Personal Protective Equipment

PPE Selection: Find the Right Type of Respirator

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What You Need to Know:

OSHA's respirator standard, 29 CFR 1910.134, requires employers to first consider engineering and administrative controls to protect employees.
Respirators fall into two categories: filtering and air supplying. One prevents airborne particles from reaching the employee's nose and lungs, and one provides clean outside air directly to the user.
N95 is a tight-fitting, air-purifying respirator made of filtration material covering the nose and mouth.
Different types of respirators provide different levels of protection, and each class is labeled by OSHA with an APF. The larger the APF, the greater the level of protection.
Silica dust is a pervasive problem throughout manufacturing and other industries, and even miniscule amounts of silica particles in the air can cause a severe lung illness called silicosis.

Protecting the lungs, heart and ability to breathe with the right personal protective equipment can be complex. Learn how to find the right respirator that balances the protection-level needs for OSHA with the comfort and fit needs of employees.

Airborne contaminants in manufacturing and metalworking shops may come in the form of gases, vapors, particulates, fumes, mist or some combination of these potentially harmful hazards. Composite cutting, for example, can yield carbon dust that can damage the lungs and heart, while metal fume fever can result from inhaling certain metals as fine dust or fumes.

"OSHA requires a respirator to be worn in any oxygen deficient environments or any environment where workers could be exposed to harmful airborne contaminants," says Zachary Braden, regional sales manager for Honeywell North.

For these hazards, the Occupational Safety and Health Administration's respirator standard, ***29 CFR 1910.134***, requires employers to first consider engineering and administrative controls to protect employees.

"However, if engineering controls alone are not enough to reduce the contamination levels to acceptable OSHA levels, engineering controls and/or administrative controls should be used in conjunction with the properly selected respirator," Braden says. "For example, if welding hexavalent chromium—stainless steel—at an inside location, you could use an engineering control such as an

exhaust fan, which may reduce the contamination level," he says.

In that setting, given a certain contamination level, Braden might recommend a half-mask respirator with P100 cartridges. However, the same welding process carried out in another room with no airflow may create a much higher contamination level, requiring a PAPR or even an SCBA system.

How to Select the Right Type of Respirator Equipment

When selecting a respirator, it's important to know the different types available and the purposes of each. Respirators fall into two main categories: filtering and air supplying. Filtering respirators use filters to prevent airborne particles from reaching the employee's nose and lungs. Air supply systems provide clean outside air directly to the user, so that no contaminated air is breathed in.

"Each type of respirator has pros and cons, can be used in different environments and can have different Assigned Protection Factor depending on which facepiece, hood or helmet is used," Braden says. "So it's important to do your research."

Within those two subcategories, a respirator can be classified as tight-fitting or loose-fitting. A tight-fitting respirator creates a seal around the user's nose and mouth, or around the entire face. A loose-fitting respirator is designed so that it does not depend on a tight seal to protect the user.

A common term for a filtering facepiece half-mask respirator, **N95** is a tight-fitting, air-purifying respirator made of filtration material covering the nose and mouth. An N95 may have an exhalation valve to make it easier to exhale. This type of respirator filters out particles but doesn't protect against gases or vapors. It is typically disposed of after a single use.

Other respirator types include:

Half-facepiece Elastomeric – This tight-fitting, air-purifying respirator consists of a rubber or silicone facepiece that covers the nose and mouth. It uses replaceable filters for particulates, or cartridges or canisters to protect against gases and vapors. An elastomeric half-facepiece respirator can be cleaned, decontaminated and reused.

Full-facepiece Elastomeric – This type of respirator provides better protection than a half-facepiece respirator because it is easier to create a seal around the entire face. It can also protect against liquid splashes and vapors that could irritate the eyes.

PAPR – A powered air-purifying respirator (PAPR) is a loose-fitting device with a blower that pulls air through attached filters. The blower then pushes the filtered air into the facepiece, which covers all of the user's face. There are also tight-fitting, full-facepiece PAPRs, which come with an elastomeric facepiece made of rubber or silicone, as well as half-mask PAPRs.

Airline respirator – This type of respirator supplies clean air to either a hood or a facepiece through a long hose, from a source of clean air such as a cylinder or compressor.

SCBA – A self-contained breathing apparatus (SCBA) provides clean air from a compressed air tank mounted on the user's back or belt directly to a tight-fitting, full-face elastomeric facepiece. An SCBA provides workers with the highest level of protection.

Different types of respirators provide different levels of protection, and each class is labeled by OSHA with an APF. The larger the APF, the greater the level of protection, so an APF of 10 will reduce exposure to 1/10th the concentration of the contaminant in the air, while an APF of 50 will reduce exposure to 1/50th the concentration.

Technical Respirator Issues: Cartridge Replacement

One of the biggest challenges to using respirators is knowing when to change out the cartridges, says Zachary Braden, regional sales manager for Honeywell North.

According to OSHA, a cartridge's useful service life is how long it provides adequate protection from harmful chemicals in the air. This varies with the type and amount of contaminants in the air (which depends on the work rate), environmental conditions such as temperature and humidity, individual breathing rate, and the cartridge's filtering capacity.

"There are three ways to determine your cartridge change-out schedule," Braden says. "You can conduct air monitoring experiments, use the manufacturer's recommendation for that specific cartridge/filter, or use a math model."

These three approaches range from the most accurate (experimental) to the least accurate (math model), and each method incurs varying amounts of time and expense. Once the correct replacement rate has been determined for a cartridge, OSHA recommends taking a conservative approach by applying a safety factor to the service life estimate.

Finding the Right Fit and Comfort with Respirators

OSHA requires tight-fitting respirators to be fit tested yearly to ensure that the facepiece creates a tight seal around the user's face. Loose-fitting respirators don't require fit testing. Often, problems arise with facial hair, earrings, wigs, scarves or piercings that interfere with creating a complete seal. In these cases, a loose-fitting type, such as a PAPR, may be worn instead if the employer allows.

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Contaminant-Specific Regulations for Silica, Welding

According to Braden, the choice of a respirator depends upon the specific activity, as well as the specific contaminant and the expected contamination level.

"Keep in mind that just because a respirator is marketed for welding does not mean that it will work for every welding application," he says. "Always consult the manufacturer of the respirator or an industrial hygienist for verification for your specific application."

For example, silica dust is a pervasive problem throughout manufacturing and other industries, and even miniscule amounts of silica particles in the air can cause a severe lung illness called silicosis.

The OSHA silica standard 29 CFR 1910.1053 ***has been updated***, and the new general industry requirements for silica will become active in June 2018. These include specific medical surveillance requirements, engineering and administrative controls, training, air monitoring, housekeeping and a written exposure control plan.

"There are many contaminant-specific regulations for silica, and it is the employer's job to understand these and related regulations that go beyond a standard written respiratory plan," Braden says.

How does your shop manage respirator types and fit testing? Share in the comments.