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Respiratory Protection for Occupational Users of Pesticides

This document is a revision of the Rutgers Cooperative Extension 2002 publication “Respiratory Protection for Pesticides”. It updates and supersedes all information contained in the 2002 publication. This revision has been funded, in part, by the Pesticide Safety Education Program Improvement and Modernization Initiative under Grant 437173, Respiratory Protection for Pesticides, A National User's Guide.

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Introduction

United States Environmental Protection Agency (EPA) and state regulations require the training and/or certification of occupational users of pesticides to gain knowledge and practices for protection of human health and the environment. Occupational users include certified/licensed applicators and those under their direct supervision, including pesticide operators, technicians, and handlers.

Full-face non-powered air purifying respirator *(photo Rutgers University)*

Occupational users of pesticides can be exposed to toxic gases and vapors, particulates, or both. Inhalation of pesticides can result in several different outcomes depending on the pesticide itself.

With some pesticides, our bodies can tolerate a limited amount of exposure through the airway, but for others, serious health effects or even death can result. Some pesticides cause contact damage to the nose, throat, and lung tissue. This can range from mere irritation of the contacted areas to impairment of their function, or even to destroying the areas contacted.

Assessment of respiratory hazards and respirator selection for pesticides are regulated under the Federal Insecticide Fungicide and Rodenticide Act (FIFRA). Various pesticide formulations, environments, and application methods require different types of respiratory protection devices (respirators). A respirator is a safety device that protects the wearer from breathing in air that is contaminated with hazardous substances, including pesticides.

This document is intended to provide practical information for proper use of respirators by occupational users of pesticides. It also serves to distinguish regulatory requirements for commercial applicator businesses (such as exterminators or landscapers) and agricultural employers. It describes types of respirators; their limitations, use, care, maintenance, and storage; as well as requirements for the medical evaluation, fit testing, and training of respirator users.

Respiratory Protection for Pesticide Use

EPA requires that pesticide manufacturers determine and specify respiratory protection according to the anticipated hazards and risk of inhalation. Manufacturers provide requirements for respiratory protection on the pesticide label that are product- and task-specific. The pesticide label is a legal document, and states whether you must use a respirator and, if so, which type. Read and follow the product label for respirator requirements since specific pesticides may have different formulations and use directions.

The pesticide label specifically requires use of “NIOSH-approved” respirators. National Institute for Occupational Safety and Health (NIOSH) approval is granted only to those respirators that meet minimum approval requirements of NIOSH regulations [42 CFR Part 84]. Standards, testing, and certification assure the commercial availability of safe respirators for users, such as pesticide applicators.

NIOSH reviews respirator approval applications, which contain technical specifications, drawings, and other related information. NIOSH also inspects, examines, and tests the respirators to determine that the applicable requirements are met for individual, completely assembled respirators.

The testing and certification criteria (and corresponding approval number, 'TC-XXX-XXX') apply to the complete respirator 'assembly' (e.g., facepiece and air purifying elements). Respirator approvals are manufacturer- and model-specific; parts, cartridges, or filters cannot be interchanged between different manufacturers. Approval 'certificates' include a chart that identifies all of the component parts making up the approved assembly. These 'certificates' are typically package inserts with new respirators, as well as cartridges and filters *(see example certificate with NIOSH logo to right*).

Respirator Manufacturing Company

Anytown, Anystate USA

1-800-123-4567

THIS RESPIRATOR IS APPROVED ONLY IN THE FOLLOWING CONFIGURATION:

TC-	Protection [1]	Respirator	Cautions and Limitations [2]
TC-84A-0000	N95	X 1-X2	ABCJMNOP

Additional lines may appear here showing more approval numbers and associated information.

1. **Protection**

N95 - Particulate Filter (95% filter efficiency level)
Effective against particulate aerosols free of oil;
time use restrictions may apply

2. **Cautions and Limitations**

A - Not for use in atmospheres containing less than 19.5% oxygen.
B - Not for use in atmospheres immediately dangerous to life or health.
C - Do not exceed maximum use concentrations established by regulatory standards.
J - Failure to properly use and maintain this product could result in injury or death.
M - All approved respirators shall be selected, fitted, used, and maintained in accordance with MSHA, OSHA and other applicable regulations.
N - Never substitute, modify, add, or omit parts. Use only exact replacement parts in the configuration as specified by the manufacturer.
O - Refer to users instructions, and/or maintenance manuals for information on use and maintenance of these respirators.
P - NIOSH does not evaluate respirators for use as surgical masks.

Sample NIOSH Approval Certificate

There are other respirators on the market that are not NIOSH-approved, such as nuisance dust masks or some surgical masks. Nuisance dust masks can be used to keep you from breathing in non-toxic particulates, such as pollen or dust. However, they are not NIOSH-approved. The filter, box, or packaging cannot be marked with a filter rating. When a respirator is required for working with pesticides, you must wear a NIOSH-approved device that is listed on the label.

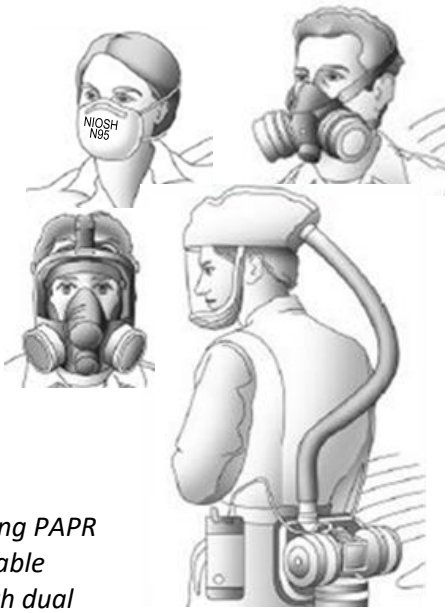
Types of Respirators for Pesticide Uses

There are two classes of respirators: atmosphere-supplying and air-purifying respirators.

Atmosphere-supplying respirators provide clean, breathable air from an uncontaminated source. Atmosphere-supplying respirators include air-line respirators and self-contained breathing apparatus (SCBA). Air-line respirators deliver breathing air through a hose. The source of air can be either from a compressor or a compressed air cylinder that is not carried by the user. SCBAs deliver air from a source that the user carries with them, such as a compressed air tank (*see top right figure*), or escape bottle.

In very specific pesticide uses, such as when using phosphide fumigants in enclosed areas, the environment may be immediately dangerous to life and health (IDLH). In these cases, the only kind of respirators that may be used are either a pressure-demand SCBA with a full facepiece, or a pressure-demand full facepiece air-line respirator with an SCBA-escape bottle (*see bottom right figure*). These respirators have built-in back up to allow escape without having to remove the respirator. The breathing air supply for these respirators should meet or exceed the specification for Grade D breathing air as described in the most current Compressed Gas Association Specification G-7.1 *(figures adapted from the OSHA Small Entity Compliance Guide for the Respiratory Protection Standard).*

Air-purifying respirators remove contaminants from the air that you breathe. These respirators do not supply oxygen and should never be used in an environment that has limited oxygen (< 19.5%) or is immediately dangerous to life or health. Air-purifying respirators may be either non-powered or powered.



All non-powered air-purifying respirators (APRs) have tight-fitting facepieces that seal directly to your face. These facepieces include particulate filtering facepiece respirators (FFR), half masks, and full facepiece masks. They may be designed for single use or with replaceable purifying elements.

Powered air-purifying respirators (PAPRs) use a blower to pass contaminated air through replaceable purifying elements. PAPRs are available with tight-fitting facepieces, or loose-fitting helmets or hoods.

Figures of APR are pictured to the right, clockwise, from the bottom: loose-fitting PAPR with replaceable cartridges; full facepiece non-powered APR with dual replaceable cartridges; single use particulate FFR; and half facepiece non-powered APR with dual replaceable cartridges (figure adapted from the OSHA Small Entity Compliance Guide for the Respiratory Protection Standard).

Purifying Elements for Air-Purifying Respirators and Gas Masks

When selected and used appropriately, purifying elements for air-purifying respirators and gas masks remove specific contaminants from the air passing through them. The pesticide label specifies the purifying element(s) for you to use based on the anticipated hazard and phase of the pesticide that will be present in your breathing zone.

Elements that remove solids or liquids suspended in the air are called particulate filters; while vapor and gas removing elements are called either chemical cartridges or canisters. “Gas mask” refers to a full facepiece APR which incorporates a canister that may or may not have a particulate filter.

There may be instances where the pesticide label requires use of a respirator fitted with both types of purifying elements. For example, a handler may be applying a particular pesticide that is a liquid; but EPA has determined that the phase of that pesticide in the breathing zone during use is both a mist (i.e., liquid droplets suspended in the air) and a vapor. This would be a case where the pesticide label would specify the use of a combination particulate filter - chemical cartridge.

Particulate Filters

Particulate filters remove aerosols suspended in the air that you breathe (e.g., dust, mist, fog, smoke). Particulate filters DO NOT remove gases or vapors. The pesticide label specifies N, R, and/or P filters for non-powered APR; and HE for PAPR.

Particulate filters for non-powered APR and gas masks are rated for both oil resistance and filter efficiency to remove particles. This is because oil mists will affect the filter efficiency. NIOSH-approved filters come in three grades of oil resistance: N-series, R-series, and P-series.

N-series filters are not oil-resistant; R-series filters are oil-resistant for up to 8 hours; and P-series filters are oil-proof. Each of the three grades of filters (N, R, and P) are available in three levels of filter efficiency (95, 99, and 100). These ratings are determined by the efficiency of a filter to remove the most penetrating particle size (as opposed to the smallest size particle).

The nine classes of particulate filters for non-powered APR and gas masks are:

Not oil-resistant

- N95: No oil; moderate filtering efficiency (95%)
- N99: No oil; high filtering efficiency (99%)
- N100: No oil; highest filtering efficiency (99.97%)

Oil-**resistant (somewhat resistant to oil)**

- R95: moderate filtering efficiency (95%)
- R99: high filtering efficiency (99%)
- R100: highest filtering efficiency (99.97%)

Oil-**proof (strongly resistant to oil)**

- P95: moderate filtering efficiency (95%)
- P99: high filtering efficiency (99%)
- P100: highest filtering efficiency (99.97%)

***Non-powered APR with Particulate Filtering Elements**: clockwise from bottom: disposable N95 FFR; elastomeric full facepiece APR with dual replaceable P100 filters; silicon half facepiece APR with dual replaceable P100 filters; half facepiece APR with replaceable N95 filter (photo Rutgers University).*

Non-powered APR and gas masks are configured with replaceable particulate filters. FFR are typically single use; however, FFR with replaceable filters are available (*see figure above right)*. The class of the filter (such as N95) will be clearly marked on the filter, filter package, or respirator box.

Use Limitations of Particulate Filters

For pesticides, EPA regulations [40 CFR 170.507(d)] require replacement of particulate filters when damaged, torn, soiled, or it becomes uncomfortable for the wearer to breathe. Additionally, particulate filters should be replaced according to respirator manufacturer recommendations or pesticide labeling (whichever is more frequent).

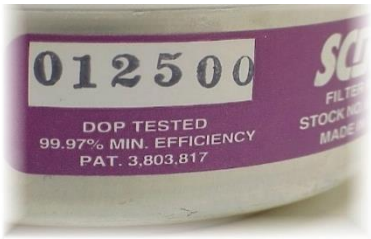
For example, FFRs are designed by respirator manufacturers to be disposable. As pesticide loads on the FFR surface, the soiled filter can be a direct source of contamination to the respirator user, and must be handled with caution. These disposables should not be used beyond a single work shift.

For non-powered APR, respirator manufacturers prescribe specific use limitations for particulate filters (N, R, P) since oils or oil-like substances can degrade the *ability* of a filter to remove particles (versus degrade the filter itself). NIOSH-approved respirator assemblies always meet or exceed certified efficiency levels (95%, 99%, 99.97%), *provided that users follow recommended use instructions*:

N-series filters must only be used for protection from non-oil aerosols. N-series filters must be replaced whenever damaged, soiled, or causing noticeably increased breathing resistance.

R-series filters can be used when either oil or non-oil aerosols are present. When oil or oil-like substances are present, these can only be used for a single work shift (up to 8 hours of continuous or intermittent use). When oil is not present, R-series filters may only be re-used if they are not damaged, soiled, or causing noticeably increased breathing resistance.

P-series filters can be used when either oil or non-oil aerosols are present. Respirator manufacturers are required by NIOSH to determine the maximum recommended service life of P-series filters when used in the presence of oil. NIOSH requires manufacturers to publish the maximum service life of P-series filters in user instructions that come with the respirator. Additional details may be found in product literature or bulletins online.



Non-powered APR P100 filter
(photo Rutgers University)

Manufacturer replacement schedules for P-series filters in the presence of oil aerosols vary widely, from as short as 8 hours to 40 hours or more. Unless you know the manufacturer's replacement recommendation, replace P-series particulate filters after a single work shift (up to 8 hours of continuous or intermittent use) when oil is present.

When oil is not present, P-series particulate filters may be re-used if not damaged, soiled, or causing noticeably increased breathing resistance.

For powered air-purifying respirators, particulate filters are rated High Efficiency (*see right*). When a PAPR with a particulate filter is required, the pesticide label will specify this by the acronym "HE." Change PAPR filters whenever they are damaged, torn, or soiled, or clogged. Replace PAPR HE filters when the PAPR airflow indicator shows that the minimum rated airflow cannot be maintained; see manufacturer user guide for details. Some PAPRs are equipped with alarms when filter(s) are clogged or blocked or battery life is low. Alarms may be audible, vibration, or flash, signaling time to exit to replace filter(s) and/or charge batteries.

HE particulate filter for PAPR color-coded magenta
(photo courtesy 3M Corporation)

Follow respirator manufacturer instructions on service limits for APR and PAPR particulate filters as outlined above. Otherwise, replace all particulate filters at the end of the work day (up to 8 hours continuous or intermittent use). Follow state, tribal, or local regulations when they are more stringent.

Chemical Cartridges or Canisters

Chemical cartridges (APR/PAPR) and canisters (gas masks) for air purifying respirators use sorbents to remove contaminant-specific gases and vapors. Used by themselves, they provide no protection from pesticide particulates; including liquid droplets from sprays, smoke, fogs, or dusts. The type of chemical cartridge or canister that must be used is specified on the pesticide label.

The most typical chemical cartridge or canister specified by the label for pesticide use is an OV cartridge or canister. They contain activated carbon that adsorbs organic vapor gas or vapor molecules from the air being drawn in through the container. Always use the type of purifying element required by the pesticide label.

Types of commercially-available chemical cartridges include: organic vapors, formaldehyde, ammonia, mercury vapor, phosphine, and acid gases. Both chemical cartridge and high-efficiency particulate filter purifying elements are required by NIOSH to be labeled, as well as color-coded. For example, organic vapor-removing (OV) elements are coded black while P-100 series filters are color-coded magenta (*see figure to right*). HE particulate filters for PAPRs are also color-coded magenta.

Color-coded Filter and Cartridges
(photo courtesy of Moldex®)

Chemical purifying elements are also available for "multi-gas/vapor" removal. If a pesticide label specifies OV cartridges, a multi-gas/vapor element that also includes OV may also be used.

A chemical cartridge/canister is effective until the sorbent bed is filled and the gas or vapor "breaks through." Breakthrough is the penetration of a gas or vapor through a chemical air-purifying element to inside the wearer's mask. Any taste, smell, or irritation is a warning that breakthrough of the pesticide through the sorbent may have occurred, and that you should exit the area.

The effective service life of any chemical cartridge or canister depends on the conditions of use. Conditions that impact service life are: type and concentration of pesticide as well as other contaminants; user's breathing rate; relative humidity; and temperature.

For a given pesticide, the higher the concentration of the contaminant gases or vapors, the shorter time to breakthrough. Cartridge/canister service life is also shortened by increased breathing rate when performing more physically demanding tasks. Service life can also be reduced with higher ambient temperature and humidity.

The service life for chemical cartridges/canisters can be identified by chemical-specific end-of-service-life-indicators (ESLI), such as a color change indicator on the cartridge or canister. There are a limited number of cartridges and canisters equipped with ESLI; but research and development continues.

In the absence of ESLI, OSHA requires that employers evaluate the conditions of use and pre-determine a change schedule for replacement of chemical cartridges and canisters per 29 CFR 1910.134(d)(3)(iii)(B)(2). EPA's Revised WPS adopted this by reference. Pre-determination of a chemical cartridge/canister-change schedule requires knowledge of the pesticide formulation (both active and inactive ingredients); use conditions; and anticipated concentration in the breathing zone.

In absence of this information, EPA's Revised WPS requires that gas- or vapor-removing canisters or cartridges be replaced according to respirator manufacturer recommendations or pesticide product labeling instructions, whichever is more frequent.

Respirator manufacturers recommend that OV cartridges/canisters should not be used beyond one day. Organic vapors trapped by the sorbent in the cartridge or canister (*see right; photo courtesy of Scott Safety*) may easily desorb overnight. If you were to use it the next day, you could breathe in any desorbed pesticide vapors. At the very least, make sure to dispose of OV-purifying elements at the end of the work day.

Gas mask OV canister (left)
Non-powered APR OV cartridge (right)

Change cartridges/canisters earlier if contaminant odor, taste, or irritation is detected inside the facepiece. Although useful, these sensory indicators should not be the sole determining factor for when a chemical cartridge/canister should be replaced. There is a wide variability in sensory thresholds of the general population; some substances are odorless; and individuals can develop olfactory fatigue. Breakthrough may not be detectable by the general population at concentrations that are safe to breathe.

Combination Chemical Cartridge/Particulate Filters

When both particulates and gases/vapors toxic by inhalation are anticipated to be in your breathing zone during handling, the pesticide label will specify respirators with both a chemical purifying element and a particulate filter.

Combo cartridges for non-powered air-purifying respirators can have either N, R, or P rated filters. Combination chemical cartridges for powered air-purifying respirators will include an HE filter; while a combo gas mask canister would typically include a P100 filter. These filters are permanently attached to cartridges or canisters.

(Respirator photo courtesy Moldex®; adapted with permission)

Another option would be the use of particulate N, R, or P filters "piggy-backed" onto the chemical cartridge(s) of a non-powered APR using a retainer (*see figure to left*).

Apply individual filter and chemical cartridge replacement criteria to respirators fitted with combination purifying elements. For example, if using a respirator with a combo OV/N95 cartridge and you detected breakthrough in the mask, the entire cartridge would need replacement. Or if using a respirator with an OV cartridge piggybacked with an N95 filter and it became uncomfortable to breathe, you would keep the cartridge but replace the filter with a new one.

Identifying the Respirator Type from the Pesticide Label

When respiratory protection is required, the respirator type will be listed in the precautionary statements of the pesticide label. Respiratory protection required by the label is product- and task-specific.

EPA regulations [40 CFR 156.212] prescribe language for respiratory protective devices required in the precautionary statements. Requirements include use of approved respirators; and type of respirator and corresponding approval schedule designation (i.e., TC #). This language is applied to both agricultural and occupational uses of pesticides.

The most current version of respirator statements required by EPA for pesticide labels can be found in Chapter 10 of its' Label Review Manual (LRM).

EPA will be updating the respirator statements for pesticide labels. Consult LRM Chapter 10 *Worker Protection Label* for revisions (see www.epa.gov/pesticide-registration/label-review-manual).

Attachment 1 provides EPA's respirator label statements excerpted from the February 2016 version of Chapter 10.

Use of Approved Respirators

Prior to 1995, Mine Safety and Health Administration **[MSHA 30 CFR Part 11]** regulations gave MSHA and NIOSH authority to jointly certify respirators. Some older pesticide labels do state "use MSHA/NIOSH approved respirators." These MSHA/NIOSH-approved respirators have not been manufactured since 1998, and are no longer commercially-available.

MSHA regulations were replaced in 1995 by NIOSH **[42 CFR Part 84]** regulations, granting approval authority of respirators solely to NIOSH. The table to the right lists NIOSH-approved respirator types grouped by atmosphere-supplying and air-purifying respirators. These are listed by approval schedule (i.e., TC #).

Atmosphere-Supplying Respirators

TC-13F:	Self-contained breathing apparatus
	Supplied-air respirator with a self-contained escape bottle
TC-19C:	Supplied-air respirator

Air Purifying Respirators

TC-21C:	Powered air-purifying respirator (PAPR) with particulate filter (HE)
TC-14G:	Gas mask with/without particulate filter (N, R, or P)
	Tight-fitting PAPR with gas canister with/without particulate filter (HE)
TC-23C:	APR with chemical cartridges
	PAPR with chemical cartridges
	PAPR with combination chemical cartridge & particulate filter (HE)
TC-84A*:	Filtering facepiece respirators (N, R, or P)
	APR with particulate filters (N, R, or P)
	APR with combination chemical cartridge & particulate filter (N, R, or P)

Adapted from: NIOSH Standard Application Procedure for the Certification of Respirators Under 42CFR 84. Rev 2.1. August 2015

EPA issued a policy statement (PRN 98-9) specifically allowing the substitution of Part 84 for Part 11 respirators. It would not be/is not a violation of the label to use Part 84 respirators.

Some older pesticide labels may not specify use of any type of approved respirators. In all cases, pesticide applicators must use a NIOSH-approved respirator when use of a respirator is required by the pesticide label.

NIOSH-Approved Respirators [NIOSH 42 CFR Part 84]

NIOSH regulations did not change MSHA certification and testing criteria, except for certain particulate filters. It requires more demanding certification testing for non-powered particulate filters than the old respirators certified under 30 CFR 11. It also created a separate schedule, **TC-84A***, for any non-powered air-purifying respirator assembly that includes a particulate filter, or combination particulate filter/ chemical cartridge.

These changes impact which respirators will be specified on pesticides labels. See Attachment 2 for "Respirator Approvals - Comparison of MSHA vs. NIOSH Schedules" for detailed changes. It includes notes to current users of respirators for pesticides.

NIOSH 42 CFR Part 84 Particulate Filter Designations

- N-series: Not resistant to oil
- R-series: Oil-resistant
- P-series: Oil-proof

Non-powered particulate filtering respirators are rated by oil resistance, as well as removal efficiency. These NIOSH-approved filters come in three grades of oil resistance: N-series, R-series, and P-series (*see text box to left*). Pesticide labels will specify N-, R-, and/or P-series filters for non-powered APR and FFR (TC-84A).

If N series filters are not listed on the label, the pesticide formulation or mix has oil or is oil-like. In these cases, the pesticide label requires use of R- or P-series filters. R-series may be used for one shift only. If you do add an adjuvant to a tank mix, use only R- or P- series filters. Do NOT use an N-series filter as the adjuvant could either contain oil or act like an oil.

Some pesticide label statements will specify "use any N, R, P, or **HE** filter", combining non-powered (N, R, P) and powered APR (**HE**) particulate filter designations. You may use either of: 1) non-powered air-purifying respirator with any N- series, R-series, or P-series particulate filter; or 2) PAPR with or without a combination OV cartridge and **HE** particulate filter.

Obsolete Respirators [MSHA 30 CFR Part 11]

With these regulatory changes, MSHA/NIOSH non-powered and some powered respirator designations became obsolete. Obsolete particulate filter designations that may be found on older pesticide labels include: "dust and mist [DM] filters"; "dust, fume and mist [DFM]; "HEPA"; "dust mask"; and "pre-filter". None of these are NIOSH-approved. When obsolete respirators (*see text box to right*) are required by the pesticide label, err on the side of safety and use either an R- or P-series filter; do not use an N-series filter.

Obsolete Respirator Classifications MSHA 30 CFR Part 11

- Dust and mist [DM] respirators
- Dust, fume and mist [DFM] respirators
- Pesticide respirators
- Paint spray respirators

Sometimes pesticide labels will include a mixture of these obsolete classifications as well as N, R, and/or P particulate filters. When this occurs, simply use the N, R, and/or P filters specified by the pesticide label.

Finally, product labels may specify the use of a "pesticide respirator" or a "pre-filter approved for pesticides". Since NIOSH no longer certifies pesticide respirators, substitute either a: 1) gas mask with OV canister and P100 particulate filter; 2) non-powered air-purifying respirator with combination OV cartridges and R-series or P-series particulate filters; or 3) PAPR with combination HE particulate filter/OV cartridge or canister.

Contact your Cooperative Extension Pesticide Safety Education Program, state, territory, or tribal pesticide regulatory agency, and/or the EPA for assistance in selecting the correct respirator and any component parts from the pesticide label.

Federal and State Occupational Safety & Health Programs

In the United States, the Federal Occupational Safety and Health Administration (OSHA) adopts and enforces health and safety standards to protect workers from occupational hazards, with the exception of agricultural pesticide use. In these cases, agricultural employees (workers and handlers) are protected under EPA's Worker Protection Standard [40 CFR 170]. In these cases, OSHA must defer to EPA under FIFRA.

EPA also has jurisdiction over the content and enforcement of pesticide labels in non-agriculture situations where pesticides are being applied by pest control companies, such as landscapers or exterminators. Pest control companies are otherwise covered by OSHA and subject to inspection. In the case of pesticides, OSHA may not (versus *must not*) cite its Hazard Communication standard. Federal OSHA inspectors are not required to make a citation, but may make a referral to EPA.

Some states, such as California, have State occupational safety and health standards or other regulations for pesticides that are equivalent or exceed OSHA or EPA requirements. When a state regulation is more stringent, it takes primacy and must be followed.

In the case of respiratory hazards, OSHA's Respiratory Protection Standard [29 CFR 1910.134] requires that employers take measures to reduce employee exposures to harmful contaminants below the permissible exposure limit of a contaminant. If measures are not feasible or are ineffective, respiratory protection and accompanying program elements must be put in place. Agricultural operations are specifically exempt from these requirements of 1910.134 (*see box to right*), although some states require all agricultural operations to comply.

Agricultural Employers

Small farming operations that have 10 or fewer employees as well as have had no temporary labor camp activity within the prior 12 months are exempt from Federal OSHA regulations.

All other farming operations are subject to applicable OSHA regulations. This would include having a Hazard Communication Program for all hazardous chemicals that are not pesticides.

Farming operations* are specifically exempt from OSHA's Respiratory Protection Standard 29 CFR 1910.134.

However, **EPA's Revised WPS overrides OSHA exemption in the case of handler use of respirators required by the pesticide label.** EPA 40 CFR 170 requires that all agricultural employers comply with a *subset* of OSHA 29 CFR 1910.134.

** with SIC codes starting with 01 and 02*

Pest control companies, however, must comply with OSHA's requirement of a written Respiratory Protection Program that covers the following eight elements [29 CFR 1910.134(c)]:

1) Procedures on how to select the proper respirator for your worksite or job.
2) Medical evaluation of respirator users to determine ability to use a respirator, before being fit-tested.
3) Fit testing procedures for tight-fitting respirators.
4) Proper use of respirators.
5) Care and maintenance of respirators.
6) Breathing air quality and use for supplied air respirators.
7) Training on hazard recognition, dangers associated with respiratory hazards, and proper care and use.
8) Program evaluation of respirator fit, selection, use, and maintenance.

In 2015, EPA revised its WPS and adopted a *subset* of OSHA's Respiratory Protection [OSHA 1910.134] requirements. The Revised WPS requires that when a WPS-covered pesticide label requires a handler to wear a respirator, the handler's employer must provide them with a medical evaluation, fit test, and respirator training. EPA's WPS does not exempt owners of agricultural establishments from providing themselves or their family members these requirements.

EPA's Revised WPS did not adopt OSHA's requirements for employers to develop a Respiratory Protection Program [29 CFR 1910.134(c)] or to conduct a workplace hazard evaluation [29 CFR 1910.134(d)(1)(iii)].

Medical Evaluation of Respirator Users

When use of a respirator is required by the pesticide label, both commercial applicator and agricultural employers must provide pesticide handlers a medical evaluation per OSHA 29 CFR 1910.134(e) to determine their ability to safely use the respirator specified. This includes FFR. Under OSHA's regulations, medical evaluations are required for voluntary use of a respirator in the workplace, with the exception of FFR. EPA's Revised Worker Protection Standard requires that agricultural employers and/or their family members also receive a medical evaluation if they will be using label-required respiratory protection. Medical evaluation must be completed prior to fit testing, or use of the respirator for the first time.

Medical eligibility must be determined by a physician or other licensed health care provider (referred to as a "PLHCP") that is permitted to perform respirator medical evaluations of individuals. OSHA defines a PLHCP as a "person whose legally permitted scope of practice (i.e., license, registration, or certification) allows them to independently provide, or be delegated to provide, some or all of the health care services required by OSHA's Respiratory Protection Standard". It is state law that determines the legal scope of practice. Licensing rules vary from state to state. In New Jersey, for example, Physician Assistants may perform these medical evaluations independently provided that they are under the direct supervision of a physician licensed by the State Board of Medical Examiners (BME).

OSHA outlines all information required to be obtained by the PLHCP for medical evaluation in its "Respirator Medical Evaluation Questionnaire" [Appendix C to 1910.134]. The questionnaire is designed to identify general medical conditions that place employees who use respirators at risk of serious medical consequences, and includes questions addressing these conditions. Such medical conditions include seizures, diabetes, respiratory disorders and chronic lung disease, and cardiovascular problems. The information contained in an employee's medical evaluation questionnaire are considered medical records, and as such are confidential.

OSHA Respirator Medical Evaluation Questionnaire Infosheet

PLHCPs must perform a medical evaluation of a pesticide handler's eligibility to wear a respirator using the questionnaire, or an initial medical examination that obtains the same information. OR a PLHCP may make a determination using both. Various companies provide online medical evaluations of respirator wearers as required per 1910.134. These evaluations use a web-based interactive questionnaire that is evaluated by a PLHCP, some with an expanded version of the OSHA Respirator Medical Evaluation Questionnaire.

The PLHCP's medical evaluation must also consider the specific conditions of the respirator use(s): type and weight of the respirator to be worn; duration and frequency of respirator use; expected physical work effort; use of protective clothing and equipment to be worn; and temperature and humidity extremes that may be encountered. This information must be provided to the PLHCP by both commercial applicator businesses and agricultural employers. Commercial pesticide applicator businesses would also provide the PLHCP with copies of the company's respiratory protection program and the OSHA respiratory standard [29 CFR 1910.134].

Regardless of whether the questionnaire itself and/or exam is used, the PLHCP can require a follow-up with medical tests, consultations, or diagnostic procedures necessary to make a medical determination of the employee's eligibility to safety wear the respirator(s) under the conditions of use specified.

The PLHCP then makes a medical determination per OSHA 29 CFR 1910.134(e)(6)(i) regarding the pesticide handler's ability to use the respiratory protection specified. The PLHCP's written recommendation (often called a medical clearance) must be limited to, but include:

1) any limitations on respirator use related to the medical condition of the handler;
2) any limitations on respirator use relating to the workplace conditions in which the respirator will be used;
3) a statement regarding whether or not the person is medically able to use the respirator;
4) the need, if any, for follow-up medical evaluations; and
5) a statement that the PLHCP has provided the handler with a copy of the PLHCP's written recommendation.

The letter of medical determination should be kept as record that the pesticide handler is medically cleared to use the respirator as specified. OSHA requires (per 29 CFR 1910.1020) that employers retain such records for the employee's length of employment, plus thirty years; this is not required if the employee has been employed for less than a year. The Revised WPS requires that the PLHCP written recommendation be maintained by agricultural employers on the establishment for two years.

Annual medical evaluations are not explicitly required by either OSHA or EPA. However, the evaluating PLHCP may include a reevaluation requirement in their written recommendation. And, company respiratory protection plans may require periodic reevaluation for continued respirator use by the employee. Additional medical evaluations would be required for continued respirator use, in specific instances as outlined in OSHA 29 CFR 1910.134(e)(7). Some instances include: changes in workplace conditions, or reported signs or symptoms directly related to their ability to use a respirator.

Follow state, tribal, or local regulations when they are more stringent.

Use of Tight-Fitting Respirators

Tight-fitting respirators include: filtering-facepiece respirators (FFRs); re-usable respirators with replaceable cartridges and/or filters; and respirators with tight-fitting facepieces used with powered air purifying, supplied air systems, and self-contained breathing apparatus

User Seal Checks (Leak Checks)

For any tight-fitting respirator, wearers must check that the mask has been put on correctly and has been adjusted to fit properly by performing a 'user seal check' each time the mask is put on. If the mask is not sealed to the face, air contaminants would be drawn inside the user's mask with each breath. A user seal check is not a substitute for a fit test.

Perform either positive or negative user seal checks, and preferably both if possible, every time you put on your mask. OSHA User Seal Check Procedures are published as Appendix B-1 of Title 29 part 1910.134 of the Code of Federal Regulations. OSHA allows use of respirator manufacturer's user seal check procedures if equally effective to Appendix B-1. Respirator manufacturers include with the respirator model-specific directions and/or pictorials to perform user seal check(s). Several have online videos.

To perform a positive pressure user seal check of an elastomeric respirator, cover the exhalation port with the palm of your hand and lightly exhale into the mask. You will feel air escaping at any gaps in your seal. Readjust the mask until there is no leakage *(figure to right).*

Positive Pressure User Seal Check
(photo Rutgers University)

Negative Pressure User Seal Check
(photo Rutgers University)

To perform a negative pressure user seal check of an elastomeric respirator, cover or seal off the surface or hose where air is inspired and suck in. If a mask is properly sealed, it should collapse on your face with no signs of leakage in the facepiece or hoses. If you can't get a seal, readjust the mask until there is no leakage *(figure to left)*.

User seal checks for filtering facepiece respirators can and must be performed prior to each use. FFR are intended by the respirator manufacturers to be disposable. In practice, FFR are donned and doffed multiple times during the workday. And, this can cause them to become misshapen or distorted, and no longer provide a protective seal to the user's face. Therefore, it is necessary to perform user seal checks prior to each wearing per the respirator manufacturer instructions to ensure that it is adjusted properly and maintains a seal. Discard FFR when a seal can no longer be achieved.

Fit Testing Requirements for Occupational Users of Pesticides

The primary purpose of fit testing is to identify the right size and type of tight-fitting respirator that an employee can comfortably wear. Employers must provide a sufficient number of makes, models, and /or sizes for employee fit testing. Even FFR come in different sizes and configurations.

A qualitative (QLFT) or quantitative (QNFT) fit test of a given mask type on a user's face should be performed in order to select the best-fitting respirator. OSHA-Accepted Fit Test Protocols for both QLFT and ONFT are published as Appendix A of Title 29 part 1910.134 of the Code of Federal Regulations. The Revised WPS adopts all OSHA procedures regarding fit testing of respirators and requires a fit-test for any tight-fitting respirator required by the label of a WPS-covered pesticide.

Qualitative fit testing involves the introduction of a harmless odoriferous; bitter- or sweet-tasting; or irritating substance around the respirator. If no odor, taste, or irritation is detected by the wearer while performing prescribed tasks, the mask fits properly.

OSHA provides step-by-step instructions for four acceptable types: 1) isoamyl acetate (more commonly known as banana oil); 2) saccharin solution aerosol; 3) Bitrex™ solution aerosol; and 4) irritant smoke. Kits for qualitative testing are commercially available from local and online safety suppliers (*see right*).

Qualitative Fit Test Kit
(photo courtesy of Moldex®)

Employers must ensure that the person administering the QLFT is able to prepare test solutions, calibrate equipment, perform tests properly, recognize invalid tests, and ensure test equipment is in proper working order.

TSI PortaCount® Quantitative Fit Test
(photo Rutgers University)

Quantitative fit testing is a method of assessing whether a particular size and brand of respirator adequately fits an individual's face using instrumentation to numerically measure leakage into the respirator.

While the wearer performs exercises that could cause facepiece leakage, the air inside and outside the facepiece is then measured for the presence of an aerosol, ambient particulates, or pressure change, to determine any leakage into the respirator.

Employers must ensure that the person administering the QNFT is able to calibrate the equipment and perform tests properly, recognize invalid tests, calculate "fit factors" properly, and ensure that test equipment is in proper working order.

Fit testing is required annually and whenever a different model or size of tight-fitting respirator facepiece will be used. Get fit tested whenever something physically changes that could affect the fit of your respirator (e.g., facial scarring, dental changes, cosmetic surgery, or an obvious change in body weight).

OSHA and EPA regulations do not require a specific format for keeping records of fit testing. However, each fit test record must contain the following information: name of handler tested; type of fit test performed; make, model, and size of the respirator tested; date of the fit test; and results. Results for QLFT are pass/fail; QNFT would be the "fit factor" achieved during testing and a recording of the results such as a strip chart.

OSHA requires that employers maintain records of fit testing until the next fit test is performed (at a minimum, this would be annually). The Revised Worker Protection Standard further requires that agricultural employers maintain records of annual fit testing on the establishment for two years for each employee that will use a respirator in the application of pesticides.

Respirator Training for Occupational Users of Pesticides

Training is an integral element of protecting the health and safety of workers. EPA requires that certified applicators of pesticides receive training in reading and following the pesticide label, which includes properly selecting the type of respirator and components such as purifying elements.

Further, employers of occupational users of pesticides must provide effective respirator training per OSHA 29 CFR 1910.134(k) to those employees required to wear respiratory protection by the product label.

Training of these employees must be conducted in a manner that is understandable, and before the respirator is used in the workplace. Respirator training must be repeated annually; when workplace conditions change; a new type of respirator is used; or retraining is needed because the employee's knowledge or use is inadequate.

Pest control companies (interior and exterior) are required to provide worksite-specific respirator training to all employees required to use respirators for protection from workplace hazards, including pesticides. The content of training must include all seven elements as itemized in OSHA 29 CFR 1910.134(k(i)-(vii). *See text box above right.*

Respirator Training Content
Adapted from OSHA 29 CFR 1910.134(k)(i)-(vii)

1. Why the respirator is necessary and how improper fit, usage, or maintenance can compromise the protective effect of the respirator;
2. What the limitations and capabilities of the respirator are;
3. How to use the respirator effectively in emergency situations, including situations in which the respirator malfunctions;
4. How to inspect, put on and remove, use, and check the seals of the respirator;
5. What the procedures are for maintenance and storage of the respirator;
6. How to recognize medical signs and symptoms that may limit or prevent the effective use of respirators; and
7. The requirements for federal/state OSHA respiratory protection standards.

All agricultural employers (*regardless of size*) are required by the 2015 Revised Worker Protection Standard to provide respirator training to those handlers (including themselves and their family members) who will be required to use respiratory protection by pesticide label. WPS respirator training must cover items 1 – 6 in the box.

OSHA does not specifically require records of respirator training; however, an employer is required to ensure that respirator users can demonstrate knowledge of training. EPA's Revised WPS additionally requires agricultural employers maintain written records of respirator training on the establishment for two years; but it does not require a specific format or content.

Follow state, tribal, or local regulations when they are more stringent.

Proper Use of Respirators in Pesticide-Contaminated Areas

Failure to properly use respiratory protection can result in injury or death. Read, understand, and follow manufacturer instructions supplied with the respirator and its component parts. Prior to use, complete inspection procedures listed in the User's Instructions. For PAPRs, this would include checking battery charge, airflow, and alarms, if equipped.

Prior to use of a tight-fitting respirator in a contaminated area, take care that nothing interferes with the seal between the surface of the mask and your face. This includes stubble, beards, moustaches, jewelry, and eyewear. Facial hair must not interfere with the operation of check valves. Eyeglasses, goggles, or faceshields should not interfere with the fit or seal of respirators. Full facepiece respirators can be fitted with spectacle kits for prescription lenses available from the respirator manufacturer.

Use of contact lenses with respiratory protection is not specifically prohibited by either OSHA or EPA. However, an employer's respiratory protection plan can disallow their use by employees. Inspect your respirator and perform user seal check(s) prior to use.

When using a respirator in a contaminated area, be alert for danger signs. For example, tasting or smelling contaminants; eye, nose, or throat irritation; difficulty breathing; nausea or dizziness; breathing air becomes uncomfortably warm; or facepiece slippage or leaks. If you are using a chemical cartridge, for example, this may mean that breakthrough has occurred, OR your respirator may not be working, or be seated on your face properly.

In all of these cases, keep your respirator on, and return to fresh air immediately.

Care and Maintenance of Respirators

Reusable respirators require care and maintenance to function properly to provide protection from respiratory hazards. Inspect your respirator before and after each use, as well as when it is cleaned. Make sure it functions properly and that the connections are tight. Also check for wear and deterioration of its component parts.

Depending upon the type of respirator, inspection should include the facepiece, head straps, valves, connecting tube, and cartridges, canisters or filters. Give special attention to rubber or plastic parts that can deteriorate or lose pliability. For replacements or repairs, only use manufacturer parts for the make and model of respirator. This includes replacement filters, cartridges, and canisters.

Keep air-purifying elements such as chemical cartridges or filters sealed in their original packaging until use. Don't stockpile purifying elements. Although it is not a requirement, some respirator manufacturers stamp the expiration date of purifying elements on the outside of the product package. Do not use beyond the expiration date.

After using your respirator, remove and properly dispose of any expendable components such as filters, cartridges, or canisters. Reusable respirators should be routinely washed and disinfected; those shared between users must be cleaned and disinfected after each use. Follow OSHA's Respirator Cleaning Procedures [29 CFR 1910.134 Appendix B-2]. Or wash in an equally-effective cleaning/sanitizing solution recommended by the respirator manufacturer. Take care to clean under and around gaskets and valves. Rinse thoroughly, and allow to air dry thoroughly.

Store cleaned respirators, as well as replacement purifying elements, in a clean dry place that is not exposed to sunlight or extremes in temperature. Protect them from damage, contamination, dust, and excessive moisture. Store your respirator carefully so that the facepiece or valves don't lose their shape. Do not store any protective equipment, including respirators, with or near chemicals such as pesticides.

MSA Confidence Plus™ Germicidal Cleaner
(photo courtesy of MSA The Safety Company)

Summary

Occupational users of pesticides can be exposed to toxic gases and vapors, particulates, or both. Various pesticide formulations, environments, and application methods require different types of respiratory protection devices (respirators).

EPA requires that pesticide manufacturers determine and specify respiratory protection according to the anticipated hazards and risk of inhalation. Manufacturers provide requirements for respiratory protection on the pesticide label that are product- and task-specific.

The pesticide label states whether you must use a respirator and, if so, which type. Atmosphere-supplying respirators provide clean, breathable air from an uncontaminated source, while air-purifying respirators remove contaminants from the air that you breathe. Both may be configured with either tight- or loose-fitting facepieces. When a tight-fitting respirator is used, fit testing is required to select the correct size, model, and manufacturer.

Occupational users of pesticides must understand the capabilities and limitations of each respirator they will use. The pesticide label specifies use of "NIOSH-approved" respirators. The NIOSH-approval certificate that accompanies the respirator indicates the approved configuration, protection, and cautions and limitations of the respirator. For example, air purifying respirators do not supply oxygen, and must not be used in an environment containing less than 19.5% oxygen.

When air-purifying respirators are required, the label will specify the type of particulate filter and/or chemical cartridge or canister. For example, non-powered particulate filters differ according to their oil resistance. When a pesticide contains oil or an oil-like substance, an N-series (not oil proof) cannot be used; and the pesticide label will specify R-series (oil-resistant) or P-series (oil-proof) filters.

Prior to use of respirators, users must be medically evaluated to determine that they can safely use the respirator under the conditions of use. Annual training is required. Respirator users must know how to properly inspect, recognize danger signals during use and what to do; don and doff (put on and remove). After use, proper care, maintenance, and storage of their respirator can prolong the life of the respirator.

This document provides practical information for proper use of respirators by occupational users of pesticides. It also outlines regulatory requirements of EPA and OSHA that apply to commercial users and also agricultural operations that use pesticides. Its purpose is to describe types of respirators, their limitations, use, care, and maintenance. Consult the primary references and glossary at the end of the document for more detailed information. Contact your Cooperative Extension Pesticide Safety Education Program, state or tribal pesticide regulatory agency, and/or the EPA for assistance in selecting the correct respirator and any component parts from the pesticide label.

ATTACHMENTS

Table 1: EPA Respirator Language Statements[1]

Pesticide Type	Vapor Pressure (mmHG)	Respirator Language	
		Oil in Application Mix	No Oil in Application Mix
Non-Organic Gaseous Products: Products that are formulated or applied as a gas that are not organically based such as phosphine	1×10^{-3} or lower	Case by case basis	Case by case basis
Organic Gaseous Products Used in Enclosed Areas: Products that are formulated or applied as a gas (space and soil fumigants) and that may be used in greenhouses or other enclosed areas must bear labeling specifying the following RPD requirements and statement	1×10^{-3} or lower	For handling activities in enclosed areas, use either a NIOSH approved supplied-air respirator with NIOSH approval number prefix 19C; or a self-contained breathing apparatus (SCBA) with NIOSH approval number prefix TC-13F.	For handling activities in enclosed areas, use either a NIOSH approved supplied-air respirator with NIOSH approval number prefix 19C; or a self-contained breathing apparatus (SCBA) with NIOSH approval number prefix TC-13F.
Organic Gaseous Products Applies Outdoors: products that are formulated or applied as a gas (space and soil fumigants) and that may be applied outdoors must bear labeling specifying the following RPD requirements and statement:	1×10^{-03} or lower	A NIOSH-approved respirator with an organic vapor (OV) cartridge with a combination R or P filter, with NIOSH approval number prefix TC-84A; or NIOSH approved gas mask with an organic vapor canister with NIOSH approval number prefix TC-14G; or a NIOSH approved powered air purifying respirator with organic vapor (OV) cartridge and combination HE filter, with NIOSH approval prefix TC-23C.	A NIOSH-approved respirator with an organic vapor (OV) cartridge with a combination N, R, or P filter with NIOSH approval number prefix 84A; or NIOSH approved gas mask with an organic vapor canister with NIOSH approval number prefix TC-14G; or a NIOSH approved powered air purifying respirator with organic vapor (OV) cartridge and combination HE filter with NIOSH approval number prefix TC 23C.
Solid Products: Products that are formulated and applied as solids.	NA	A NIOSH approved particulate respirator with any R or P filter with NIOSH approval number prefix TC-84A; or a NIOSH approved powered air purifying respirator with HE filter with NIOSH approval number prefix TC-21C.	A NIOSH approved particulate respirator with any N, R or P filter with NIOSH approval number prefix TC-84A; or a NIOSH approved powered air purifying respirator with HE filter with NIOSH approval number prefix TC-21C.
Liquid Products in Toxicity Category I: Products that are formulated or applied as liquids:	Lower than 1×10^{-05}	A NIOSH approved particulate respirator with an R or P filter with NIOSH approval number prefix TC – 84A. ; or a NIOSH-approved powered air purifying respirator with an HE filter with NIOSH approval number prefix TC-21C.	A NIOSH approved particulate respirator with any N, R, or P filter, NIOSH approval number prefix TC-84A . ; or a NIOSH-approved powered air purifying respirator with an HE filter with NIOSH approval number prefix TC-21C.
	Greater than 1×10^{-05}	A NIOSH approved respirator with an organic vapor (OV) cartridge with a combination R or P filter, with NIOSH approval number prefix TC – 84A; or a NIOSH approved powered air purifying respirator with organic vapor (OV) cartridge and combination HE filter with NIOSH approval number prefix TC-23C; or a NIOSH approved gas mask with an organic vapor canister with NIOSH approval number prefix TC – 14G.	A NIOSH approved respirator with an organic vapor (OV) cartridge with any combination N, R or P filter with NIOSH approval number prefix TC – 84A; or a NIOSH approved powered air purifying respirator with organic vapor (OV) cartridge and combination HE filter with NIOSH approval number prefix TC-23C; or a NIOSH approved gas mask with an organic vapor canister with NIOSH approval number prefix TC – 14G.
Liquid Products in Toxicity Category II: Products that are formulated or applied as liquids	Lower than 1×10^{-04}	A NIOSH approved particulate respirator, with any R or P filter with NIOSH approval number prefix TC-84A; or a NIOSH-approved powered air purifying respirator with an HE filter with NIOSH approval number prefix TC-21C.	A NIOSH approved particulate filter with any N, R, P filter with NIOSH approval number prefix TC-84A; or a NIOSH-approved powered air purifying respirator with an HE filter with NIOSH approval number prefix TC-21C.
	Greater than 1×10^{-04}	A NIOSH approved respirator with an organic vapor (OV) cartridge with a combination R or P filter, with NIOSH approval number prefix TC – 84A; or a NIOSH approved gas mask with a canister with NIOSH approval number prefix TC – 14G; or a NIOSH approved powered air purifying respirator with organic vapor (OV) cartridge and combination HE filter with NIOSH approval number prefix TC – 23C.	A NIOSH approved respirator with an organic vapor (OV) cartridge with a combination N, R or P filter with NIOSH approval number prefix TC – 84A; or a NIOSH approved gas mask with a canister with NIOSH approval number prefix TC – 14G; or powered air purifying respirator with organic vapor (OV) cartridge and combination HE filter with NIOSH approval number prefix TC –23C.

[1] *Reproduction of US EPA Label Review Manual Table 5. Respirator Language. Chapter 10 Worker Protection Labeling. February 2016. Pp10-11 to 10-12. URL: https://www.epa.gov/sites/production/files/2016-02/documents/chap-10-feb-2016.pdf. Date accessed: 6/27/2017.*

Table 2: Respirator Approvals - Comparison of MSHA vs. NIOSH Schedules

	MSHA Regulation	NIOSH Regulation	
Approval Schedules	MSHA and NIOSH Joint Approval MSHA 30 CFR Part 11 Effective dates: 1971 – 1995	NIOSH Approval[1] NIOSH 42 CFR Part 84 Effective dates: 1995 to present	Notes to Current Users of Respirators for Pesticides
TC-21C Particulate Respirators *changes* deletions	• Non-powered particulate filter APR: – APR with HEPA filters – Single use dust/mist respirators – Dust/mist filtering respirators – Dust/mist/fume respirators • Any[2] Powered Air Purifying Respirator (PAPR) with particulate filter (HE) • Any[2] PAPR with dust/mist filter • PAPR with dust/mist/fume filter	– Obsolete – Obsolete – Obsolete – Obsolete • Any PAPR[2] with particulate filter (HE) • Obsolete • Obsolete	All MSHA/NIOSH non-powered particulate respirator designations are obsolete. dust mask; dust/mist, dust/mist/fume, and HEPA filters. Respirators with these filter types have not have not been manufactured since 1998. 42 CFR Part 84 created "Schedule" TC-84A. It includes all non-powered APR with particulate filters; as well as those with particulate filters in combination with chemical cartridges.
TC-84A Air Purifying Particulate Respirators (only non-powered) *new schedule*	not applicable	• Filtering facepiece respirators (N, R, or P) • Non-powered APR with particulate filters (N, R, or P) • Non-powered APR with combination chemical cartridge - particulate filter (N, R, or P) • Non-powered APR with chemical cartridge & particulate filter (N, R, or P) held in place with retainer	Schedule TC-84A particulate filters (N, R, P) are rated for degradation of filter efficiency by oil; i.e. N (no oil); R (oil-resistant); and P (oil-proof). Each of these filter types is also rated by filter efficiency; i.e., 95%, 99%, and 99.97%.
TC-14G Gas Mask Air Purifying Respirators *changes*	• Gas mask without particulate filter • Gas mask with particulate filter (dust/mist, dust/mist/fume, HEPA) • Gas mask or PAPR with gas mask canister approved for pesticides • Tight-fitting PAPR with gas mask canister with HE filter • Tight-fitting PAPR with gas mask canister	• Gas mask without particulate filter • Gas mask with particulate filter (N, R, or P) • Obsolete • Tight-fitting PAPR with gas canister with HE filter • Tight-fitting PAPR with gas canister	Current NIOSH Approval Schedule TC-14G allows for certification of N, R, or P-series filters for gas masks. P100 is the most typical filter type commercially available for gas masks. All NIOSH/MSHA pesticide respirator designations are obsolete. PAPR that include particulate filters in combination with chemical canisters or cartridges are currently tested & approved under schedules TC-14G & TC-23C (*see below*).
TC-23C Chemical Cartridge Respirators *changes*	• Chemical cartridge respirators with/without dust/mist, dust/mist/fume, or HEPA particulate filters • Pesticide respirators (pesticide cartridge; OV cartridge with pesticide filter) • Paint spray respirators • Any[2] PAPR with chemical cartridge(s) • Any[2] PAPR with chemical cartridges and either, dust/mist, dust/mist/fume, paint spray, or pesticide filters • Any[2] PAPR with combination chemical cartridge & HE filter	• Chemical cartridge respirators without particulate filters • Obsolete • Obsolete • Any[2] PAPR with chemical cartridge(s) • Obsolete • Any[2] PAPR with combination chemical cartridge & HE filter	Any chemical cartridge combination with dust/mist, dust/mist/fume, & HEPA filter; or pesticide pre-filters are obsolete. Any pesticide or paint spray respirators (TC-23C, TC-14G) are obsolete, & have not been manufactured since 1998. Current NIOSH Schedule TC-23C includes testing & certification criteria for chemical cartridge respirators without particulate filters. The testing & certification criteria for combination chemical cartridge-particulate filter respirators are now included in TC-84A and 23C (*see above*).
TC-19C Supplied-air Respirators *no change*	• Supplied air respirator (airline)	TC-19C respirators cannot be used in atmospheres immediately dangerous to health and life (IDLH). Entry into IDLH atmospheres requires use of self-contained breathing apparatus that allow for emergency escape (*see TC-13F below*).	
TC-13F Self-Contained Breathing Apparatus *no change*	• Self-contained breathing apparatus (SCBA) • Supplied air respirator with a self-contained escape bottle	When TC-13F is specified, check pesticide label for whether the SCBA or SAR with SCBA escape bottle is to be "pressure-demand" or "demand" mode. If one or both of these is not indicated on the label, contact the pesticide manufacturer for direction. Otherwise, use a pressure-demand unit, in case of IDLH atmospheres. TC-13F Pressure-demand is the state of the art for IDLH atmospheres because they are the most protective respirators	

[1] MSHA and NIOSH jointly review and approve respirators used for mine emergencies & mine rescue
[2] Any loose- or tight-fitting respirator

Appendix I

Glossary

APR. Air-purifying respirator. Respirator that uses filters or sorbents to remove hazardous substances, including pesticides, from air being breathed.

Atmosphere-supplying respirator. Respirator that provides a supply of breathable air from a clean, independent outside source. Includes SCBA and supplied air respirators.

Breakthrough. For air-purifying respirators, the penetration of a gas or vapor through a chemical air-purifying element to inside of the wearer's mask.

Chemical cartridge (or canister). For air purifying respirators, the type of purifying element that removes specific gases or vapors by absorbing or adsorbing them.

Dangerous to life or health, immediately (IDLH). Used to describe an atmosphere that poses an immediate threat to life, would cause irreversible adverse health effects, or would impair an individual's ability to escape from a dangerous atmosphere. [OSHA 29 CFR 1910.134(b)]. Environments that have less than 19.5% oxygen by volume are considered IDLH by OSHA.

End-Of-Service-Life Indicator (ESLI): A system that warns the respirator user of the approach of the end of adequate respiratory protection; for example, that the sorbent is approaching saturation or is no longer effective.

Facepiece, loose-fitting. A respiratory inlet covering (facepiece) that is designed to form a partial seal with the face. It does not cover the neck and shoulders, and may or may not offer head protection against impact and penetration.

Facepiece, tight-fitting. A respiratory inlet covering (facepiece) that forms a complete seal with the face. Includes filtering facepiece respirators (FFR), half-masks and full facepiece masks.

Filter efficiency. For air purifying respirators, the collection efficiency of an air-purifying filter to resist penetration by particulates. The filters of non-powered APR filters are tested and rated at 95%, 99%, and 99.7% efficiency. The higher the number, the more efficient the filter. PAPR filters are tested and rated as High Efficiency (HE).

Filter, HEPA. High-efficiency particulate air filter. A High Efficiency (HE) filter is used in powered air-purifying respirators. The N100, R100, and P100 filters used in non-powered air-purifying respirators are equivalent to a HEPA filter. HE and P100 filters are identified by a magenta color.

Filter, Particulate. For non-powered air purifying respirators, a purifying element that removes aerosols (solid or liquid particulates) from air being breathed. They are rated N, R, and P for oil degradation of efficiency; and 95, 99, and 100 for filtering efficiency.

Filtering facepiece respirator: A type of non-powered air-purifying respirator where a particulate filter is an integral part of the facepiece, or the entire facepiece is composed of the filtering medium.

Fit factor: A quantitative estimate of the fit of a particular respirator to a specific individual, and typically the estimated ratio of the concentration of a substance in ambient air to its concentration inside the respirator when worn during the fit test.

Fit test, qualitative. A method of assessing whether a particular size and brand of respirator adequately fits an individual's face. If the individual can detect inside the mask a test agent that is outside the mask, there is leakage at the seal and the mask does not fit.

Fit test, quantitative. A method of assessing whether a particular size and brand of respirator adequately fits an individual's face using instrumentation to numerically measure leakage into the respirator.

Helmet. A hood that offers head protection against impact and penetration.

Hood. Loose-fitting covering of the nose and mouth that completely covers the head and neck and may cover portions of the shoulders.

NIOSH. The National Institute of Occupational Safety and Health. A federal agency that conducts research on health and safety concerns, tests and certifies respirators, and trains occupational safety and health professionals.

Nuisance dust. Dust with a long history of little adverse effect on the lungs; does not produce significant organic disease or toxic effect when exposures are kept at reasonable levels.

OSHA. Occupational Safety and Health Administration. A federal agency that issues regulations for workplace health and safety.

PAPR. Powered air-purifying respirator. Uses a blower to force contaminants through purifying elements.

Particulate. A particle of solid or liquid matter. **Particulate matter.** A suspension of fine solid or liquid particles in air, such as dust, fog, fume, mist, smoke, spray droplets. Particulate matter suspended in air is commonly known as an aerosol.

Physician or Other Licensed Health Care Professional (PLHCP). An individual whose legally-permitted scope of practice (i.e., license, registration, or certification) allows him or her to independently provide, or be delegated the responsibility to provide, some or all of the health care services required for medical evaluation to wear a respirator [i.e., OSHA 29 CFR 1910.134 (e)].

Pressure-demand respirator. An atmosphere-supplying respirator that admits breathing air to the facepiece when the positive pressure is reduced inside the facepiece by inhalation.

Respirator. A safety device that covers at least the mouth and nose that protects the wearer from breathing in hazardous substances, including pesticides.

SCBA. Self-contained breathing apparatus. A type of atmosphere-supplying respirator where the user carries the breathing air supply. A pressure-demand SCBA is required to be used when the environment is IDLH, including when there is less than 19.5% oxygen by volume.

Supplied-air respirator (SAR) or airline respirator. An atmosphere-supplying respirator where the source of breathing air is not designed to be carried by the user. A pressure-demand SAR with an SCBA-escape bottle is required to be used when the environment is IDLH.

User seal check. For tight-fitting respirators, a check by the wearer that the mask has been put on correctly and has been adjusted to fit properly. Must be performed every time these respirators are worn.

Appendix II

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Appendix A: Fit Testing Procedures (Mandatory)
Appendix B-1: User Seal Check Procedures (Mandatory)
Appendix B-2: Respirator Cleaning Procedures (Mandatory)
Appendix C: OSHA Respirator Medical Evaluation Questionnaire (Mandatory)
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