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Respiratory Protection Program

The purpose of EPA's pesticide applicator certification and training program is to provide pesticide applicators with the knowledge and ability to use pesticides safely and effectively. This includes the proper use of respiratory protection. In some states, labor regulations define the requirements of a respiratory protection program. These regulations will often incorporate the Federal Occupational Safety and Health Administration's (OSHA) standards. The OSHA Respiratory Protection Standard, Title 29 part 1910.134 of the Code of Federal Regulations provides that an effective respiratory protection program should be written and should cover the following eight elements:

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

Respiratory Hazards and Proper Use of Respirators

You may be subject to exposure to toxic gases, vapors, and/or particulates when using pesticides. Although our respiratory (breathing) system tolerates exposure to a limited degree, some chemicals can impair or destroy portions of it. For many pesticides, the respiratory system is the quickest and most direct route into the circulatory system, allowing rapid transport throughout the body. Thus, it is important to follow the pesticide label and follow directions for control of exposure, especially when respiratory protection is specified.

A respirator is a safety device covering at least the mouth and nose that protects the wearer. Respiratory protection varies in design, use, and protective capability. There are two major classes of respirators:

- (1) **air-purifying respirators** that remove contaminants from the air, and
- (2) **air-supplying respirators** that provide clean, breathable air from an uncontaminated source.

Air-purifying respirators may be powered or non-powered. A powered air-purifying respirator uses a blower to pass contaminated air through purifying elements. Non-powered air-purifying respirators may be designed for single-use, or with replaceable filters, canisters or cartridges (*pictured below*).

fullface
air purifying
respirator



Air-purifying respirators do not supply oxygen, and should never be used when oxygen may be limited (<19.5% oxygen by volume), or when an environment is immediately dangerous to life or health (IDLH).

Purifying elements for air-purifying respirators will contain a filter, sorbent, or catalyst (or a combination of these items), to remove specific contaminants from the air passed through the container. When pesticides are used, particulates may be present as well as solids and/or liquids. When this is the case, use a particulate respirator (or filter). Additionally, pesticide products may be present as gases or vapors. When this is the case, use a contaminant-specific chemical cartridge or canister (*see figure to right for example of organic vapor-removing*).

Organic vapor
removing cartridge



When both may be present, use a chemical-specific air-purifying respirator with a particulate filter. Be sure that the respirator assembly (with component purifying element) is approved for protection against the pesticide you intend to use (see 'Selection' below).

Air-supplying respirators include supplied-air respirators and self-contained breathing apparatus (SCBA). Use these respirators when oxygen is limited. If, however, the environment is immediately dangerous to life and health 'IDLH', the only types of air-supplying respirators that may be used are either a pressure-demand self-contained breathing apparatus, or an airline respirator with an auxiliary air supply for emergencies. 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.

Respiratory Protection For Pesticides

Use of Certified Respirators

Standards, testing, and certification assure the commercial availability of safe personal protective devices to respirator users such as pesticide applicators. Most respirator manufacturers issue approval 'certificates' with a chart of all of the component parts considered part of the approved 'assembly'; these 'certificates' are typically package inserts with new respirators (see figure below). The testing and certification criteria (and corresponding approval number, 'TC-XXX') apply to the respirator assembly (including the facepiece and purifying elements). Respirator approvals are manufacturer-specific; you cannot interchange parts, cartridges, or filters between different manufacturer's units.

As a result of recent regulatory changes, NIOSH now has exclusive authority for testing and certification of respirators (with the exception of certain mine emergency devices, which will continue to be jointly certified by NIOSH and MSHA). Certification of respiratory protective devices manufactured for use after 1998 is issued by NIOSH of the United States Department of Health and Human Services (DHHS). Approvals for these respirators bear both NIOSH and DHHS emblems under Title 42 part 84 of the Code of Federal Regulations ('part 84'). The testing and certification criteria (and corresponding approval number, 'TC-XXX') currently remain the same for all except particulate respirators.



Part 84 Label for P100 Filter **NIOSH**

DEF Manufacturing Co.
Anywhere, USA
1-800-555-1234

These respirators are approved only in the following configurations

TC	Protection	Respirator	Cautions & Limitations
84A-00X	P100	HALO 2000	ABCJLMNO

1. Protection
P-100 Particulate Filter (99.7% filter efficiency level) is effective against all particulate aerosols.

2. Cautions & Limitations

A- Not for use in atmospheres containing <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 use and maintain this product properly could result in injury or death.
M- All approved respirators shall be selected, used, & maintained in accordance with MSHA, OSHA, & other applicable standards.
N- Never substitute, modify, add, or omit part. Use exact replacement parts in the configurations specified by the manufacturer.
O- Refer to user instructions &/or maintenance manuals for information about use & maintenance of these respirators.

Under the 40 CFR Part 84 approval system, cartridges and filters are no longer marked with a "TC number". Instead, they are marked with "NIOSH", the manufacturer's name and part number (see below), and an abbreviation to indicate the cartridge type.



Since 1971, the National Institute for Occupational Safety and Health (NIOSH) and the Mine Safety and Health Administration (MSHA) jointly certified respirators for the contaminant or situation of exposure. Approval certificates for these respirators bear both NIOSH and MSHA emblems, and certification numbers under the Code of Federal Regulations Title 30 part 11 (30 CFR part 11). Under the 30 CFR Part 11 approval system, manufacturers were required to mark cartridges and filters with an abbreviated label that included the NIOSH/MSHA approval number ("TC number").

Pesticide labels will often specify the type of respirator required for a particular pesticide application using its 'TC-XX-XXXX' designation. When purchasing a new respirator, the certification numbers per respirator type according to current 'part 84' NIOSH **approval criteria** are as follows:

- TC-13F-XXXX: self-contained breathing apparatus
- TC-14G-XXXX: gas masks with canisters
- TC-19C-XXXX: supplied air respirators
- TC-21C-XXXX: powered particulate respirators (**revised**)
- TC-23C-XXXX: chemical cartridge respirators
- TC-84A-XXXX: non-powered particulate respirators (**new**)

Respiratory Protection For Pesticides

In accord with the criteria now established by 'part 84'; there are significant new certification and testing provisions for non-powered particulate-filter respirators. Particulate filters for these respirators have been upgraded to be far more resistant to filter degradation from oil. The certification number sequence for these new upgraded non-powered particulate-filter respirators that are now commercially available is 'TC-84A'. In most cases, you will be able to upgrade your existing respirator by using new upgraded 'part 84' replacement filters as described below.

The new 'part 84' regulation creates a total of **nine classes of particulate filters based upon oil degradation resistance and filter efficiency**. Specifically, there are three possible grades of oil degradation resistance: N-series, R-series, and P-series. N-series filters are not oil-resistant (see figure below);

**'N95' particulate
air-purifying
filter & cover**



R-series filters are oil-resistant; and P-series filters are oil-proof (see figure above right). N-series filters can only be used for protection from non-oil aerosols because certain compounds can degrade their efficiency over time. So, do not use the N-series filters when oil may be present. Each of the three grades of filters has three levels of filter efficiency (95%, 99%, and 99.97%); higher efficiency means lower filter leakage.

The nine new classes and prescribed use of non-powered particulate filters are as follows:

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

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

Oil-proof

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

Although there are three efficiencies for filters, most manufacturers are simply marketing the 95% and 99.97% efficiency filters as listed above. If you previously used a high efficiency particulate air (HEPA) filter, a filtering unit with 99.97% filtering efficiency would be comparable. You would still have to choose the appropriate N-, R-, or P-series for the filter. The particulate filter type (grade and class) will be clearly marked on the filter itself. In the case of chemical cartridges that include these particulate filter elements, similar markings will be present.

P100 particulate filter



These new criteria make **dust, mist, fume respirators obsolete under TC-21C**; yet powered particulate respirators will continue to be certified as 'TC-21C'. The high efficiency (HE) particulate air filter of a powered air-purifying respirator is comparable in performance to the P-series filters. But, you will not be able to interchange any of the new TC-84A particulate filters with the existing high efficiency (HE) particulate filter approved under TC-21C for powered air-purifying respirators.

N-series: NOT OIL RESISTANT

R-series: OIL RESISTANT

P-series: OIL-PROOF

Respiratory Protection For Pesticides

If you currently have a stock of the old 'part 11' TC-21C particulate filters (dust, mist, fume) you may use them until depleted. However, *NIOSH encourages users to discontinue the use of particulate respirators certified under 30 CFR part 11 and switch to the new particulate respirators certified under 42 CFR part 84 for protection from toxic particulates.* One could reasonably use a dust, mist, fume filter as a 'pre-filter' on an approved particulate respirator assembly. Further, dust, mist, fume respirators would be acceptable for non-toxic 'nuisance' particulates. Another term used by some respiratory protection manufacturers for these non-toxic dusts is 'harmful' (not to be confused with 'hazardous').

These new criteria also make the approval of **old 'part 11' TC-23C pesticide respirators obsolete.** If you currently are using an old pesticide respirator (combination organic vapor/pesticide pre-filter) that has been properly selected, you may use them until depleted. In choosing a replacement for this respirator NIOSH advises "a combination respirator consisting of an organic vapor cartridge and an N95 (for non-oil aerosols) or an R95, or P95 particulate filter would be minimally protective". Some manufacturers are continuing to market 'pesticide' respirators; be advised that this is a manufacturer recommendation for use, not a NIOSH recommendation. Be sure that the respirator assembly (with component purifying element) is approved for protection against the pesticide you intend to use (see 'Selection' below).

Selection of Respirator Type

The United States Environmental Protection Agency (EPA) requires that pesticide manufacturers determine and specify respiratory protection required according to the anticipated hazards and risk of inhalation. **Manufacturers now provide recommendations for appropriate respiratory protection on the pesticide label.** These label recommendations are product- and task-specific. For example, manufacturers may specify organic vapor-removing cartridges or canisters for formulations where the solvent carrier for the pesticide active ingredient is petroleum based. It is extremely important for you to read and follow the product label for respirator requirements since specific pesticides may have different formulations and use directions.

EPA provides pesticide manufacturers specific pesticide label statements for respiratory protection for five categories of pesticide formulation and application activity. The five categories are: (1) gases applied outdoors; (2) gaseous products used in enclosed areas; (3) solid products; (4) liquid products in Toxicity Category I; and 5) liquid products in Toxicity Category II.

Depending upon when a pesticide's label was approved and released, EPA's label statements allow for use of either the old 'part 11' respirators with MSHA/NIOSH certifications, and/or the new 'part 84' respirators with NIOSH certification.

[\(Table 1 summarizes EPA respirator statements for pesticide product labels by these five categories\)](#). It is surmised that EPA still includes specification of use of the now obsolete 'part 11' respirators so that you may use them until your stock is depleted. If the pesticide label specifies N, R-, and P-series filtering elements, take care not to use the N-series when oil is present.



The **five categories of use and corresponding respiratory protection statements** you will find on pesticide product labels (**verbatim per EPA's document PR 98-9**) follow:

1. **Gases Applied Outdoors:** Products that are formulated or applied as a gas (space and soil fumigants) and that may be applied outdoors will bear labeling specifying the following:

Does not contain any oil:

"For handling activities outdoors, use either a respirator with an organic-vapor-removing cartridge with a pre-filter approved for pesticides (MSHA/NIOSH approval number prefix TC-23C) or a canister approved for pesticides (MSHA/NIOSH approval number prefix TC-14G) or a NIOSH-approved respirator with an organic vapor (OV) cartridge or canister with any N, R, P, or HE pre-filter."

Does contain oil:

"For handling activities outdoors, use either a respirator with an organic-vapor-removing cartridge with a pre-filter approved for pesticides (MSHA/NIOSH approval number prefix TC-23C) or a canister approved for pesticides (MSHA/NIOSH approval number prefix TC-14G) or a NIOSH-approved respirator with an organic vapor (OV) cartridge or canister with any R, P, or HE pre-filter."

Respiratory Protection For Pesticides

2. **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 will bear labeling specifying the following:

"For handling activities in enclosed areas, use either a supplied-air respirator with MSHA/NIOSH approval number prefix TC-19C, or a self-contained breathing apparatus (SCBA) with MSHA/NIOSH approval number TC-13F."
3. **Solid Products:** Products that are formulated and applied as solids will bear labeling specifying the following:

Does not contain any oil:
"For handling activities, use a dust/mist filtering respirator (MSHA/NIOSH approval number prefix TC-21C or a NIOSH-approved respirator with any N, R, P, or HE filter)."

Does contain oil:
"For handling activities, use a dust/mist filtering respirator (MSHA/NIOSH approval number prefix TC-21C or a NIOSH-approved respirator with any R, P, or HE filter)."
4. **Liquid Products in Toxicity Category I:** Products that are formulated and applied as liquids will bear labeling specifying the following:

Does not contain any oil:
"For handling activities, use either a respirator with an organic-vapor-removing cartridge with a pre-filter approved for pesticides (MSHA/NIOSH approval number prefix TC-23C), or a canister approved for pesticides (MSHA/NIOSH approval number prefix 14G) or a NIOSH-approved respirator with an organic vapor (OV) cartridge or canister with any N, R, P, or HE pre-filter)."

Does contain oil:
"For handling activities, use either a respirator with an organic-vapor-removing cartridge with a pre-filter approved for pesticides (MSHA/NIOSH approval number prefix TC-23C), or a canister approved for pesticides (MSHA/NIOSH approval number prefix 14G) or a NIOSH-approved respirator with an organic vapor (OV) cartridge or canister with any R, P, or HE pre-filter)."
5. **Liquid Products in Toxicity Category II:** Products that are formulated or applied as liquids will bear labeling specifying the following:

Does not contain any oil:
"For handling activities during [air blast; mist blower; pressure greater than 40 p.s.i. with fine droplets, smoke, mist, fog, aerosol or direct overhead] exposures, wear either a respirator with an organic vapor-removing cartridge with a pre-filter approved for pesticides (MSHA/NIOSH approval number prefix TC-23C), or a canister approved for pesticides (MSHA/NIOSH approval number prefix 14G) or a NIOSH approved respirator with an organic vapor (OV) cartridge or canister with any N, R, P, or HE pre-filter). For all other exposures, wear a dust/mist filtering respirator (MSHA/NIOSH approval number prefix TC-21C, or a NIOSH-approved respirator with any N, R, P, or HE filter)."

Does contain oil:
"For handling activities during [insert applicable terms based on directions for use: air blast, mist blower, pressure greater than 40 p.s.i. with fine droplets, smoke, mist, fog, aerosol or direct overhead] exposures, wear either a respirator with an organic vapor-removing cartridge with a pre-filter approved for pesticides (MSHA/NIOSH approval number prefix TC-23C), or a canister approved for pesticides (MSHA/NIOSH approval number prefix 14G) or a NIOSH-approved respirator with an organic vapor (OV) cartridge or canister with any R, P, or HE pre-filter). For all other exposures, wear a dust/mist filtering respirator (MSHA/NIOSH approval number prefix TC-21C, or a NIOSH-approved respirator with any R, P, or HE filter)."

Respiratory Protection For Pesticides

Service Life

The **service life of all particulate filters** is limited by considerations of hygiene, damage, and breathing resistance. All filters should be replaced whenever they are damaged, soiled, or causing noticeably increased breathing resistance, or as required by state-specific labor regulations.

N-series filters can only be used for protection from non-oil aerosols because certain compounds can degrade their efficiency over time. N-series filters should be replaced whenever they are damaged, soiled, or causing noticeably increased breathing resistance.

R-series filters have prescribed use limitations because certain compounds can degrade their efficiency over time. When oil is present, they can be used for at a single shift (or for 8 hours of continuous or intermittent use). When oil is not present, R-series particulate filters should be changed whenever they are damaged, soiled, or causing noticeably increased breathing resistance.

P-series filters can be used when either oil or non-oil aerosols are present. They do not currently have prescribed service time use limits imposed upon them. However, you should use and reuse them per the manufacturer's instructions when oil aerosols are present. If there is no oil present, P-series particulate filters should be changed whenever they are damaged, soiled, or causing noticeably increased breathing resistance.

The effective **service life of a chemical cartridge** respirator depends upon the conditions of use. Conditions include: the type and concentration of contaminant(s), user's breathing rate, and humidity. Thus, these cartridges should remain sealed until ready to use. Additionally, make sure to use cartridges within the manufacturer's prescribed cartridge shelf life.

Chemical cartridge respirators, when selected appropriately, are essentially 100% efficient until the gas or vapor 'breaks through'. The service life for chemical cartridges can be identified by: chemical-specific end-of-service-life-indicators (ESLI); warning properties (smell, taste, irritation); and pre-determined conservative change-out schedules. The availability of end-of-service-life-indicators is limited.

Reliance on warning properties is problematic due to a wide variation in odor threshold in the general population; it is important that the wearer be able to detect break-through at concentrations below accepted permissible exposure limits or threshold warning levels. Consult pesticide and respirator manufacturers, as well as NIOSH and OSHA guidance when establishing a cartridge change-out schedule. Cartridges should be changed immediately whenever break-through is detected in the mask. Further, you should dispose of chemical cartridges at the end of a workday unless you have pre-determined its end of service life exceeds the work period.

Medical Evaluation

Before considering wearing a respirator for pesticide application, it is recommended that you receive a medical exam. In some states, this is a requirement of labor regulations. Your physician will specifically evaluate and document your ability to wear a respirator. Occupational Safety and Health Administration (OSHA) procedures regarding medical evaluation to wear a respirator are published as Title 29 part 1910.134(e) of the Code of Federal Regulations. Additionally, OSHA's Respirator Medical Evaluation Questionnaire is published as Appendix C of Title 29 part 1910.134 of the Code of Federal Regulations.

Respirator Fit

The most commonly used facepiece configurations for pesticide use are either half-masks or full-face masks. Half-face masks are typically available as single-use, or with cartridges that are replaceable with each use.

Full-face masks are typically available with dual cartridges on either side of the mask, or with a canister mount (see below) on the chin. Full-face masks provide eye protection and a better seal; most full-face masks



are sized small, medium, and large affording enhanced fit to the face. Full facepieces, half-masks, quarter masks, and even the different brands of the same type of respirator marketed, have different fit characteristics.

Respiratory Protection For Pesticides

With the exception of hooded powered air-purifying respirators, no one respirator will fit everyone. The protection provided to a respirator wearer depends on how well the facepiece (mask) fits. No matter how efficient the purifying element or how clean the supplied air, you are not protected from air contaminants when there is not a leak-free face-to-facepiece seal. OSHA regulations specifically disallow the use of tight-fitting respirators, like a half or full-face mask, by persons with facial hair at the face-facepiece seal. Persons with facial hair should only wear a hooded powered air-purifying respirator, which does not require a seal to the face.

A qualitative or quantitative fit test of a given mask type on a user's face is recommended to be performed annually in order to select the best fitting respirator (In some states, it is a requirement of labor regulations to have an annual fit test). OSHA-Accepted Fit Test Protocols are published as Appendix A of Title 29 part 1910.134 of the Code of Federal Regulations. Qualitative fit testing involves the introduction of a harmless odoriferous or irritating substance into the breathing zone around the respirator being worn. If no odor or irritation is detected by the wearer while performing prescribed tasks, the mask fits properly. Kits for qualitative testing are now marketed and easy to use. Quantitative fit testing offers more accurate, detailed information on respirator fit. 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.

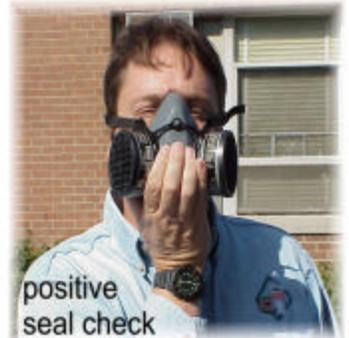
Use, Care, and Maintenance of Respirators

Prior to using a respirator, read and understand the manufacturer's instructions that are supplied with the respirator and its component parts. 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, your 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. Replacement component parts for reusable respirators are available from most manufacturers. Use only NIOSH-approved parts designed for the respirator for replacements or repairs.

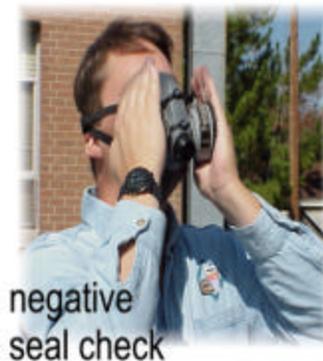
Wearers should perform both positive and negative seal checks every time they put on their respirator masks.

These ensure that the respirator is properly seated on the face, and that all inhalation and exhalation ports are functioning properly.

To perform a positive pressure seal check (see figure to right), cover the exhalation port with the palm of your hand and exhale into the mask. You will feel air escaping at any gaps in your seal. Readjust the mask until you do not get leakage.



To perform a negative pressure seal check (see figure to left), cover or seal off the surface or hose where air is inspired and suck in. A properly sealed mask should collapse on your face with no signs of leakage in the facepiece or hoses. Again, readjust the mask until you do not get leakage.



After using your respirator, remove and properly dispose of any

expendable components such as filters, cartridges, or canisters. Wash the face piece in a cleaning/sanitizing solution as recommended by the respirator manufacturer. For cleaning, NIOSH advises the use of neutral detergent without lanolins or oils (most dish detergents will work). For disinfecting, NIOSH advises the use of a quaternary ammonia disinfectant (one packet per 2 gallons or per manufacturer's recommendation), or a hypochlorite (1 oz [30milliliters] household bleach in 2 gal [7.5 L] water) solution, or an aqueous solution of iodine (50ppm of iodine, made by adding 0.8 milliliters of tincture of iodine to one liter of water at 110 F). Take care to clean under and around gaskets and valves. Allow to air dry.

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.

Respiratory Protection When Using Pesticides

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