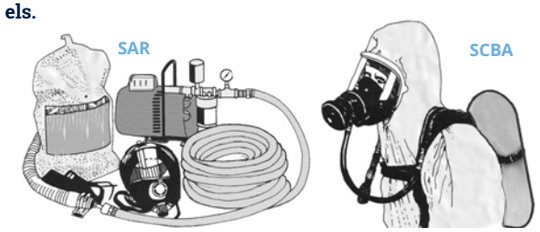
ed air, either from a tank carried by the user (Self-Contained Breathing Apparatus), or through a line from a compressor (Supplied-Air Respirator). These are the only respirators that can be used safely when working with most fumigants, or other pesticides at or above IDLH levels.



Translating obsolete label language

If the label says…	The user should…
Dust/mist filtering	Use a particulate filter.
Pre-filter approved for pesticides	Use a combination chemical cartridge-particulate filter.
Canister approved for pesticides	Use a gas mask with a canister labeled for the contaminant. For many pesticides this will be a black organic vapor (OV) or black and pink OV-particulate canister.
Any N, R, P, or HE filter	Use a non-powered respirator with a N, R, or P filter, or a PAPR with an HE filter.
TC-21C	Check for obsolete language. TC-21C used to refer to *any* respirator with a particulate filter. Non-powered APRs with particulate filters are now designated TC-84A and TC-21C refers only to PAPRs *without* a chemical cartridge.
TC-23C	Check for obsolete language. TC-23C used to refer to *any* respirator with a chemical or combo cartridge. *Non-powered* APRs with combination chemical cartridge-particulate filters are now designated TC-84A while TC-23C only refers to PAPRs *with* a chemical cartridge.

This material is meant as a *general guide only*. ALWAYS follow pesticide label and respirator manufacturer instructions. For more information on respirators and their use, see:

- NIOSH/CDC – cdc.gov/niosh, cdcinfo@cdc.gov, 800.232.4636,
- OSHA– osha.gov, 800.321.6742,
- EPA– epa.gov/pesticides, pesticidequestions@epa.gov,
- PERC– pesticideresources.org,
- AgriSafe Network – agrisafe.org/lungs-for-life,
- Maine BPC – thinkfirstspraylast.org, 207.287.2731, or
- UMaine Cooperative Extension professionals – Jason Lilley, jason.lilley@maine.edu, 207.781.6099, or Kerry Bernard, kerry.bernard@maine.edu, 207.581.3884

Source material includes publications from EPA, CDC/ NIOSH, OSHA, Oregon OSHA, and PERC, and Cooperative Extension Offices from Pennsylvania State University, Rutgers University, University of Florida, and University of Nebraska. Cover photo is courtesy of USDA-ARS. Illustrations by Donald Barry.

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The Right Respirator: Types, NIOSH Numbers, Filter Codes, and Cartridge Colors

Respirators and Pesticides I

The Right Respirator

Inhaled pesticides can damage the respiratory tract and may pass into the bloodstream within moments. The consequences range from minor nose and throat irritation to permanent disability, neurological damage, or death.

Not only is it a health risk, but when the pesticide label directs you to wear a respirator, it's illegal to do otherwise. Not all respirators are suitable for all pesticides, users, or pesticide situations, however, and selecting one is far from straightforward. The codes used to identify the different respirator types and components can be confusing. Worse, some pesticide labels still use outdated respirator language.

The following graphics and descriptions should help demystify respirator terminology and classification.

Only respirators with a TC prefix have been tested and certified by the National Institute of Occupational Health and Safety (NIOSH) and approved for use with pesticides.

NIOSH prefix	Type(s) of respirator	Explanation
TC-84A	•Filtering facepieces •*ALL* non-powered elastomeric (rubbery) respirators equipped with a particulate filter or combo cartridge.	Non-powered respirators with non-canister particulate filtering components get this prefix, regardless of chemical protection
TC-21C	•Powered air-purifying respirators (PAPRs) without a chemical cartridge	PAPRs that protect against particulates alone have their own approval standards
TC-23C	•Non-powered respirators with *only chemical cartridges* •PAPRs with chemical cartridges/ canisters	Non-powered chemical respirators without a particulate filtering component to their cartridges and PAPRs with chemical protection get this prefix
TC-14G	•Gas masks	Non-powered respirators that take a canister instead of cartridges have their own prefix
TC-19C	•Supplied-air respirators (SARs)	Airline respirator setups in which no escape tank is carried have their own prefix
TC-13F	•SCBA respirators •SARs equipped with an escape tank	Atmosphere-supplying respirator setups where the user carries supplied air get this prefix

The Particulars of Particulates

Particulates, also known as aerosols, are tiny, solid or liquid particles suspended in the air. These include mists, dusts, fumes, smoke, mold, and bacteria. Only ***filters*** protect against particulates. These filters come in nine types, depending upon how well they hold up against oils and the minimum percentage of particles they remove. P100 and HE (for PAPRs only) filters offer the most protection and are colored pink or purple for easy recognition. If a pesticide requires an N, R, or P class filter, but an adjuvant or another, oil-based pesticide has been added to the mix tank, use an R or P class filter.

Filter Efficiency	Not Oil-Resistant	Oil-Resistant	Oil-Proof
95%	N95	R95	P95
99%	N99	R99	P99
≥ 99.97%	N100	R100	P100

Gases and Vapors

Some pesticides are gases, or give off gases at ambient temperatures (vapors). Filters do not protect against these, but the sorbents and/or catalysts in cartridges and canisters can. Cartridges/canisters are color-coded by the type of chemical they protect against. No cartridge or canister can adsorb every type of gas or vapor, but some are designed to protect against two or more (not at once).

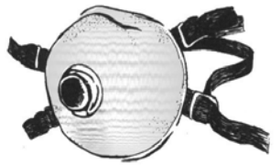
Since many pesticides that require a chemical cartridge produce organic vapors AND particulates, a pink and black cartridge or canister is typical (but see the label).

Cartridge/ canister/ filter color	Type	Offers protection against
Black	Organic vapors	*Most pesticide vapors, but NOT pesticide dust or mist*
White	Acid gases	Sulfur dioxide, hydrogen chloride, *most disinfectants*
Yellow	Organic vapors and acid gases	Both organic vapors and acid gases, but NOT AT ONCE
Green	Ammonia	Anhydrous ammonia and ammonia from livestock
Olive	Multi-gas	Organic vapors, acid gases, ammonia, formaldehyde, others
Pink or purple (filters)	P100 or HE filter	Particulates—dusts, mists, and fumes
Black and pink	Organic vapors and particulates	The vapors, dusts, and mists typical of *most* pesticides

Air-Purifying Respirators (APRs)

Air-purifying respirators mechanically filter out particulate contaminants and/or adsorb gases and vapors as the air is drawn through filters, cartridges, or a canister. They *cannot* be used in oxygen-deficient atmospheres.

Filtering facepieces are disposable particulate APRs in which the entire facepiece serves as a filter. Though not elastomeric, they must be tight-fitting with a proper seal. As non-powered particulate APRs, they get the TC-84A NIOSH designation.

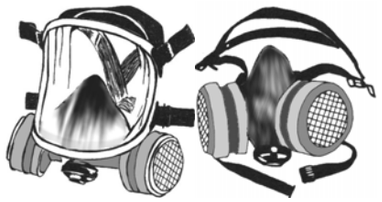


FILTERING FACEPIECE

Nuisance Dust Masks

Though they strongly resemble filtering facepieces, nuisance dust masks are not respirators, are not NIOSH approved, and cannot provide adequate protection from pesticides. They only protect against nuisance levels of NON-TOXIC particles.

Reusable non-powered chemical cartridge and particulate APRs are tight-fitting respirators equipped with cartridges of activated carbon that adsorb gases and vapors, filters that mechanically prevent particulates from entering the facepiece, or combination cartridges with the components of both. NIOSH designates all non-powered respirators with only chemical cartridges as TC-23C and ALL non-powered respirators and cartridges with particulate protection as TC-84A. Since most pesticides for which respirators are used require some particulate protection, TC-84A respirators are more common. The facepieces for either can be half- or full-mask.



NON-POWERED, COMBO CARTRIDGE APRS

PAPR

Powered air-purifying respirators (PAPRs) force air through a filter and/or cartridge for the user, making it less strenuous to breathe than when wearing other APRs. They're commonly outfitted with a loose-fitting helmet or hood instead of an elastomeric facepiece. This allows individuals who are unable to get a proper seal with tight-fitting respirators, or those with certain physical limitations, to use them. PAPRs are classified differently by NIOSH, depending upon whether they protect against gases and vapors (TC-23C) or particulates alone (TC-21C). TC-21C PAPRs are equipped with a high efficiency (HE) filter. TC-23C PAPRs have either a chemical cartridge or combination cartridge with both HE filter and chemical sorbent. PAPRs are typically much more expensive than non-powered APRs, but may be the only option for some individuals, including those with beards.

Gas masks are non-powered, elastomeric APRs that take a canister. With the proper canister, they protect from both pesticide particulates and vapors. Gas masks are more effective for longer than other non-powered APRs. Some fumigant labels allow their use at known, low-level chemical concentrations. They can be used to escape from IDLH (Immediately Dangerous to Life and Health) atmospheres in emergency situations, but the canisters become saturated too quickly under these conditions to be used in place of atmosphere-supplying respirators.

GAS MASK

	Type	NIOSH prefix	Facepiece	Fit	Reusable	Protects against particulates	Oil resistant	Protects against OV	Protects against fumigants	For use in IDLH atmospheres	Requires fit test	Offers eye protection	Can be worn with facial hair
Atmosphere-Supplying Respirators	Self-contained Breathing Apparatus (SCBA)	TC-13F	Hood/helmet	Loose	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
			Elastomeric	Tight							YES		NO
	Supplied-air Respirator (SAR)	TC-19C	Hood/helmet	Loose	Yes	Yes	Yes	Yes	At lower than IDLH levels	Not by itself, TC-13F escape bottle necessary	No	Yes	Yes
			Elastomeric	Tight							YES	If full-mask	NO
Air-Purifying Respirators (APRs)	Gas Mask	TC-14G	Elastomeric	Tight	Yes	With combo canister	With P100 canister	With OV canister	Some, at very low levels	Emergency escape only	YES	Yes	NO
	Chemical Cartridge Respirators	TC-23C	Powered hood/helmet	Loose	Yes	With HE filter	With HE filter	With OV cartridges	NO	NO	No	Yes	Yes
			Powered elastomeric	Tight							YES	If full-mask	NO
			Non-powered elastomeric			NO	NO						
	Powered Particulate Respirators	TC-21C	Hood/helmet	Loose	Yes	Yes	Yes, HE filters	NO	NO	NO	No	Yes	Yes
			Elastomeric	Tight							YES	If full-mask	NO
	Non-powered Particulate Respirators	TC-84A	Elastomeric	Tight	Yes	Yes	With R or P rating	With OV combo cartridges	NO	NO	YES	If full-mask	NO
			Filtering Facepiece		No			NO				No	

Increasing protection

Atmosphere-Supplying Respirators

Atmosphere-supplying respirators must be used when the air is oxygen deficient or too contaminated to safely filter/decontaminate. They provide clean, oxygenat-