

AGRI-FACTS

Practical Information for Alberta's Agriculture Industry

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Respiratory Protection for Producers

Dust and harmful gases can cause immediate and long-term respiratory problems. Wearing protective equipment is vitally important when working in a situation where there is the potential for respiratory hazard:

- working in dusty buildings or fields
- entering silos or manure pits
- handling mouldy hay
- applying pesticides or fertilizers

Depending on the specific hazard, failing to wear the proper respirator, or wearing it improperly, can result in health effects ranging from temporary discomfort to long-term lung problems and even death.

Wearing the appropriate type of respirator is key when facing airborne hazards. A respirator is any device designed to provide protection against the inhalation of a potentially hazardous contaminant. The following steps are essential:

- select a respirator type that has been approved for the specific respiratory hazard involved
- choose a style that fits the user properly
- carefully read and follow all manufacturer instructions for the respirator's use and maintenance

Respirator types

Respirators can be categorized into two classes:

- air-purifying respirators
- atmosphere-supplying respirators

It is very important to have the right type of respirator for each individual situation.

Atmosphere-supplying respirators **MUST** be used instead of air-purifying respirators in the following situations:

- environment is oxygen-deficient, such as in silos and manure pits
- contaminant level is very high (i.e. beyond the capability of the air-purifying respirator to capture and filter it)
- contaminant is highly toxic

No matter what respirator type is required, ensure that the model chosen is approved by a safety standards agency such as the National Institute for Occupational Safety and Health (NIOSH) or the Canadian Standards Association (CSA).

Wearing the appropriate type of respirator is key

Air-purifying respirators

Air-purifying respirators (APRs) are the most commonly used respirators. They clean contaminants from the air via filters and/or cartridges or canisters before the wearer breathes in the air. APRs should **only** be used in an environment that:

- has enough oxygen to sustain life
- allows the respirators to protect at or below specific concentrations of contaminants

APRs are available in half-mask and full-face styles. A half-mask only covers the nose and mouth, whereas a full-face mask covers the nose, mouth and eyes. If the hazard irritates the skin or eyes, use a full-face style.

APRs also come in two-strap and adjustable strap models. Two-strap models give a much better fit. Masks with only one strap typically don't provide a seal.

There are two basic APR types: non-powered and powered.

Non-powered air-purifying respirators

Several types of non-powered air-purifying respirators are available:

1. Disposable dust masks

Disposable dust masks protect workers against nuisance and non-toxic dusts (such as dust in pig or poultry barns), but they are not effective against toxic gases and vapours. They last for one day and are the least expensive form of respirator.



Figure 1. Disposable dust mask

Dust masks should be certified and approved, two-strapped, and clearly labelled with both a letter (N, R, P) and a number (95, 99, 100). This labelling indicates three levels of filter efficiency (Table 1). For example:

- an N95 respirator has a filter with a minimum efficiency of 95 per cent and provides protection from aerosol particles free of oils
- an R99 respirator has a filter with a minimum efficiency of 99 per cent and provides protection from oily aerosol particles
- a P100 respirator has a filter with a minimum efficiency of 99.97 per cent and provides protection from very oily aerosol particles

Choose the type that will provide the filtering ability needed for the situation.

Table 1. Dust mask filtering efficiency

Filter efficiency (per cent)	Not oil resistant	Oil resistant	Very oil resistant
95	N95	R95	P95
99	N99	R99	P99
99.97	N100	R100	P100

2. Reusable dust and mist masks

Reusable air-purifying respirators are the type commonly used to protect the user from dusts and mists. These masks operate like disposable masks, but the filters are replaceable. The filters should be replaced when the user finds it difficult to breathe through them.

These respirators are ideal for workers who often require respiratory protection for dusty or misty conditions. The masks can last for a few months. Some models have exhalation valves for comfort.



Figure 2. Reusable dust mask

3. Chemical cartridge respirators

Chemical cartridge respirators are normally used to protect workers from toxic gases, fumes and vapours. These masks have replaceable chemical cartridges that contain charcoal or other substances that absorb gases and vapours. A particulate pre-filter may also be attached to the cartridge to protect workers from both dusts and gases.

When using chemical cartridge respirators:

- Choose the type of cartridge that is designed for the specific respiratory hazards faced.
- Set a regular schedule for replacing the cartridges to ensure continued safe use. When the cartridge's capacity is exhausted, contaminants will be able to pass through it and be inhaled.
- Follow the manufacturer's instructions for replacing the cartridge.

Ensure the mask fits the user properly. When it comes to effective protection, a good fit is as important as the regular replacement of the cartridges.

4. Gas masks

Gas masks are more effective than chemical cartridge respirators against high concentrations of toxic gases and vapour. The chemical filter in the gas mask removes toxic vapours and particles from the air, such as fumigants in buildings. It is important to select the correct type of canister for the specific hazards being dealt with.

Gas masks have replaceable canisters that are larger than the cartridges used in chemical cartridge respirators. The canisters also contain a larger volume of chemical sorbent than do the cartridges; as such, they may be used for longer periods than the chemical cartridges before breakthrough occurs. Follow a regular schedule for replacing the canisters.

When it comes to good protection, the fit of the mask to the individual is as important as the volume of chemical sorbent. Gas masks usually have a full-face piece with an

attached hose leading to a canister mounted on the wearer's belt. Chin-type canisters also are available, but they have somewhat smaller capacities.

Powered air-purifying respirators

Powered air-purifying respirators are equipped with high-efficiency particulate air filters. These respirators can be effective for use in livestock buildings with high levels of dust or in areas with high concentrations of pesticides, but **they CANNOT be used in oxygen-limited environments** such as silos and manure pits.

These respirators consist of mechanical filters, chemical cartridges or both. They are powered by batteries that blow filtered air into a faceplate. They are particularly useful for workers with beards or glasses.

Follow a regular schedule for replacing the batteries, filters and/or cartridges for continued safe use.

Atmosphere-Supplying Respirators

These respirators are for use in **oxygen-deficient environments**. They come in two types: supplied-air respirators and self-contained breathing apparatus.

1. Supplied-air respirators (SAR)

Supplied-air respirators are available in two styles: with a hose mask with a blower, or with an emergency air-supply. The emergency air-supply respirators are designed **ONLY** for escape purposes and are not intended for use when working in manure pits or silos.

Table 2. Comparison of non-powered air-purifying respirators*

	Disposable dust masks	Reusable dust and mist masks	Chemical cartridge respirators	Gas
Uses	Dusts. Not recommended for gases.	Dusts. Not recommended for gases.	Dusts and gases.	Dusts and gases.
Fit	Hard to obtain good fit. Adjustable and two-strap models available.	Moderately good for half-mask models.	Good.	Good.
Amount of maintenance	Low.	Moderate (unless used as a disposable).	Moderate.	Moderate.
Breathing resistance	High (unless has exhalation valve)	Moderate.	Moderate.	Moderate.
Remarks	Easy to see over. Lightweight. Clog with moisture from wearer's breath in humid air. Cause glasses to fog in cold weather.	Reusable mask with replaceable dust filter.	Correct type of cartridge must be selected. Particulate pre-filters available. Some disposable models are available that are discarded when cartridge is spent.	Larger capacity canisters, rather than cartridges. Correct type of canister must be selected.

* Adapted from *How to Protect Yourself from Respiratory Hazards*, University Extension, University of Missouri Columbia

2. Self-contained breathing apparatus (SCBA)

SCBAs offer the best protection to agricultural workers entering oxygen-deficient areas or other atmospheres immediately dangerous to life. SCBA have either an open circuit or closed circuit design. The closed circuit design involves a re-breathing device. The open circuit SCBA expels the exhaled air into the atmosphere instead of re-circulating it.

SCBAs have the advantage of an independent supply of breathable air. However, they do have shortcomings:

- they are heavy and bulky
- can only be used for a short time
- require extensive training

Respirator selection, use and maintenance

The effectiveness of a respirator depends on several factors:

- properly assessing the situation where the respirator will be used
- selecting the appropriate type of respirator for that situation
- ensuring the respirator fits the user properly
- regularly maintaining the respirator

Buying the right respirator

Respirators are available from the manufacturer, through mail-order catalogues or local farm supply stores. Most types of respirators are available from a safety supply store.

It is critical to buy the correct type of respirator for each particular situation. Table 3 summarizes the appropriate types of respirators for a variety of hazards. Check that the respirator has a label showing that it has been approved by a recognized safety standards agency such as the NIOSH or the CSA.

Ensuring a proper fit

Wearing a respirator incorrectly is as dangerous as not wearing one at all. If the respirator does not provide a tight seal around the nose and mouth, the contaminant will leak through the seal.

More than one brand and size of a particular type of face piece are available. A fitting test can ensure the face piece fits properly. For best results, have the equipment fitted to the wearer by qualified personnel.

Always follow the manufacturer's instructions for wearing the respirator. Check for a proper seal each time the respirator is worn. An easy way to check the seal is to conduct a positive or negative fit check:

Table 3. Respirator uses*	
Respiratory hazard	Required type of respiratory protection
Pesticides	Chemical cartridge approved** pesticide respirator; gas mask or self-contained breathing apparatus, depending on concentration, oxygen level and type of application (refer to precaution note on product label)
Fumigants (for buildings)	Gas mask, supplied-air or self-contained breathing apparatus, depending on type of applications
Fumigants (for soils)	Chemical cartridge, full-face organic vapour respirator
Carbon monoxide	Self-contained breathing apparatus
Nitrogen dioxide (silage gas)	Self-contained breathing apparatus
Hydrogen sulphide	Supplied-air respirator with full face piece, helmet or hood or self-contained breathing apparatus
Ammonia	Chemical cartridge respirator approved for ammonia and methylamines
Chemical additives (powders or solids)	An approved toxic dust respirator
Grain dust	An approved toxic dust respirator
Paint	An approved spray paint respirator
Welding	An approved fume respirator
Fungal spores	An approved toxic dust respirator

* Adapted from *How to Protect Yourself from Respiratory Hazards*, University Extension, University of Missouri-Columbia

** Approved by a recognized safety standards agency

- For a positive check, cover the exhalation valve with the palm of the hand and exhale so that air builds up inside the respirator. If there is a leak, the wearer will feel it against the skin of his/her face.
- For a negative fit check, cover the cartridge(s) with both hands and inhale. If there is no leakage, the mask will be drawn tightly to the wearer's face.

Most types of respirators will not seal properly if the wearer has a beard or moustache. Such facial hair should either be shaved off, or the user should wear a powered air-purifying respirator (see above) if that type is appropriate for the respiratory hazard involved. Industries require that workers be clean-shaven if they have to wear respirators.

Maintenance and storage

Different types of respirators require different amounts of maintenance. Carefully read and follow the manufacturer's instructions for maintaining the respirator. Follow a regular schedule for replacing filters and/or cartridges/canisters.

Periodically inspect the respirator for damage and dirt. Look for the following:

- excessive dirt around the face piece
- detergent residue
- missing valve covers
- a cracked face piece
- breaks, tears or loss of elasticity in the head straps

NEVER attempt to repair a damaged respirator beyond replacing the replaceable parts, such as filters and head straps. Contact the manufacturer for parts for the particular respirator. Do not try to substitute parts from other respirators because they might prevent a total seal.

Store respirators in a safe, clean location.

Summary

- Try to minimize exposure to dust and harmful gases.
- Use respiratory protection when working in an environment with dust or harmful gases.
- Be sure to select the respirator type designed for the specific hazard faced. Choose a model that has been approved by a recognized safety standards agency.

- Wearing a respirator that does not seal properly to the face is as dangerous as not wearing one at all:
 - have the respirator properly fitted to the wearer by qualified personnel
 - each time it is used, test the respirator to ensure a proper seal
 - most types of respirators will not properly seal if the user has a beard or moustache
- Read and carefully follow all use and safety instructions for the respirator.
- Maintain, clean and store respirators in a safe, sanitary location.
- Different types of respirators require different amounts of maintenance. Follow the manufacturer's instructions and maintain the respirator carefully and regularly.
- Training is essential for the proper use of respirators.

For more information

The following two videos may help train those using respirators:

- *Respirators and How to Use Them* (12 min.): This video explains the use of **respiratory equipment**.
- *Fit Testing Respirators* (12 min.): This video explains the procedures for testing, maintaining and using respiratory equipment.

These videos are available by calling Digital-2000 at (800) 334-1523 or by visiting <http://www.trainingprofessionals.com/>

References

Some of the information in this publication is adapted from:

- *Using and Selecting Respirators*, University of Maine Cooperative Extension Bulletin #2331
- *How to Protect Yourself from Respiratory Hazards*, University Extension, University of Missouri-Columbia
- *Respiratory Protection in Agriculture*, Virginia Polytechnic Institute and State University
- *Good Farming Is No Accident*, Government of Manitoba
- *Workplace Safety and Health Manual for Alberta Hog Farmers*, Alberta Pork