

## FARM PRACTICES

## VENTILATION

### Description

Ventilation in agricultural structures, which include barns and storage buildings, is necessary to permit contaminated indoor air to escape and fresh outdoor air to enter. Ventilation creates an environment in which, in the case of barns, animals do not merely survive but live comfortably. In the case of greenhouses, ventilation enables plants to maximize yields. In manure storage structures, for example, ventilation is necessary to prevent the buildup of hazardous gases and to increase the longevity of building components susceptible to corrosion.

A properly operating ventilation system accomplishes three tasks:

1. It brings fresh air into a structure through strategically placed openings or inlets.
2. It thoroughly mixes outside and inside air; picks up heat, moisture, and air contaminants; and lowers temperature, humidity, and contaminant levels.
3. It exhausts moist, contaminated air from the building. The most common gases needing removal are carbon dioxide and ammonia. Hydrogen sulfide, methane and carbon monoxide are also removed. Solid wastes, such as dust, fecal matter, feathers, hair, skin, and feed, particulate matter, and microorganisms are also removed.

Ventilation systems may be mechanical or natural. Some systems use a combination of the two. Mechanical ventilation systems rely on electrically powered axial flow fans to create a pressure differential between the inside of a building and the outdoors. Natural ventilation systems operate on pressure differences created as a result of thermal buoyancy effects and outdoor wind conditions. Inlets and exhaust openings must be properly placed for both types of systems to work well.

### Nuisance Concerns

The three main disturbances mentioned in the *Farm Practices Protection (Right to Farm) Act* are odour, noise and dust. All three can play a role in the ventilation of farm structures.

#### Odour

Farmers engage in a variety of activities that produce odours. Most ventilation systems generate some odour. Odour is the human response to chemicals in the air. How people perceive the odour (nuisance or not) will depend on the frequency, intensity, duration and offensiveness of the odour, how well they smell and personal experiences associated with the odour.

See Nuisance Reference: [Odour](#)

## **Noise**

Most ventilation equipment generates some noise. Noise is defined as any sound that is audible but judged to be an unwanted, irregular or erratic disturbance. Noise levels vary and may rise when equipment is run at high RPMs. Noise may be generated continuously or intermittently.

See Nuisance Reference: [Noise](#)

## **Dust**

Farmers engage in a variety of activities that require the use of equipment or practices that will create dust. Dust may also be generated as 'fugitive dust' when fine particulate is lifted from fields, roads, buildings and yards by the stirring action of air. Most land clearing equipment generates some dust. Dust in the air is defined as fine-grained suspended particulate. How people perceive dust (nuisance or not) will depend on the frequency, intensity and duration of the dust generating event.

See Nuisance Reference: [Dust](#)

# **Activities and Operations**

## **Building Location and Orientation for Natural Ventilation**

While such factors as efficient animal traffic flow and access to buildings often dictate barn and storage location, it is advisable to orient buildings, particularly naturally ventilated buildings, to take advantage of prevailing winds. In some situations, this may mean locating a barn or storage on a ridge or away from existing buildings. For optimum ventilation, building axes should be oriented at right angles to prevailing winds and buildings should be located at least 15 metres away from other structures or natural obstructions.

## **Dilution**

The purpose of ventilation, whether natural or mechanical, is to dilute indoor dust concentrations to a point that animal and human health are not significantly affected. This is most easily accomplished by exhausting dust-laden air to the outdoors. In situations where barns are located close to residential areas, the negative impact of exhaust dust can be reduced by placing ventilation fans on the sides of buildings which do not face neighbors or by installing chimney fans to dilute exhaust air. Fan hoods should be installed on wall-mounted units. Hoods, apart from deflecting exhaust toward vegetation which can absorb and collect odors and dust, help reduce static pressure differences caused by wind, thereby creating a more efficient ventilation system.

Care must be taken to ensure that dust causes no long-term damage to the respiratory system of people working inside barns and storage buildings. Cereal grain oil sprays are an inexpensive way of controlling dust.

It is common practice in naturally ventilated buildings to open as many end and side doors as possible when agitating manure in pits beneath barn floors. When this is done, odour levels may rise, but only for a short time. Barn cleaning and agitation are typically done during daylight hours.

## **Ventilation Fans**

Fans are needed to control the indoor environment of farm structures housing livestock or containing plants. Fans may run intermittently or continuously to achieve and maintain the desired temperature or moisture level. To prevent excessive noise levels, units should be regularly maintained and operated with blade tip speeds not exceeding 10,000 - 11,000 feet per minute. It is in farmers' own best interests to keep noise levels as low as possible to prevent long-term hearing damage and to provide a comfortable environment for both animals and humans.

## Ventilation Duration

Ventilation equipment can run 24 hours a day to ensure that animal health and plant vigor are optimized. Summer rates are typically 15-20 times higher than those in winter for a given population of animals. These high rates are necessary to keep interior temperatures from reaching levels that could be detrimental to plant growth and animal well-being.

## Related Farm Practices

Other farm practices that pertain to ventilation practices include, but are not limited to, the following:

### Structures

Any agricultural building housing animals or in which respirable product is stored will require some form of mechanical or natural ventilation. Building codes specify minimum expectations with respect to ventilation exchange rates to ensure animal or human comfort and safety.

### Stationary Equipment

To create an environment that does not compromise the health and well-being of animals and people, fans must be operated round-the-clock. Warm weather will generate conditions where greater numbers of fans will be in use, and often at higher speeds as well.

## Legislation

Information on federal and provincial legislation can be found in Appendices B and C. Acts, regulations and bylaws that regulate or may affect ventilation practices include, but are not limited to, the following:

### Provincial

*Waste Management Act* – protects environment from soil, water & air pollution

*Workers Compensation Act* – outlines minimum air quality standards for workers around farm buildings within the Act's *Industrial Health and Safety Regulations*

## Publications

Publications that provide further information on ventilation include, but are not limited to, the following (refer to Appendix D for details):

*Fan Ventilation Principles and Rates*

*Farm Workers Health Problems Related to Air Quality Inside Livestock Barns*

*Livestock Building Exhaust Fans - Selection, Installation, and Maintenance*

*National Farm Building Code of Canada*

*Natural Ventilation*

*Protecting Workers in Livestock Buildings from Dust and Gases*

*Selecting Fans for Livestock Buildings*

*Ventilation Handbook – Livestock and Poultry*