# Ventilation Basics for Sheep

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As we are moving into cooler weather it is time to review the basics of ventilation to ensure that we get the maximum comfort, and by association, performance from our flock. The vast majority of flocks in Ontario have some sort of shelter for the winter months. Though sheep can tolerate the cold given a proper diet, freezing, and near freezing rain combined with wind can be very detrimental to their health if they have no shelter to escape this type of weather.

Every type of structure used to house sheep, or any other animals, relies on ventilation to introduce fresh air and to remove excess moisture, dust, manure gases and to modify the temperature. Moisture and gases are produced by respiration and from the decomposition of the manure pack. Sheep produce two types of heat: sensible or dry heat and latent or heat from the evaporation of moisture (the animals breathe and the manure pack). Latent heat production tends to decrease as the air temperature goes down and sensible heat production goes up. The desired temperature is maintained in the barn by stocking density (more sheep, more heat until welfare is compromised), insulation (more insulation, less heat loss through the building shell) or additional heat (expensive). Fortunately for sheep producers, with the exception of very young stock, sheep are able to withstand a wide range of temperatures as long as they are in a dry and relatively draft free environment.

The goal is to have a Relative Humidity in the 50 to 75 % range; in this range condensation on the exterior surfaces is minimized and the animals are in their comfort zone. This can be achieved by means of natural or mechanical systems that are designed to remove air from the building, but also control the incoming air as well. Humidity is removed from the barn by introducing outside air into the barn space, mixing it with the air in the space, and then exhausting it outside. One kg of outside air at -25°C for example can have a volume of 700 litres, a relative humidity of 100% and contains 0.4 grams of water vapour. The air enters the barn airspace and warms up to 15°C and the same kg of air has a volume of 820 litres, a relative humidity of 75% and contains 8 grams of water vapour. It then leaves the barn space via the exhaust system. Thereby, a kg of air at -25°C, 100% relative humidity can remove 7.6 g of water vapour from the airspace at 15°C and a relative humidity of 75%.

The type of shelter required depends on the production system. Those producers who lamb only in the early fall or late spring / summer can get by with only a rudimentary shelter, three walls and a roof with the open front to the South, is adequate. Whether it’s a non-insulated pole type structure, hoop barn or steel prefab type building the key to success is to orientate the opening away from the winter winds and towards the south. Animal comfort is reliant on a dry and relatively draft-free environment. The water system must be heated or insulated such to prevent

freezing and the barn temperature is allowed to swing in rhythm with the outside temperature. Any attempt to seal these types of buildings to increase temperature results in very uncomfortable sheep and a rapid deterioration in the structure. It is a recommended practice to insulate under the roofing steel with 0.9 RSI or R5 in order to reduce condensation and to install chimneys or ridge vents. Hoop barns should have a ridge vent or chimneys to exhaust the warm moist air out the top, barring this, the tops of the end wall should be left open so as to allow the humidity to escape, through this technique will be less effective on longer barns.

For marketing reasons, many Ontario producers lamb year-round or through the winter, this entails a more complicated type of structure in terms of insulation and/or heating. Lambing pens should be kept about 2°C or greater with provisions of a means of heating sick/orphan pen(s) as the need requires. By placing claiming pens away from outside wall and/or drafts allows for greater comfort of newborns until they are dried off and adapted to their surroundings. In order to maintain a 2°C or greater temperature within the barn itself there is a need for heat and insulation. Heat can come in the form of the animals themselves and if required by the addition of a heater, typically a gas fired radiant tube heater. Insulation levels should be RSI 3.96 (R22.6) for the walls and RSI 5.32 (R30.4) for the ceiling. Again, supplemental heating may be required depending on production practices and the barn location (Lucan vs. Powassan for example). Ventilation rates, either natural or mechanical should range between 1.75 l/s (3.7 cfm) per ewe minimum to 10.1 l/s (21.5 cfm) per ewe maximum. With proper stocking rates, ventilation can maintain a comfortable relative humidity and temperature while minimizing condensation on the exterior surfaces of the barn, through this assumes equal distribution in the barn. Many facilities have proper sizing of inlets and outlets (fans or chimneys), but have “dead pockets” of air that are detrimental to animal and building health. For these situations the addition of stir fans like those used in the poultry industry can aid in the proper distribution of air.