

Dairy Cow Building Ventilation

The Cafre dairy unit has been designed to best meet the education and training needs of agriculture students and the dairy industry, to enable the delivery of knowledge and technology transfer and to comply with all relevant legislation and animal welfare recommendations.

This is one of a series of technical notes aimed at farmers and students. The notes are designed to provide the level of technical detail required to assist farmers in adopting technologies and practices demonstrated in the Greenmount Campus dairy unit on their farm business.

Optimal ventilation in a livestock building accommodating a large number of animals is critical to prevent respiratory disease. In buildings for dairy cows, it is even more important to ensure that the ventilation system performs optimally in providing the required frequency of air change to keep the internal building surfaces as dry as possible to minimize mastitis incidence. At the same time, the inlet ventilation design must be designed to control air speed through the building as excessive air speed will increase volatilization of ammonia from floor surfaces.

Critical features of the building structure to ensure optimal ventilation performance are:

- **The correct pitch (slope) of the roof.** As a guide, livestock buildings should have a pitch of between 1 in 4 and 1 in 3. These pitches equate to roof angles between 14 and 18 degrees respectively. For example, a shed 18m (60') wide should rise from eaves to ridge by between 2.25m (7'6") to 3m (10'), with a typical eaves height of 4.2m (14'). The ridge should be 4.5 (21'6") to 7.2m (24') above ground level.
- **The provision of adequate outlet (open ridge).** As a guide the ridge opening should be 5 cm (2") for

every 3 m (10') of building width. For example the same 18 m (60') wide shed should have a 30cm (12") opening. Care is needed in the internal design of houses to avoid open ridges directly above cubicle beds.

- **The provision of adequate air inlet.** This can take the form of space boarding, "ventilated" cladding or mechanical curtains. Care needs to be taken in siting new buildings along side existing sheds as this can impair the inflow of fresh air into both sheds.



Detailed calculations of the minimum inlet and outlet ventilation requirements of a building taking into account the building dimensions, eaves and ridge height stocking density and animal size can be performed using the Cafre "Ventilation App".

The aim of good ventilation is to provide a constant supply of fresh air to all stock in the house PLUS an outlet for stale air to remove:

- Excess heat – dairy cows are more susceptible to heat stress (even under warm humid days in N. Ireland) than to cold but the layout should not create draughts.

- Moisture – this is important to keep cubicle beds dry.
- Pathogens and dust for a healthy disease free environment.

Indicators of poor ventilation are:

- Poor air circulation/ draughts
- Fluctuations in temperature
- Smell of ammonia
- Build up of dust/ cobwebs
- Damp bedding/ mould growth

VENTILATION IN THE NEW CAFRE DAIRY UNIT

The new Cafre dairy building consists of two attached portal frame buildings due to the size of the site available. Inlet ventilation is provided through the external eaves of each building and through the raised roof profile of the cubicle house building over the milking parlour building. Features of the inlet ventilation control system are as follows:

Inlet Ventilation

- 1. West inlet (maternity wing feed passage)** – baffled above a 2.0 m wall with 3.0 m of 15 mm spaced Yorkshire cladding.
- 2. Central inlet** – cubicle building roof profile raised 1.3 m above the milking parlour building roof and extended 1.0 m over the parlour building roof to give a clear air inlet aperture of 0.5 m. The inlet is screened with 25 mm wire mesh bird proofing and an extended height gutter is fitted to the parlour building to prevent the ingress of rain and snow.
- 3. East inlet** – baffled above a 2.0 wall with a computer controlled variable ventilation system (VVS).

Variable Ventilation System (VVS)

There are several different variations of the VVS available by different manufacturers. The system installed in the new CAFRE Dairy Unit is a Galebreaker Variable Ventilation System with a torque

drive system. The equipment has the following specification:



- The curtain constructed from a 10% permeable, PVC coated polyester material, which is rot proof, tear resistant and UV stable.
- The curtain opens from the top down; rolling from the base up.
- The torque/gear drive system makes minimal use of wire ropes to reduce maintenance and vandalism.
- The motor is mounted on the south end of the curtain.

- Metal retention stays are fitted to ensure the curtain remains in place in windy conditions.
- The control system is fully automated with a weather station complete with rain, temperature and wind speed sensors.
- Bird netting with 25mm spacing is fixed over the full height of the opening.

Outlet Ventilation

1. The calculated **outlet ventilation** areas required were specifically 192mm wide and 207mm wide for the milking parlour and cubicle buildings respectively. For practical purposes, and to no detriment of building ventilation performance, the outlet width for the full length of each ridge was constructed at 200mm.
2. The **roof slope** is 18 degrees.
3. The **ridge outlets** are baffled using a light ridge structure which serves numerous functions from ventilation outlet to radiating natural light, preventing bird entry and preventing rainfall through an open ridge.



Light Ridge

A 2.0 m wide light ridge is fitted along the complete length of both the milking parlour and cubicle house portal frames.

Tailored wind deflector plates form a key part of the light ridge structure to prevent any snow or rain entering and to encourage the 'stack effect' natural ventilation process.

Bristle material is fitted to the underside of the light ridge structure to control airflow between the light ridge and the cladding corrugation gaps.

Bird proofing protection is provided on the underside of the light ridge structure.