air-purifying respirator with a loose-fitting hood or helmet equipped with appropriate gas/vapor cartridges. <sup>2</sup> Any continuous flow supplied-air respirator equipped with a hood or helmet.
50	Any air-purifying full facepiece respirator equipped with appropriate gas/vapor cartridges <sup>2</sup> or gas mask (canister respirator). <sup>2</sup> Any powered air-purifying respirator equipped with a tight-fitting facepiece (half or full facepiece) and appropriate gas/vapor cartridges or canisters. <sup>2</sup> Any negative pressure (demand) supplied-air respirator equipped with a full facepiece. Any continuous flow supplied-air respirator equipped with a tight-fitting facepiece (half or full facepiece). Any negative pressure (demand) self-contained respirator equipped with a full facepiece.
1,000	Any pressure-demand supplied-air respirator equipped with a half-mask.
2,000	Any pressure-demand supplied-air respirator equipped with a full facepiece.
10,000	Any pressure-demand self-contained respirator equipped with a full facepiece. Any pressure-demand supplied-air respirator equipped with a full facepiece in combination with an auxiliary pressure-demand self-contained breathing apparatus.

### Combination Gas/Vapor and Particulate Respirators

Assigned protection <sup>1</sup> factor	Type of Respirator
10	Any air-purifying half-mask respirator equipped with appropriate gas/vapor cartridges <sup>2</sup> in combination with appropriate type of particulate filter. <sup>3</sup> Any full facepiece respirator with appropriate gas/vapor cartridges <sup>2</sup> in combination with appropriate type of particulate filter. <sup>3</sup> Any negative pressure (demand) supplied-air respirator equipped with a half-mask.
25	Any powered air-purifying respirator with a loose-fitting hood or helmet that is equipped with an appropriate gas/vapor cartridge <sup>2</sup> in combination with a high-efficiency particulate filter. Any continuous flow supplied-air respirator equipped with a hood or helmet.
50	Any air-purifying full facepiece respirator equipped with appropriate gas/vapor cartridges <sup>2</sup> in combination with an N-100, R-100 or P-100 filter or an appropriate canister <sup>2</sup> incorporating an N-100, P-100 or R-100 filter. Any powered air-purifying respirator with a tight-fitting facepiece (half or full facepiece) equipped with appropriate gas/vapor cartridges <sup>2</sup> in combination with a high-efficiency filter or an appropriate canister <sup>2</sup> incorporating a high-efficiency filter. Any negative pressure (demand) supplied-air respirator equipped with a full facepiece. Any continuous flow supplied-air respirator equipped with a tight-fitting facepiece (half or full facepiece). Any negative pressure (demand) self-contained respirator equipped with a full facepiece.
1,000	Any pressure-demand supplied-air respirator equipped with a half-mask.
2,000	Any pressure-demand supplied-air respirator equipped with a full facepiece.
10,000	Any pressure-demand self-contained respirator equipped with a full facepiece. Any pressure-demand supplied-air respirator equipped with a full facepiece in combination with an auxiliary pressure-demand self-contained breathing apparatus.

### Self-Contained Breathing Apparatus

A self contained breathing apparatus, or SCBA, sometimes referred to as a Compressed Air Breathing Apparatus (CABA) or simply Breathing Apparatus (BA) is a device worn by rescue workers, firefighters, and others to provide breathable air in a hostile environment. If designed for use under water, it is called SCUBA (self-contained *underwater* breathing apparatus).

There are two kinds of SCBA: open circuit and closed circuit.

**Closed-circuit:** It is used when a longer-duration supply of breathing gas is needed, such as in mine rescue and in long tunnels, and going through passages too narrow for a big open-circuit air cylinder.

**Open-circuit:** Open-circuit industrial breathing sets are filled with filtered, compressed air, rather than pure oxygen. Typical open-circuit systems have two regulators; a first stage to reduce the pressure of air to allow it to be carried to the mask, and a second stage regulator to reduce it even further to a level just above standard atmospheric pressure. This air is then fed to the mask via either a demand valve (activating only on inhalation) or a continuous positive pressure valve (providing constant airflow to the mask).

An open-circuit rescue or firefighter SCBA has a full face mask, regulator, air cylinder, cylinder pressure gauge, and a harness with adjustable shoulder straps and waist belt which lets it be worn on the back. The air cylinder usually comes in one of three standard sizes: 30, 45 or 60 minutes. Air cylinders are made of aluminium, steel, or of a composite construction (usually carbon-fiber wrapped.) The composite cylinders are the lightest in weight, but they also have the shortest lifespan and must be taken out of service after 15 years. Air cylinders must be hydrostatically tested every 3 years for composite cylinders, and every 5 years for metal cylinders.

## Respiratory Protection Standards (Z88)

### ANSI Z88.2-2015 - Practices for Respiratory Protection

This standard sets forth minimally accepted practices for occupational respirator use; provides information and guidance on the proper selection, use and maintenance of respirators and contains requirements for establishing, implementing and evaluating respirator programs. The standard covers the use of respirators to protect persons against the inhalation of harmful air contaminants and against oxygen-deficient atmospheres in the workplace. The following are not covered by this standard:

- a) underwater breathing devices;
- b) aircraft oxygen systems;
- c) supplied-air suits;
- d) use of respirators under military combat conditions, and
- e) medical inhalators and resuscitators

### ANSI Z88.6-2006 - Respiratory Protection – Respirator Use – Physical Qualifications for Personnel

This standard provides information that is useful for the medical evaluation of respirator users. This standard does not deal with medical surveillance or biological exposure monitoring. It is understood that local circumstances vary, that no set of guidelines can cover all situations, and that specific programs and procedures should be modified for each individual workplace. Medical evaluation is only one element of a complete respiratory protection program.

### ANSI Z88.7-2010 - Color Coding of Air Purifying Respirator Canisters, Cartridges and Filters

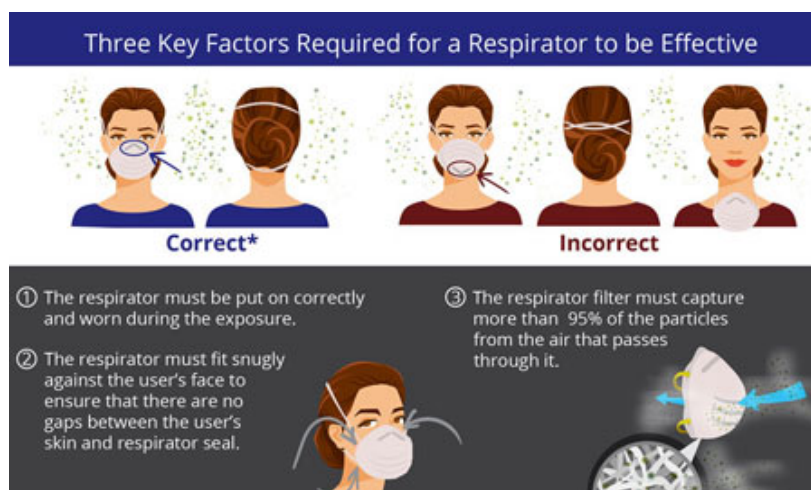
The requirements of this standard apply to the identification of air-purifying respirator canisters, cartridges and filters used to provide respiratory protection against gases, vapors or particles. These requirements apply to canisters, cartridges, and any high efficiency filters, whether encapsulated or un-encapsulated, used as components of air-purifying respirators. These requirements do not apply to and shall not be used to identify canisters, cartridges or filters for:

- a) aviation respirators,
- b) military respirators,
- c) non-high efficiency filters, or
- d) un-encapsulated respirator filters (e.g. filtering facepieces) except for high efficiency filters.

Users of this standard should be aware that regulatory agencies might have requirements that are different from this standard.

### ANSI Z88.10-2010 - Respirator Fit Testing Methods

This standard provides guidance on how to conduct fit testing of tight-fitting respirators and appropriate methods to be used. Fit testing is only one element of a complete respiratory protection program. Examples of complete respiratory protection programs are defined in ANSI Z88.2, 29 CFR 1910.134 (OSHA), etc





### EN149: 2001 European Standard

#### Respiratory protective devices. Filtering half masks to protect against particles.

A filtering half mask is one in which the facepiece consists entirely or substantially of filter material or comprises a facepiece in which the main filter(s) from an inseparable part of the device.

Respirators which meet the requirements of EN149: 2001 are designed to protect against solids, water based aerosols and oil based aerosols. There are three classes of protection detailed in EN149: 2001 – FFP1, FFP2 & FFP3 and filtering facepieces are classified according to filter efficiency.

#### FFP1 (80% Filter efficiency)

Suitable for protection from non-toxic contaminants in concentrations up to 4 x OEL or 4 x APF

#### FFP2 (94% Filter efficiency)

Suitable for protection from low to average toxicity contaminants in concentrations up to 12 x OEL or 10 x APF

#### FFP3 (99% Filter efficiency)

Suitable for protection from toxicity contaminants in concentrations up to 50 x OEL or 20 x APF

**OEL = Occupational Exposure Limit**      **APF = Assigned Protection Factor**

Class	Separation ability (at 95 L/min airflow)	Allow leakage between mask and face
FFP1	Filter separates 80% of airborne particles	< 22%
FFP2	Filter separates 94% of airborne particles	< 8%
FFP3	Filter separates 99% of airborne particles	< 2%

### Disposable Mask Protection Levels

#### FFP1 Particles larger than 5 microns

Dusts, Fumes, Aqueous mists, Oils based mists

#### FFP2 Particles between 2&5 microns

Fine dusts, Fibers, Aqueous mists, Oils based mists

#### FFP3 Particles less than 2 microns

Very fine dusts, Fibers, Aqueous mists, Oils based mists

The year reference in addition to the standard number, EN149: 2001 is to be printed on to the respirator. Note: products meeting the previous version of the standard are marked EN149 only.

FFP3 respirators to be used for more than one shift must now not only have cleanable face seals, but must also have passed the Dolomite test for clogging – indicate by the letter “D” printed on the mask, previously only required on FFP1 & FFP2 respirators.

**Activated Carbon:** Layers of carbon designed to offer relief from the irritation of low level of specific gases and vapors

### Respiratory Protective Equipment (RPE) Types

RPE is divided into two broad categories; filtering respirator and air supplied equipment

### Respiratory Protective Equipment (RPE) selection calculation

Workplace monitoring is required to measure the respiratory hazard level in the workplace. The hazard level is then compared to the OEL to determine the required respirator performance.

Example; woodworking

A. Measure Respiratory Hazard Level (wood dust) = 60mg/m<sup>2</sup>

B. Occupational Exposure Limit (OEL) = 5mg/m<sup>2</sup>

C. Divide A by B i.e. 60/5=12

Therefore Respiratory Hazard Level is 12 times the OEL. Assuming all other control measures have been considered you should select a respirator with an APF of greater than 12. Furthermore, you must consider whether the respirator is suitable for the wearer.





**Warning: Do Not Use any filtering respirator**

- \* In oxygen deficient atmospheres i.e. less than 19.5% by volume at sea level
- \* In poorly ventilated areas or in confined spaces
- \* In atmospheres when the concentration of Toxic Contaminants is unknown or is Immediately Dangerous to Life or Health (IDLH)
- \* For Fire Fighting, Sand Blasting or for protection against Gas or Vapor contaminants with poor warning properties i.e. odor, taste or irritation
- \* At concentrations of substance greater than those for which the respirator is marked or permitted by COSHH or other applicable regulations
- \* Where chemicals are likely to “desorb” In such case, filters must only be used once then immediately discarded

COSHH (Control of Substances Hazardous to Health) regulations require that all “filtering” respirators be thoroughly examined at least **once a month (specifically 28 days)**, if in regular use. For filtering respirators used only occasionally, for short periods, against dusts or fumes of relatively low toxicity, longer intervals between examinations may be suitable, but must **not exceed 3 months**. The result of these examinations must then be noted on the Maintenance Record Card for the individual’s mask. These records should be kept for a period of five years.

### **EN149: 2001 + A1: 2009**

A1: 2009 is the annex, with amendments and additions to existing European standard EN 149:2001

Performance tests in this standard include filter penetration; extended exposure (loading) test; flammability; breathing resistance and total inward leakage. Reusable products are also subjected to cleaning, storage and mandatory clogging resistance tests (clogging is optional for non reusable products)

**R=Reusable**

**NR=Non reusable**

### **Half Mask Respirators EN141, 143 and EN371**

**EN140** is the European Standard that covers the technical specifications for both half and quarter masks. A half mask is defined as covering the nose, mouth and chin, and a quarter mask as covering only the nose and mouth. Both types of mask usually have their face pieces manufactured from natural or synthetic based rubber allowing the mask the flexibility to fit the contours of the face. Half mask can come with a variety of different types of filter conforming to various standards.

**EN141** Gas filters to remove specified gases and vapors or combined filters for removing solids and/or liquid particles and specified gases and vapors. Each of the type of filters has three classes, Class 1, Class 2 & Class 3

**EN143** Covers particle filters and these are classified according to their filtering efficiency. Here again there are three classes of filter P1, P2 & P3. P1 filters are intended for use against solid particles only, P2 and P3 are subdivided according to their ability to remove both solid and liquid particles or solid particles only.

**EN371** Deals specifically with AX filters. AX filters are designed for use against certain low boiling organic compounds. The filters are classified only one type and class AX

The maximum weight of filters that is allowed under the standard is 500 grams.

### **Full Face Masks EN136**

This standard specifies the requirements for full face mask for use as part of a respiratory protective device. These facepieces may be used in negative pressure systems, powered or supplied air systems.

There are three classes of full face masks: Class 1 – Light duty and Low maintenance

Class 2 – General duty with maintainable parts

Class 3 – Heavy duty Fire fighter

### **Powered Air Respirators EN146 (rev) & EN12941**

There are two core European Standards covering the operation and technical specifications for powered air respirators, these are prEN146 (rev) and EN12941 In brief, prEN146 (rev) describes

(a) the main components that make up the powered respiratory device: a helmet or hood, covering at least the face (eye, nose, mouth and chin), a power operated fan (turbo unit) and one or more filters,

(b) the respirator's operation: the fan should provide a flow of filtered ambient air to the wearer in excess of the wearer's demand, with the exhaled air being discharged outside the respirator by exhalation valves or other outlets and

(c) the classifications of respirator: powered respirators are classified into three categories depending on the levels of protection they offer the wearer; THP1, THP2 & THP3 (TH= Turbo Hood or Helmet)

### **Airline Fed Respirators EN270 & EN1835**

As with powered air these are two core standards covering the technical specifications of airline fed respirators, there are EN270 and EN1835 In overview the two standards describe

(a) the main components that make up the airline fed respirators system: a helmet or hood that is not self contained and covers at least the face (eye, nose, mouth and chin), and is supplied with breathable quality air from a source of compressed air,

(b) the respirator's operation: an adjustable continuous flow valve (regulator) which may be carried by the wearer (and must incorporate a low flow warning device), provide a flow of air to the wearer in excess of the wearer's demand, with the exhaled air being discharged outside the respirator by exhalation valves or other outlets and

(c) the classifications of respirator: airline fed respirators classified under EN270 have just one class; under EN1835 there are three classes; LDH1, LDH2 & LDH3 (LDH=Light Duty Hose – the protection afforded by the system as a whole denotes the class)

Additional the standards also set out the maximum permissible length of airline that should attach the valve (regulator) to the air source, under EN270 this is 30 metres and under EN1835 it is 10 metres.

### Protection Factors Chart

Type of Product	Classification	NFP	APF
Disposable Masks (EN149)	FFP1	4.5	4
	FFP2	12.5	10
	FFP3	50	20
Reusable Dust Masks (EN1827)	FMP1	4.5	4
	FMP2	12.5	10
28 Day Masks (EN405)	FF Gas + P1	4.5	4
	FF Gas + P2	12.5	10
	FF Gas + P3	50	10
Half Masks (EN140)	P1	4.5	4
	P2	12.5	10
	P3	50	20
	Gas	50	10
	Gas + P3	-	10
Full Face Masks (EN136)	P2	17	10
	P3	1000	40
	Gas	2000	20
	Gas + P3	-	20
Powered Respirators (EN12941)	THP1	-	10
	THP2	-	20
Compressed Airline Half mask (EN139)	-	50	20
Compressed Airline with Face shield (EN270)	-	200	40

### Disposable Mask Selection Guide

Workplace	Hazard	FFP1 (NPF - 4)	FFP2 (NPF - 12)	FFP3 (NPF-50)	Welding Protection according to mask
Construction	Demolition	X	X	X	
	Groundwork		X	X	
	Low Level Asbestos			X	
	Scabbling		X	X	
	Shot creting		X	X	
Metal Working	Molten Metal Handling			X	X
	Machining		X	X	
	Grinding		X	X	
	Polishing		X	X	
	Linishing		X	X	
Welding	Stainless Steel Welding				X
	MIG/TIG				X
	Spot Welding			X	X
	Brazing/Silver Solder			X	X
	Galvanised Welding			X	X
Trades / DIY	Rust		X	X	
	Filler Dust	X	X	X	
	Concrete / Plaster	X	X	X	
	Wood (soft & hard)		X	X	
	Plastic Dust	X	X	X	
	Paint Dust		X	X	
	Boiler Maintenance		X	X	

### Gas and Vapor Filters Marking

Class	Hazard	Color
A	Organic Vapors	Brown
B	Inorganic Vapors	Grey
E	Sulphur Dioxide	Yellow
K	Ammonia	Green
P	Particle	White

Filters are categorised as Class 1 Class 2 or Class 3 according to the concentration of the contaminant. Class 1 up to 1,000ppm (part per million) and Class 2 up to 5,000ppm and Class 3 up to 10,000ppm

### Filter Combinations

If a filter is a combination of types, it shall meet the requirements of each type separately.

The filter must also be marked with each color code.

For example an ABEK2P3 filter will be marked Brown, Grey, Yellow, Green and White

### Filter Life

The service life of filters depends on the conditions and use.

- Consumption of air by the wearer. How hard the wearer is breathing
- Air humidity
- Air Temperature
- Content and Concentration of impurities and their combinations

## References:

Occupational Safety and Health Administration <https://www.osha.gov>

The National Institute for Occupational Safety and Health <https://www.cdc.gov/niosh>

The Safety Equipment Institute <http://www.seinet.org>

International Safety Equipment Association <https://safetyequipment.org>

The American Society of Safety Engineers <http://www.asse.org>

European Committee for Standardization <https://www.cen.eu>

The European Union <https://europa.eu>

The British Standards Institution <https://www.bsigroup.com>