

## Protecting Your Lungs

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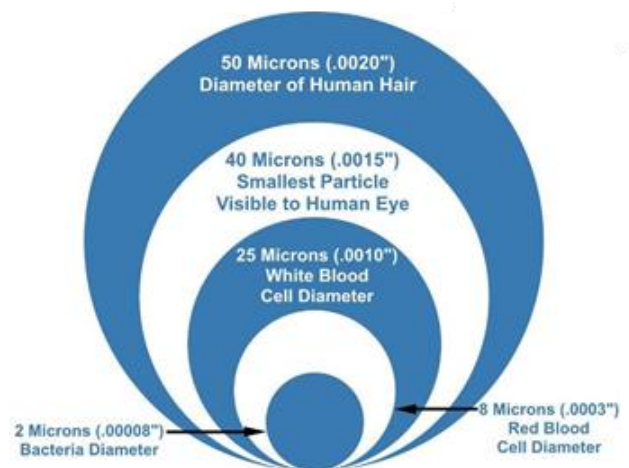
As most of us have become accustomed to wearing some type of face coverings – whether it be a cloth face covering, surgical mask, or N95/KN95 – it’s important that we understand how we are protecting ourselves while wearing these various masks. Some work well at protecting the wearer, while others offer little to no protection at all. By performing a quick risk assessment and understanding the uses and limitations of various masks, you can ensure that you are protecting your lungs and sustaining a healthy lifestyle.

### The Human Respiratory System

The purpose of the human respiratory system is to take up oxygen (O<sub>2</sub>) for the body to use, then expel excess carbon dioxide (CO<sub>2</sub>) after the cells have used it for energy. As we breathe in, however, we take in more than just pure oxygen. The air that we inhale on a daily basis is comprised of about 21% oxygen (O<sub>2</sub>), 78% nitrogen (N<sub>2</sub>), and 0.9% argon (Ar), with the final 0.1% consisting of typically eight other gases.

### **Now you enter the workplace...**

In addition to the gases that we breathe in from pure atmospheric air, we also breathe in a multitude of airborne contaminants. These contaminants can range from respirable crystalline silica from drilling into concrete to SARS-CoV-2 (the virus that causes COVID-19) to metal fumes produced while welding. All of these airborne contaminants range in size from 0.12 microns (SARS-CoV-2) up to 10 microns (respirable crystalline silica). As you can see from the chart to the right, 40 microns are the smallest particles visible to the human eye, so this goes to prove that what you **can't** see **can** hurt you!



The lungs are protected by a series of various defense mechanisms throughout the respiratory tract. As we breathe in, some particles will stop in the nose. If some of the smaller particles make it past the nose and reach the windpipe, they are diverted to the lungs through tubes called bronchi and bronchioles. The mucous lining catches most of the dust particles, yet there are still particles that are determined to make it all the way to the lungs (just imagine the lungs as the “end zone” of a football field). Tiny hair cells, called cilia, covers the walls of these tubes and move the mucus upward and into the throat, where it is either coughed up and spit out or swallowed. But once these small particles enter the lungs, that’s where the real problems start. Take respirable crystalline silica, for example. Once it enters the lungs, there are two options for removing the dust: (1) your body’s proteins will attach to them to neutralize them, or (2) special cells (called macrophages) will attempt to essentially “swallow” the particles, then get

moved out of the lungs by the cilia. If the lung is unable to get rid of the silica particles in the lungs, it causes the lungs to continuously become inflamed, leading to scarring, serious lung diseases, and/or cancer. The amount of dust and the kinds of particles involved influence how serious the lung injury will be. For example, after the macrophages swallow silica particles, they die and give off toxic substances. These toxic substances cause fibrous or scar tissue to form, which is the body's normal way of repairing itself. However, in the case of respirable crystalline silica, so much fibrous tissue and scarring form that lung function can be impaired.

### **Types of Protection**

Once you are able to determine WHAT you're protecting your lungs against, then you can determine HOW to do it. Each type of protection will have a distinct level of advantages and disadvantages. Below we will take a brief look at the common types of respiratory protection.

#### **Surgical/Medical Masks**

- These are **NOT** respirators and do **NOT** protect the wearer from breathing in small particles, gases, or chemicals in the air.
- Must have adequate oxygen content in the air.
- Only helps prevent the **wearer** from spreading respiratory droplets.
- Can be used to help prevent the spread of SARS-CoV-2, but often used in the medical field.
- Usually inexpensive.
- Disposable and should not be used for more than one day/shift.
- Level of protection varies by the material used.
- A fit test and medical evaluation are **NOT** required since it is not a respirator.



#### **Cloth Face Coverings**

- These are **NOT** respirators and do **NOT** protect the wearer from breathing in small particles, gases, or chemicals in the air.
- Must have adequate oxygen content in the air.
- Only helps prevent the **wearer** from spreading respiratory droplets.
- Can be used to help prevent the spread of SARS-CoV-2.
- Usually inexpensive.
- Must be washed before each daily use.
- Level of protection varies by the material used.
- A fit test and medical evaluation are **NOT** required since it is not a respirator.



#### **Particulate Respirators (such as N95s)**

- Particulate respirators are considered tight-fitting, air-purifying, filtering facepiece respirators and must fit your face properly.
- Must have adequate oxygen content in the air.
- Protects both the wearer and those around him/her.
- Protects the user from airborne contaminants up to 10x the occupational exposure limit.
- Filters out airborne particulates (e.g., dust). Do **NOT** filter out chemical vapors.
- Disposable and should not be used for more than one day/shift.
- Class 95s are typically inexpensive, but prices increase with class 99 and class 100.
- Usually only filter out particles that are at least 0.3 microns in diameter.
- Level of protection varies by the number class (e.g., N95, N99, N100).



- A fit test and medical evaluation **ARE** required if it's being used because exposures are above occupational exposure limits because it's a tight-fitting respirator (meaning it depends on proper seal to the face). If they are worn voluntarily, a fit test and medical evaluation is **NOT** required.

### Half Mask Respirators (Reusable)

- Half-mask respirators are considered tight-fitting, air-purifying respirators and must fit your face properly.
- Must have adequate oxygen content in the air.
- Protects both the wearer and those around him/her.
- Protects the user from airborne contaminants up to **10x** the occupational exposure limit.
- Has various types of filters based on your application (e.g., dust, ammonia, chlorine, etc.).
- Reusable as long as they are properly maintained. However, filter media has expiration dates and a service life.
- Vary in price, depending on the application.
- A fit test and medical evaluation **ARE** required if it's being used because exposures are above occupational exposure limits since it's a tight-fitting respirator (meaning it depends on proper seal to the face). If they are worn voluntarily, a fit test and medical evaluation is **NOT** required.



### Full Face Respirators (Reusable)

- Full face respirators are considered tight-fitting, air-purifying respirators and must fit your face properly.
- Must have adequate oxygen content in the air.
- Protects both the wearer and those around him/her.
- Protects the user from airborne contaminants up to **50x** the occupational exposure limit.
- Has various types of filters based on your application (e.g., dust, ammonia, chlorine, etc.).
- Reusable as long as they are properly maintained. However, filter media has expiration dates and a service life.
- Vary in price, depending on the application.
- A fit test and medical evaluation **ARE** required if it's being used because exposures are above occupational exposure limits since it's a tight-fitting respirator (meaning it depends on proper seal to the face). If they are worn voluntarily, a fit test and medical evaluation is **NOT** required.



### Powered Air-Purifying Respirators (PAPRs)

- PAPRs are considered loose-fitting, air-purifying respirators.
- Must have adequate oxygen content in the air.
- Protects both the wearer and those around him/her.
- Protects the user from airborne contaminants up to **25x** the occupational exposure limit.
- Reusable as long as they are properly maintained. However, battery life varies by model.
- Vary in price, depending on the application, but can range from anywhere from \$500 to over \$1,500.
- A fit test and medical evaluation are **NOT** required since it's a loose-fitting respirator (does not depend on a proper seal to the face).



### Supplied-Air Respirators (SAR)

- SARs are considered air-supplying respirators, but can be tight-fitting or loose-fitting.
- Oxygen content in the air does not matter since it has an independent air supply.
- Protects both the wearer and those around him/her.
- Protects the user from airborne contaminants up to **1,000x** the occupational exposure limit.
- Reusable as long as they are properly maintained. However, the time of use depends on your air supply.
- Vary in price, depending on the application, but can range from anywhere from \$500 to over \$1,500. The costs associated with system maintenance can become expensive
- Fit test and medical evaluation may or may not be required depending on the type of SAR being used (some are tight-fitting, some are loose-fitting).



### Self-Contained Breathing Apparatus (SCBA)

- SCBAs are considered tight-fitting, air-supplying respirators.
- Oxygen content in the air does not matter since it has an independent air supply.
- Protects both the wearer and those around him/her.
- Protects the user from airborne contaminants up to **10,000x** the occupational exposure limit.
- Reusable, but the costs associated with maintenance can become expensive.
- Usually expensive, costing \$2,500 or more for a complete assembly.
- A fit test and medical evaluation **ARE** required if it's being used because exposures are above occupational exposure limits since it's a tight-fitting respirator (meaning it depends on proper seal to the face). If they are worn voluntarily, a fit test and medical evaluation is **NOT** required.



### Summary

Regardless of the type of respirator you wear, this should not be your first choice for protecting yourself. Ideally, you should utilize engineering controls (e.g., ventilation) and/or administrative controls (e.g., reduced exposure time) to reduce the airborne exposure levels, if possible. However, respirators can provide great value if used properly, whether you are using it at work for occupational exposures or at home due to seasonal allergies. If you have any questions or concerns about our company's respiratory protection program, feel free to contact Arrow Safety and we'll be glad to help!

If you have any questions about how Arrow Safety can help your employees stay safe and keep your business headed in the right direction, contact us and we'll be glad to help! We travel nationwide and all new customers receive **10% off** their first quote, regardless of the scope or size!

Thank you and have a safe week!



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