

Respirator Selection Guide for the Construction Industry

Helping Construction Companies Understand the Basics of Respirator Selection

Choosing the right respirator for the job, and the hazard, is a vital part of protecting workers. For construction workers, examples of airborne hazards include contaminants like dust, mold, and chemical solvent vapors. The Occupational Safety and Health Administration (OSHA) recommends conducting a [hazard assessment](#) to figure out which contaminants could harm employee health. This assessment also identifies important information such as the concentration level of contaminants, exposure potential, and other factors that need to be considered when selecting a respirator.

Once the hazard assessment is completed, employers should follow the [hierarchy of controls](#) to reduce, or even eliminate, the exposure to the hazard. Engineering and administrative controls should be in place before personal protective equipment (PPE), such as respirators, are considered.

Engineering controls remove the hazard at the source or place a barrier between the worker and the hazard (e.g., ventilation, machine guards, wet-cutting technique).

Administrative controls are policies or practices that reduce workers' exposure to hazards (e.g., minimizing the number of workers exposed and/or the exposure time). They work with engineering controls.

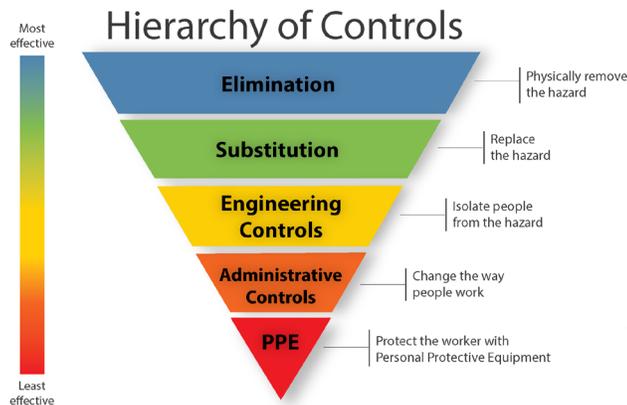


Illustration by NIOSH

When these controls are not feasible, insufficient at reducing exposure to harmful contaminants, or being installed and/or serviced, respiratory protection is required. If this is the case, employers must also have a respiratory protection program (RPP) aligned with the OSHA standard [29 CFR 1910.134](#). Respirators used within these programs must be approved by the National Institute for Occupational Safety and Health (NIOSH).

NIOSH Approved® Respirators Used in Construction

Construction workers may encounter various hazards on a work site that require respiratory protection. Air-purifying respirators, like those shown below, are commonly used in the construction industry. However, other types of respirators (e.g., [supplied-air respirators](#)) may be required depending on the task and hazard.

- **Filtering facepiece respirators (FFRs)**, such as N95® FFRs, are a disposable type of respirator. They seal against the wearer's face around the nose and mouth. FFRs remove particles, such as dust and asphalt fumes, from the air as the wearer breathes. They do not protect against gases (e.g., carbon monoxide, methane) and vapors (e.g., gasoline, organic solvents) [NIOSH 2019]. Some FFRs have exhalation valves that open to let air escape when the wearer breathes out. This reduces breathing resistance and can make the respirator more comfortable to wear.
- **Elastomeric half-mask respirators (EHMRs)** and **elastomeric full-facepiece respirators** are reusable respirators. They protect against gases, vapors, or particles when equipped with the appropriate cartridge/canister or filter. EHMRs only cover the nose and mouth. Elastomeric full-facepiece respirators cover the whole face, which provides eye protection as well [NIOSH 2019].
- **Powered air-purifying respirators (PAPRs)** are reusable respirators. They protect against gases, vapors, or particles when equipped with the appropriate filter, canister, or cartridge. They contain a battery-powered fan that pulls air through the attached filter, canister, or cartridge. There are loose-fitting and tight-fitting PAPRs [NIOSH 2019]. Tight-fitting PAPRs form a complete seal with the face.



FFR



EHMR



Elastomeric Full-Facepiece Respirator



Loose-fitting PAPR*

Illustrations by NIOSH



Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health

Selection Factors

The following selection factors may be discussed during a hazard assessment, so it is important that employers and RPP managers are familiar with them. An industrial hygienist (IH) can be a great resource when conducting a hazard assessment and when considering the factors that affect respirator selection. An IH can help identify the hazards in a work environment and determine their concentrations with an exposure assessment. If an IH is not on staff, consider using a consultant for industrial hygiene services. The [American Industrial Hygiene Association \(AIHA\)](#) and the [International Society for Respiratory Protection \(ISRP\)](#) provide resources for this.¹ OSHA also provides free [on-site occupational safety and health services](#) to small- and medium-sized businesses.



Photo by NIOSH

A worker using a respirator while tuckpointing

Employers and RPP managers need to consider the following factors when selecting respiratory protection for employees.

- The **concentration of oxygen** in the atmosphere is monitored using an oxygen deficiency meter or a four gas monitor. If the concentration is above 19.5%, air-purifying respirators can be used.
- The **concentration of each respiratory hazard** is determined using air samples to measure the amount of the contaminant found in the workplace environment.
- The **physical and chemical properties of each respiratory hazard** can be found in the [Safety Data Sheet](#). These properties determine the type of filter ([N-, R-, or P-series](#)) or cartridge/canister (e.g., organic vapor) needed for an air-purifying respirator.
- **OSHA Permissible Exposure Limit (PEL)** is the highest concentration of a hazard that workers can legally be continuously exposed to based on considerations for negative impact on worker health. PELs can be found using the [NIOSH Pocket Guide to Chemical Hazards](#) or OSHA's standard [29 CFR 1926.55](#).
- **NIOSH Recommended Exposure Limit (REL)** is NIOSH's recommendation of the highest concentration of a hazard that workers can be exposed to within a 10-hour shift, 40 hours per week, for a working lifetime based on considerations for negative impact on worker health. NIOSH RELs are more protective than the OSHA PEL compliance levels. They can be found using the [NIOSH Pocket Guide to Chemical Hazards](#).
- **Hazard Ratio** is "a number obtained by dividing the concentration of a contaminant by its exposure limit" [NIOSH 2004].
- **Assigned Protection Factor (APF)** is the minimum workplace level of respiratory protection a properly functioning respirator or respirator class (e.g., FFRs, EHMRs, and tight-fitting PAPRs) is expected to provide when the user is properly fitted and trained. The APF of each respirator type can be found in [Table 1](#) of OSHA's respiratory protection standard.

The correct respirator should be selected based on the hazard ratio of the concentration of the respiratory hazard and the exposure limit. Either the PEL or REL can be used. Once the hazard ratio is determined, a NIOSH Approved® respirator with an appropriate APF must be used within an RPP conforming with 29 CFR 1910.134. The selected respirator's APF must be greater than or equal to the hazard ratio. More information about APFs can be found in OSHA's respiratory protection standard ([1910.134\(f\)\(6\)](#), [1910.134\(f\)\(7\)](#)).

Examples of How to Use Respirator Selection Factors in the Construction Industry

The scenarios below show how to use the above selection factors to choose an appropriate respirator. Importantly, if needed, consider consulting an IH to assist with the process.

- Workers installing PVC pipes are exposed to cyclohexanone at a concentration of 625 parts per million (ppm). However, the PEL is 50 ppm. The hazard ratio is (625/50) or 12.5. Since an EHMR is not protective enough according to [Table 1](#) of the respiratory protection standard, an elastomeric full-facepiece respirator, PAPR with organic vapor cartridges, or a higher-level respirator would need to be used because a respirator with an APF greater than 10 is required.
- A worker sawing metal pipes is exposed to 1.25 milligrams (mg)/cubic meter of air (m³) of cobalt metal dust. The NIOSH REL is 0.05 mg/m³. The hazard ratio is (1.25/0.05) or 25. Given this concentration, any PAPR with a high efficiency (HE), 100-N, or 100-P filter or any supplied-air respirator would be appropriate for this exposure level.
- A construction worker is exposed to isocyanate vapors from spray foam insulation. When working with materials that release isocyanates vapors, NIOSH recommends using a supplied-air respirator because exposure to isocyanates can sensitize workers, meaning they develop an allergy. Workers who are sensitized are subject to severe asthma attacks if they are exposed again.
- Besides respiratory effects, amorphous silica is found to cause eye irritation or damage. In cases where hazards require eye protection, a respirator with a full facepiece, hood, or helmet should be used even if the hazard ratio indicates a respirator with a lower APF can be used. When exposed to airborne concentrations of amorphous silica at concentrations at or below 150 mg/m³, any PAPR is recommended.

¹ Mention of any company or product does not constitute endorsement by NIOSH.

Implementing a Respiratory Protection Program

Employers that require workers to use a respirator must implement an RPP. This is a written set of policies and procedures aligned with the OSHA respiratory protection standard (29 CFR 1910.134). An RPP may have [eight parts](#) including medical evaluations, fit testing, and training.

Medical evaluations ensure a user can wear a respirator without health complications.

Once a worker is medically cleared to wear a respirator, they must complete a [qualitative or quantitative fit test](#). Fit testing ensures that the respirator fits, which is important for providing the expected level of protection. Employers must provide various respirator models and sizes so the respirator fits and is acceptable to the worker. Fit testing is only required for tight-fitting respirators. Respirator users should undergo fit testing annually and anytime a different model, style, or size respirator is used. The [Respiratory Protection Information Trusted Source](#) webpage provides additional information about fit testing requirements.



Photo by Shutterstock

A worker undergoing qualitative fit testing

Employers must also train construction workers on how to properly use, clean, and maintain their respirators. Respirator training should occur annually or when the need arises. This includes if exposure conditions change or workers use a new type or model of respirator [NIOSH 2018].

Employers may allow workers to use respirators when they are not required. Workers may voluntarily use respirators to increase their comfort in certain environments such as a dusty room. They may also use them to avoid exposure to a respiratory hazard that is below the PEL. In these cases, the employer must follow the requirements for [voluntary use](#) defined in 29 CFR 1910.134, Appendix D.

Where can I find more information?

For additional information, visit the resources listed below.

Respirator Selection

- [Respirator Selection Logic](#)
- [A Guide to Respirators Used for Dust in Construction](#)
- [Types of Respiratory Protection](#)
- [*What are Air-Purifying Respirators?](#)
- [A Guide to Air-Purifying Respirators](#)
- [What are Atmosphere-Supplying Respirators?](#)

Respirator Use

- [Filtering Out Confusion: Frequently Asked Questions about Respiratory Protection, User Seal Check](#)
- [Respiratory Protection Information Trusted Source](#)
- [OSHA Respiratory Protection](#)

NIOSH Approved* Respirators

- [Certified Equipment List](#)
- [List of NIOSH Approved* filtering facepiece respirators](#)

References

NIOSH [2019]. Types of respiratory protection. Pittsburgh, PA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health. <https://www.cdc.gov/niosh/npptl/pdfs/RespProtectionTypes-508.pdf>

NIOSH [2018]. Filtering out confusion: frequently asked questions about respiratory protection, fit testing. Pittsburgh, PA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health. DHHS (NIOSH) Publication No. 2018-129. <https://www.cdc.gov/niosh/docs/2018-129/pdfs/2018-129.pdf>

NIOSH [2004]. Respirator selection logic. Cincinnati, Ohio: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health. DHHS (NIOSH) Publication No. 2005-100. <https://www.cdc.gov/niosh/docs/2005-100/default.html>

Suggested Citation

NIOSH [2022]. Respirator selection guide for the construction industry. By Kiederer M, Coffey C, Smith A, Casey M. Pittsburgh, PA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health. DHHS (NIOSH) Publication No. 2022-123, <https://doi.org/10.26616/NIOSH PUB2022123>

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