



MAPLEVIEW

AGRI LTD.



HOUSING AND VENTILATION
CONSIDERATIONS FOR DAIRY CALVES

WWW.MAPLEVIEWAGRI.CA

HOUSING AND VENTILATION CONSIDERATIONS

Housing and ventilation for dairy calves should be evaluated as an interacting system: space allowance (stocking density), air exchange and distribution, air speed at calf level, temperature and humidity (including THI), and noxious gases (especially ammonia) jointly determine calf microclimate and respiratory risk.

Research and extension guidance emphasize that macro-environment (barn averages) can differ from the calf's microenvironment inside pens or hutches, and that audit measurements must therefore be taken at calf level and across multiple locations.

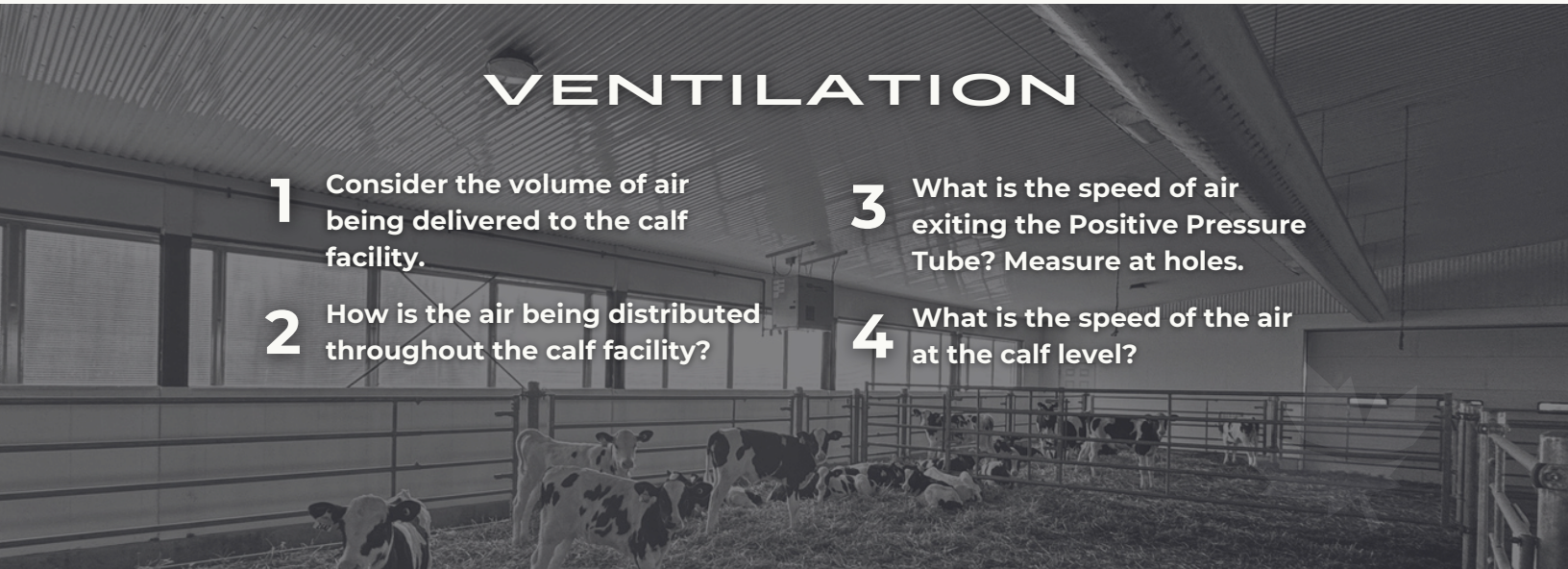
SQUARE FOOTAGE REQUIREMENTS

Recommendations* of calf and heifer housing space requirements at different ages of life.

Age	Weight	Age Spread/Group	Weight Variation/Group	Feed Bunk Space	Sq.ft/animal*
0-2 months	Birth-200 lbs	≤ 2 weeks	Minimal variation preferred	12-14"	35 sq. ft
2-4 months	200-400 lbs	≤ 2 months	< 100 lbs	14-18"	35 sq. ft
4-8 months	400-600 lbs	≤ 2 months	< 100 lbs	18-20"	40 sq. ft

*Adapted from: The Dairyland Initiative – UW Madison *Excluding feeding area.*

VENTILATION

- 
- 1** Consider the volume of air being delivered to the calf facility.
 - 2** How is the air being distributed throughout the calf facility?
 - 3** What is the speed of air exiting the Positive Pressure Tube? Measure at holes.
 - 4** What is the speed of the air at the calf level?

POSITIVE PRESSURE TUBES

Evidence suggesting an association between high air velocity at calf level and respiratory disease supports classifying excessive drafts as a high-priority hazard within calf barn audit SOPs, particularly under conditions of wet bedding.

The following parameters are consistently identified across engineering and extension guidance and can be turned into pass/fail audit checks.

Recommendations of air speed and exchange at different conditions.

Conditions	Exchange
Air Speed at PPT hole	1000–1200 ft/min
Air Speed at calf level when temperature is below 0°C	Less than 50 ft/min
*Room Air Exchanges below -7°C	4 Air Exchanges/hour
Room Air Exchanges between -7 & 10°C	15 Air Exchanges/hour
Room Air Exchanges above 10°C	30–40 Air Exchanges/hour

**Goal is to provide as much fresh air as possible without creating draft*

As a general rule, a single tube is appropriate for rooms less than 30 ft wide, whereas two tubes are recommended for rooms between 30 and 60 ft wide; longer buildings may require multiple fans or additional ducts to maintain consistent airflow.

Tube mounting height and hole orientation should also be adjusted to optimize air delivery. When tubes are installed approximately 8–10 ft above the floor, positioning hole rows at the 4 o'clock and 8 o'clock positions typically provide effective distribution (**Figure 1**). For mounting heights greater than 10 ft, positions closer to 5 o'clock and 7 o'clock may improve airflow patterns, and an additional 6 o'clock row may be beneficial in wider rooms.

Recommendations of pressure tube size based on barn width.

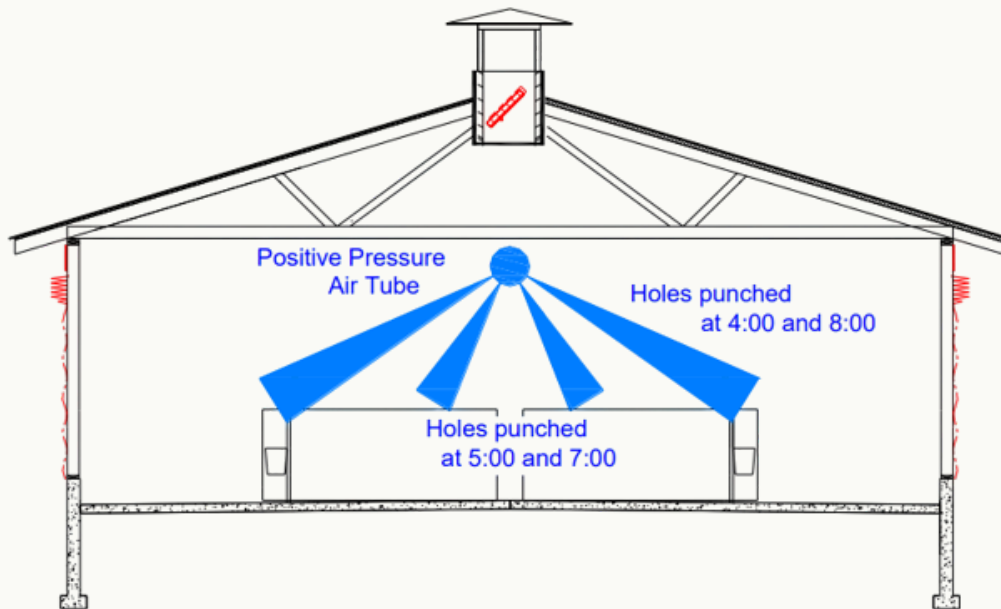
No of Tubes	Room/Barn Width
1	9m/30ft
2	9–18m 30/60ft

Note:

Larger holes in the tubes will project air further as follows:

- 2.5 cm/1" hole will project air approx. 3m/10ft
- 5 cm/2" hole will project air approx. 6.1m/20ft

FIGURE 1



Notes: Dirty fans can reduce airflow by 40%. Implement regular cleaning protocols to maximize airflow. Be aware of chimneys and exhaust fans interfering with PPT dispersion.

TEMPERATURE AND THERMONEUTRAL ZONES

Cold stress onset depends strongly on calf age, nutrition, bedding, wetness, and airspeed. However, temperature is a major contributor to climatic conditions, and critical temperatures must be monitored based on calf age.

Recommendation of temperature zones based on calf age.

Age	Temperature Range °C
0-3 weeks	15-25
1 month or older	0-23
Heifer/Steer	0-23

Adapted from: Lactanet - Constru+

RELATIVE HUMIDITY

Relative humidity (RH) also affects how calves are able to thermoregulate, particularly in warm weather. However, because RH is strongly influenced by ventilation and bedding moisture, high RH in winter often indicates insufficient moisture removal (even if temperature is in a thermoneutral zone).

Recommendation of RH targets for enclosed calf housing.

Item	Relative Humidity %
Ideal	50-70
Upper critical limit	>70
Lower critical limit	<50

Adapted from: Calfcare.ca

Note: Levels of Relative humidity above 70% allow for pathogens to thrive. RH below 50% will inhibit pathogen growth.



TEMPERATURE HUMIDITY INDEX (THI)

The thermoneutral zone for calves is similar to that of mature cattle (15–24°C). As temperatures move outside this range, calves begin diverting energy from growth and immune function toward regulating body temperature.

In trials conducted with calves in Wisconsin (which has weather patterns similar to Ontario), stress responses were observed beginning at a THI of 69 (24°C and 30% humidity). In heifers (~300+ kg), another study reported THI thresholds around 74, with abrupt increases in respiration rate and body temperature. Therefore, it is important to closely monitor THI at an age-dependent level.

FIGURE 2

THI heat stress index chart based on temperature (°C) and humidity (%)

		HUMIDITY %								
TEMPERATURE °C		20	30	40	50	60	70	80	90	100
	22	66	66	67	68	69	69	70	70	72
	24	68	69	70	70	71	72	72	73	75
	26	70	71	72	73	74	75	77	77	78
	28	72	73	74	75	77	78	78	80	81
	30	74	77	77	77	78	80	81	83	88
	32	78	77	78	78	81	83	84	85	87
	34	78	78	80	82	83	85	87	88	90
	36	80	82	82	84	86	88	91	93	96
	38	82	82	84	86	89	91	93	96	99
	40	84	86	86	89	91	93	96	99	104
	40	84	86	89	91	94	96	98	101	104
40	84	88	90	94	96	99	101	101	104	

	No heat stress (<68)
	Light heat stress (68–71)
	Moderate heat stress (72–79)
	Heavy heat stress (80–89)
	Severe heat stress (90)
	Deadly heat stress (>100)

AMMONIA

A quick rule of thumb is, "If you can smell it, it's too high." However, human odor detection for ammonia can occur around ~5 ppm, but odor is not a reliable measurement because people can become less sensitive ("nose-blind") with prolonged exposure.

For calf health protection, extension guidance reports general goals of <10 ppm ammonia and, when feasible, <5 ppm. Studies have shown calves exposed to ammonia above 4 ppm were associated with a higher prevalence of lung lesions.

Recommendations of acceptable and ideal ammonia levels for enclosed calf housing.

Item	Ammonia Level
Acceptable	<10 ppm
Ideal	<5 ppm

Adapted from: University of Wisconsin-Madison Extension

CONTACT US

info@mapleviewagri.ca

519-417-3676

www.mapleviewagri.ca

FOLLOW US





MAPLEVIEW
AGRI LTD.