

Section 5

Calf house Management



Introduction

Calf accommodation must provide for the animal's needs. Calf housing standards are regulated under the Department of Agriculture, Food and Marine specification S124 Nov. 2009, which describes the minimum specification required. Calves are susceptible to the chilling effects of wind and rain. Therefore they should be kept indoors or under shelter for the first three weeks of life. It is important that housing management is optimised in order to prevent stress and to limit the calf's susceptibility to disease.

- ① Creating a draught free environment.
- ② Creating and maintaining a dry bed.
- ③ Adequate manure disposal system.
- ④ Regular house and personnel disinfection.
- ⑤ Provision of clean air and water.
- ⑥ Adequate feeding and drinking space.
- ⑦ Sufficient air space.
- ⑧ Other services/calf house requirements.
- ⑨ Labour efficient calf housing.

Calf house Management

① Creating a draught free environment.

From the start, calves should be kept dry and draught free. Draught is considered present if wind velocity exceeds 0.5m/s in any of the calf pens. Draughts hitting calves causes them to lose heat energy. Energy loss will double when wind speed rises above 0.5m/s. A comfortable microclimate must be provided in the first week of life with temperatures >20°C.

In practice, air inlets should be above calf height level and the penning area should be laid out so that the currents of incoming air are not directed into the calf lying area. It is also important to make sure there are no down draughts from the outlets.

Draughts are especially difficult to avoid in open-sided buildings where wind cannot be controlled. Farmers with buildings like these are advised to build temporary walls/shelters to avoid uncontrolled wind impacting on young calves.

In long houses, one or more solid pen divisions is necessary to reduce draughts.



Large open sides on buildings can be blocked with bales to prevent uncontrolled wind reaching the calves.

② Creating and maintaining a dry bed.

KEY FACTS:

Calves spend 80% of their time lying down so the type and depth of bedding used is important.

Calves should not be lying directly on concrete as it tends to become wet and slippery and encourages the spread of bacteria throughout the house.

The quality of bedding material is crucial to reduce the amount of heat lost via conduction from lying calves. Deep straw bedding is superior to other bedding material in its efficacy as an insulator. It can provide a high 'nesting score' which has a preventive effect against calf respiratory disease in naturally ventilated sheds. Straw bedding should be at least 15cm deep and should remain dry at all times.

Wood shavings and bark chips can also be used to provide the calves with dry lying conditions.

KEY FACTS:

Calves require up to 20 kg/head/week of straw bedding in order to maintain dry conditions on concrete floors. This quantity can be halved by using slats under the straw.



Dry looking beds may be wet. To check if beds are adequately bedded and dry, kneel with all your weight on the bedded floor. If the knees of your trousers are wet, the house is not bedded sufficiently.

HOW TO:

Choose appropriate bedding for calves

When selecting bedding materials it is important to consider issues like on-going availability, price and the degree to which the material compacts over time. Avoid using dusty bedding as it can cause respiratory problems.

Material	Suitable (yes/no)	Explanation
Bark chips	Yes	Wood chips, tan bark and post peelings are absorbent bedding materials with good insulating properties and low palatability to calves.
Straw/hay	Yes	Using straw or hay as a bedding should be avoided if it is also supplied as a dietary fibre source. Calves may consume contaminated bedding and increase their exposure to pathogens. For example, if you use straw for bedding, feed hay as the forage/fibre source.
Wood shavings	Yes if untreated	Treated wood/pine shavings or sawdust should not be used as these can be toxic if consumed.
Sawdust	No	Fine particle sawdust will compact more, and is less suitable, than larger wood shavings.
Sand	No	Sand does not provide any insulating properties and has poor absorbing ability. It can accumulate in the stomach of calves who may consume it. Therefore it is not recommended.
Rubber mats	No if used without other bedding	Rubber mats are not suitable on their own for calves, but can be used alongside straw, bark chips etc. On their own they can lead to a net energy loss and can be too cold to allow resting.



Straw and bark chip make good bedding materials.



③ Adequate manure disposal system.

The flooring/bedding needs to facilitate easy cleaning and removal of waste. Waste should not drain away from one pen through another as this can spread disease.

Drainage on concrete floors can be improved by having a 1:20 slope towards a channel. The channel should be located a minimum of 300mm inside the feed barrier. Channels should have a 1:60 slope and waste should be removed to an external, ventilated storage tank. There should be shallow channels within the pens that are 25-30mm deep, 100-150mm wide and easily cleaned by brushing. These channels should not impede the mechanical cleaning of straw beds.

④ Regular house and stockperson disinfection.

The shed should be thoroughly cleaned and disinfected with a broad spectrum disinfectant before calves arrive. While in use, pens should be frequently disinfected to prevent the build-up of disease organisms. Ideally, calves should be bedded every day and pens cleaned out weekly.

Checklist

To ensure pens can be easily cleaned and disinfected:

- Use quality materials for pen divisions (at least 1.2m in height).
- Demand good workmanship on concrete floors and wall finishes.

Calf house Management

- Include falls of 1:20, 1:60 in channels.
- Front drainage channel should be 75mm X 75mm.
- Use trap gullets to prevent back odours.
- Prioritise safety e.g. no steps, electrical installation to ETCl standards.

KEY POINT:

Calf rearing personnel should be clean at all times, with particular attention to clothes and boots. Disinfection procedures, such as boot dips, must be carried out and maintained.

HOW TO:

Clean out a calf house

It is important to clean out, wash and disinfect calf houses. This should be done regularly and is essential between batches of calves. Maintaining a clean environment throughout calf rearing greatly reduces disease levels and enhances calf comfort.

- Rails, gates, partitions, walls and feeders must be cleaned of any obvious manure or other organic material. Disease pathogens persist longer in the environment if organic materials such as manure, saliva and bedding are present. All bedding and organic material should be removed.
- Pressure cleaning is recommended for cleaning out effectively. **Disinfection works best if all dirt and manure is removed.**
- Hot water/steam and soap may be necessary for cleaning milk residues as it aids removal of fat.
- Use a broad spectrum disinfectant for best results. A minimum of 10 minutes contact time is required, 30 minutes is preferable for effective disinfection.
- If cleaning pens when calves are in them, avoid wetting calves or creating aerosols of moisture that contain particles and pathogens.

KEY TIPS:

The longer the calf rearing area is free of calves and bedding material between calves/batches of calves, the fewer disease causing organisms will be present the next time its filled.

5 Provision of clean air and water.

There should be good ventilation in the house to remove effluent gases (ammonia) and prevent outbreaks of pneumonia. A calf house should have at least five to six air changes per hour.

Clean water must be available to calves at all times, especially if they are scouring. When dehydrated, calves will drink almost anything, so access to stale/rank water which may be harmful must be prevented.

Contamination of feed and water from other calves, vermin and flies is common; the likelihood can be reduced with good house design.

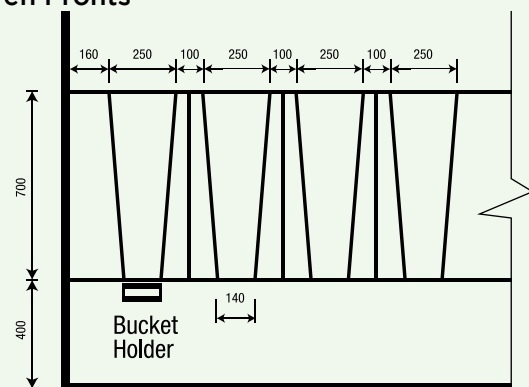
6 Adequate feeding and drinking space.

The correct feeder and drinking space must be provided to encourage feed and water intake and to discourage bullying. For bucket feeding, calves require 350mm of feed face each.

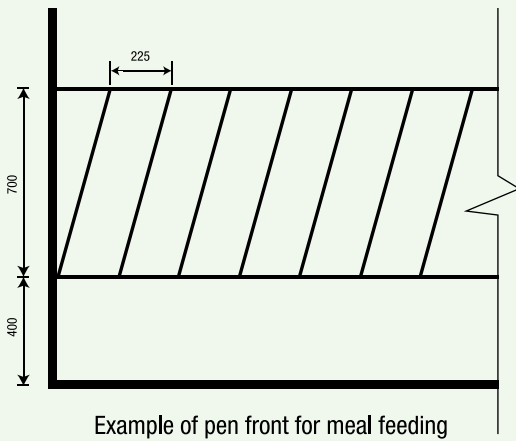
For automatic feeders there should always be more than one teat per pen. This reduces the risk of calves being without milk and then over feeding when a teat is fixed. The number of calves per feeder varies.

Meal troughs should be 450mm above the floor, 100mm deep and 250mm wide.

Pen Fronts



Example of pen front for bucket feeding



7 Sufficient air space.

Air space is critical. There should be a minimum of $7\text{m}^3/\text{calf}$ total house cubic air capacity provided per calf at birth, increasing to 10m^3 by two months of age.

The greater the number of calves in a single air space, the greater the risk to health. A calf with respiratory disease can shed millions of infectious organisms from its lungs into the surrounding atmosphere. A maximum of 50 calves per house is recommended (30-50 in a single air space).

8 Other services/calf house requirements.

- Artificial light - 50 lux (about five watts/ m^2 threshold).
- Natural light - at least 10% of roof area.
- Power points for automatic feeders, feed store, infra-red lamp, power washer etc.
- Water supply - drinkers for group pens (cold/hot).

9 Labour efficient calf housing.

In addition to providing the correct environment for calf health, welfare and growth, it is crucial that the design of the calf house allows routine tasks to be completed efficiently and provides good working conditions for the farmer/stockman.

Features of a labour efficient system include:

1. An adequately sized feed preparation area (if more than 20 calves).
 - $0.2\text{m}^2/\text{calf}$
 - Separate outside door
 - Its own airspace
 - Lockable cabinet for chemical and veterinary products
 - Sink and cold water supply, paper towel dispenser
2. Easy access for inspection and care of sick calves.
3. Access for a tractor with loader to clean bedding.
4. External access to a grazing paddock for calves.



Spacious passageways ease management of the calf rearing facility.



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Section 5

Individual and Group housing



Introduction

Individual housing of calves, either indoors or outdoors, is associated with improved calf health. However, European legislation (S.I. 14/2008) encourages group housing for animal welfare reasons. In addition, group housing systems allow for reduced labour input and space requirements. On many farms calves are individually penned for the first few days after birth to ensure that they receive adequate colostrum. From seven days of age they are group penned.

- ① What is the age limit for individual calf housing?
- ② What are the space requirements for individually housed calves?
- ③ The use and design of isolation pens.
- ④ What are the benefits of group housing?
- ⑤ What are the 'do's and don'ts' for successful calf grouping?
- ⑥ What are the space requirements for group housed calves?
- ⑦ Housing with automated feeding.
- ⑧ Outdoor v indoor housing systems.

Individual and Group housing

Individual calf housing

Isolating young calves from birth to a few weeks of age can help to prevent disease transfer. Individual calf houses must meet a certain specification to optimise their growth, health and well-being. Each calf pen is a micro-environment within the overall facility, so each pen needs to meet calf comfort standards.

1 What is the age limit for individual calf housing?

Under European legislation (S.I. 14/2008) calves greater than eight weeks old can only be kept in individual pens if a registered veterinary surgeon certifies that its health or behaviour requires it to be isolated in order to receive treatment. In addition, it prohibits the use of solid walls in individual calf pens.

2 What are the space requirements for individually housed calves?

- The pen width for a calf from birth to eight weeks of age must be the height of the calf at the withers as measured in the standing position.
- The pen length must be the calf length plus 10% (measured from the tip of nose to the caudal edge of the pin bone).
- Typically, an individual pen would be 1.0m wide by 1.5m long, but 1.7m is recommended, especially for isolation pens.



Calves must be able to see neighbouring animals.

3 The use and design of isolation pens.

Isolation pens are important to reduce the spread of disease/infection and to allow for efficient treatment of a sick calf. Solid concrete block wall divisions to roof level should be used where an isolation pen is incorporated into the building. All drainage from isolation pens must be separated from any other drainage system.

Isolation pens should be provided with adequate daylight, draught-free ventilation and a water supply. Isolation pens should have a separate entrance when incorporated in a calf house building.

Group housing

4 What are the benefits of group housing?

Pair or group housing of calves soon after birth can increase weight gains and intake of solid feed. In addition, group housing aids the behavioural and social development of calves, increasing their learning ability and allowing them to adapt better to new environments.

5 What are the 'do's and don'ts' for successful calf grouping?

Do	Don't
<ul style="list-style-type: none"> • Group calves by age and size. • Keep calves in stable groups for higher daily live weight gain and reduced prevalence of diarrhoea and respiratory disease. • Ideally 4-6 calves per pen for the first week (depending on the farm and progress of the calves). • Subsequently, keep calves in groups of 12 or less, do not overcrowd. • Practice all in-all out systems. 	<ul style="list-style-type: none"> • Mix younger calves with older calves. • Group calves at two weeks of age. • Allow >30 calves to share the same air space. • Allow calves to share air space with older cattle. • Mix animals from different pens. • Return isolated calves to their original mob.

KEY TIPS:

Don't put ill or stunted older calves into a group of younger calves to 'bring them on'.

6 What are the space requirements for group housed calves?

The space required for calves in group pens varies according to their weight. Calves housed in small groups or larger groups require 1.8m² of pen area and a total floor space of 2.3 to 2.5m²/calf floor area (including the feed passage). The minimum permissible pen floor area per calf is 1.5m².

For large herds, a shed with two rows of pens with a central passage is suitable. Passages should not be less than 1.2m wide.

Table 1. Space allowances for group housed calves

Calf Weight (kg)	Approximate age (months)	Space Allowance for Group Housing (m ² / calf)	Recommended area (m ² / calf)
45	0	1.5	2
46-99	0-2	1.5	3
100-149	3-5	1.5	4
150-220	6-8	1.7	5

7 Housing with automated feeding.

With automated feeding, farmers tend to group calves into large groups at younger ages. This means that sick or problem calves may not be identified easily. Additionally, calves tend to lie in groups in sheltered areas of the house which can cause a micro environment of stale air and increased risk of disease.

In order to avoid these issues, farmers should:

- Avoid using very deep pens (long and narrow).
- Ensure a good internal air flow pattern.

8 Outdoor v indoor housing systems.

Outdoor rearing refers to systems where calves are either outdoors at all times or have the possibility to move freely between outdoors and an open shelter. Either system, if well managed, is suitable for calves, with no difference in weaning weight between those reared indoors or outdoors.

Healthy calves are readily able to deal with outdoor temperatures as long as they receive adequate amounts of energy and are provided with a dry, well-bedded and draft-free shelter and lying area. Outdoor housing systems are superior for pneumonia prevention compared to indoor housing. Hutches are associated with lower morbidity and mortality in dairy calves.



Calves reared in outdoor hutches or shelters, whether homemade (left) or bought-in (right), suffer fewer disease incidences than calves reared indoors.

Individual and Group housing

Tips for successful outdoor housing systems:

- Unweaned calves must have a roofed shelter.
- The amount of milk or milk replacer fed may need to be increased in very cold conditions.
- If calves are to be housed in individual outdoor hutches, move them in straight away.
- If calves are being moved from indoors, try to do so under good weather conditions.
- For young calves, straw is the preferred bedding material.
- Always place mobile calf housing in areas sheltered against the prevailing wind.
- Move the shelters regularly if the area is getting poached, contaminated or dirty.
- All outdoor shelters and hutches should be appropriately ventilated.
- Ideally, allow at least 1.2 m² space per calf.

KEY TIPS:



Providing two shelters and placing them in a 'v' shape facing away from the prevailing wind will provide good protection for calves.

Section 5

Calf house Ventilation



Introduction

Adequate calf house ventilation is vital to promote the growth of healthy calves. Successful calf house ventilation helps to reduce the risk of pneumonia outbreaks and increases overall calf comfort. In Ireland, naturally ventilated housing predominates.

- ① Housing factors associated with calf respiratory health.
- ② The importance of good ventilation.
- ③ Natural ventilation in calf houses.
- ④ Building dimensions for effective ventilation.
- ⑤ Calf house designs that work well.
- ⑥ Design problems.
- ⑦ Space boarding.
- ⑧ Mechanical ventilation.

Calf house Ventilation

① Housing factors associated with calf respiratory health.

A significant factor associated with respiratory disease is the total airborne bacteria counts in pen air, with increased counts indicating poor ventilation. In order to reduce the bacterial counts, some practical changes can be made:

- I. Increase the area within a pen. Moving from 2.3 to 4.1m² can reduce the total airborne bacterial count by half.
- II. Improve house ventilation to dilute the concentration of organisms within the pens, e.g. through the use of supplementary ventilation systems.

② The importance of good ventilation.

The eight primary functions of ventilation are to:

1. Eliminate noxious gases.
2. Eliminate draughts.
3. Eliminate areas of stagnant air.
4. Maintain optimum ambient temperature.
5. Maintain optimum environmental humidity levels.
6. Decrease airborne dust contamination.
7. Decrease airborne endotoxin levels.
8. Decrease airborne pathogen concentration.

Dust and gas can have adverse effects on the health of the calf. Not only does dust irritate the respiratory tract and mucous membranes it leads to permanent damage to the lungs and encourages micro-organisms.

Ammonia at levels of 25ppm irritates the mucous membranes and makes the animal more vulnerable to respiratory diseases.

Although carbon dioxide is not poisonous at elevated levels (>3,000ppm) it adversely affects cattle as less oxygen is present. In addition, hydrogen sulphide is highly toxic with levels above 50ppm known to kill cattle - the main cause of this problem is agitation of below-ground slurry stores.

If air speed within the shed is greater than 0.5m/s, changes will need to be made to the ventilation in the calf shed.

KEY FACTS:

Each calf respires about one litre of water vapour into its environment every day.



Indoor housing which is well ventilated and bedded will reduce the risk of a pneumonia outbreak.

KEY TIPS:

To ensure adequate ventilation, it is important that the building is designed to:

- Remove excess heat.
- Remove excess water vapour.
- Remove micro-organisms, dust and gases.
- Provide a uniform distribution of air.
- Provide correct air speed for stock

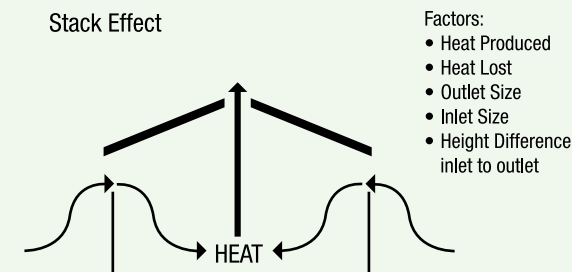
③ Natural ventilation in calf houses.

Natural ventilation is the most efficient and least expensive system for providing an optimum environment within a building. The objective is to provide a continuous stream of fresh air to every housed animal at all times of the day and night.

In Ireland, there is a predominance of natural ventilation in calf housing, which means that ventilation is provided by a combination of wind and stack effect. Natural ventilation works best when the building is positioned at right angles to the prevailing wind.

The stack effect is the same principle by which smoke is drawn up a chimney. In the building, the air that is heated by the livestock rises, escapes through the outlet area (highest point of the house) and is replaced by fresh air through the inlet area.

Adequate ventilation in sheds where young calves are housed can be difficult to achieve on still, damp days, since these animals are not generating sufficient heat to create a stack effect. In addition, sheds for young calves are more difficult to ventilate properly if the width of the building is greater than 10 metres.



4 Building dimensions for effective ventilation.

- The inlet/outlet size should be 0.08m² on sheltered sites and 0.05m² on exposed sites.
- The outlet should be at least 1.5m above the ventilation inlet.
- Roof profiles of 1:4 and 1:3 are ideal.
- There should be 5cm of ridge opening for every 3m of building width.

KEY TIPS:

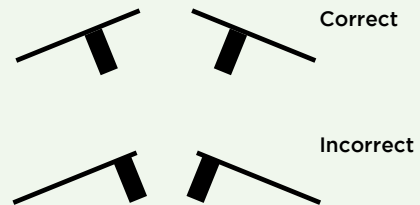


Check ventilation in pens by crouching to calf level. If there is a smell of ammonia, it is not well ventilated.

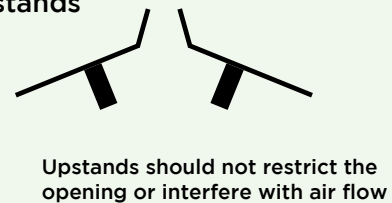
Air outlet options include:

1. Simple ridge outlet.
2. Ridge upstands.
3. Ridge capping.

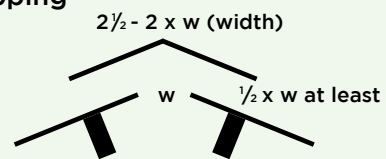
Simple ridge outlet



Ridge upstands



Ridge capping

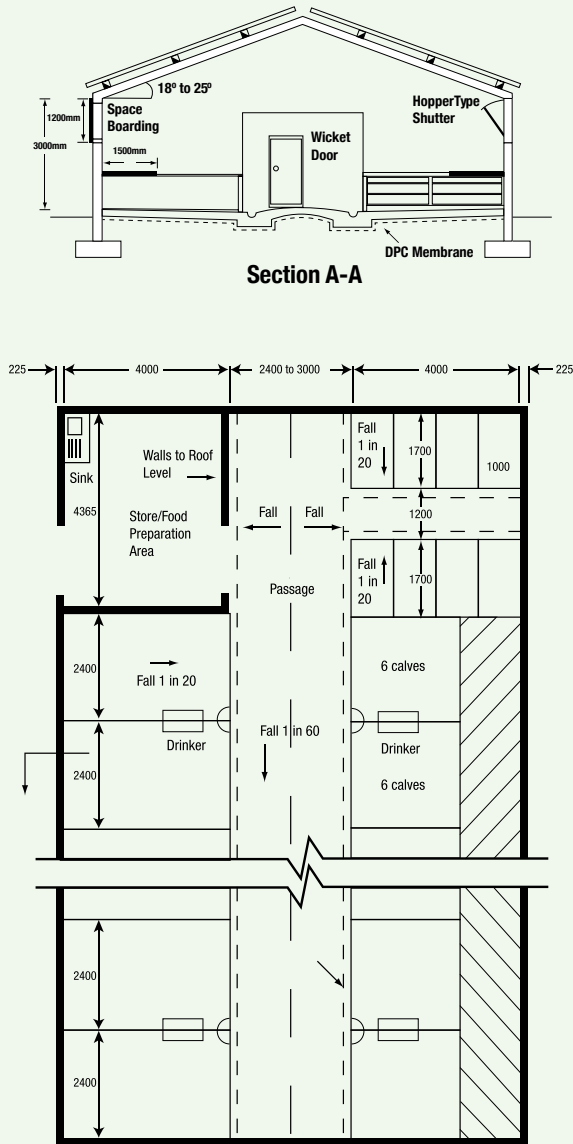


Calf house Ventilation

5 Calf house designs that work well.

There are two commonly recommended shapes for a naturally ventilated calf house - mono-pitch or duo-pitch. Purpose built calf houses help to provide efficient calf rearing of calves up to eight weeks of age, at which stage weaned calves can be housed in larger groups or put out to grass.

a) Individual and group pens bucket fed



This type of house is ideal for bucket or nipple rearing 50-60 calves (three bay shed). It can be

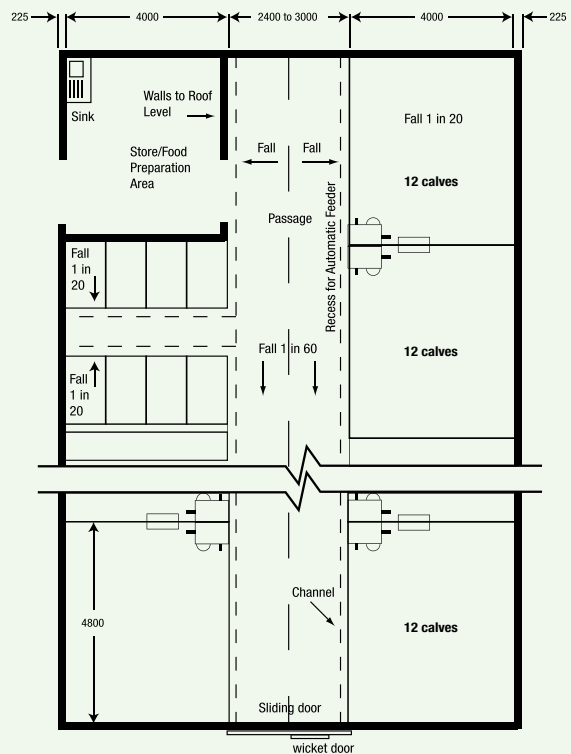
scaled up with each extra 4.8m bay catering for 24 additional calves. The advantages include a wide access passageway, the small group size allows for better batching and there is good access to pens.

KEY FACTS:



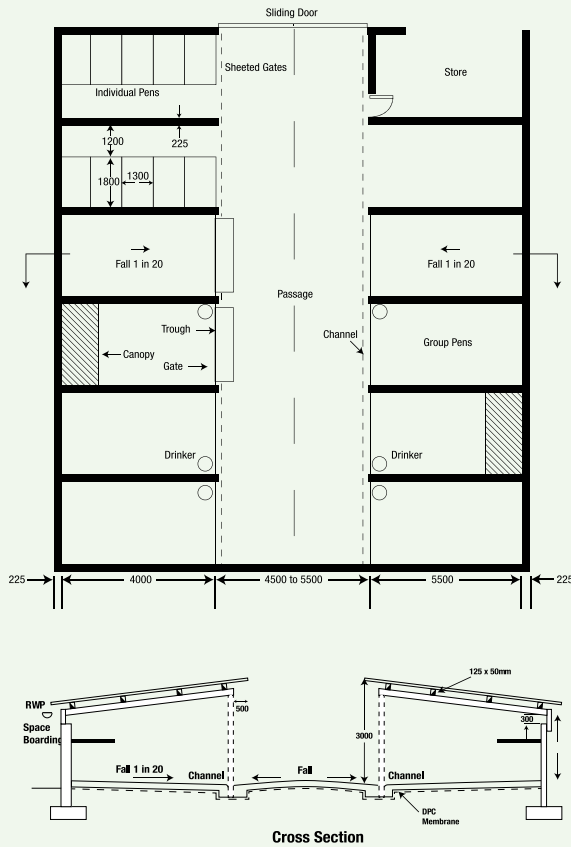
In sheds where calves are individually penned, the microclimate at the level of the calves can be very different from the general state of ventilation in the building.

b) Automatic feeder



This house is laid out to get the most out of automated milk feeding. It is similar to the individual/group pen bucket fed house.

c) Patterson calf house



This house design provides accommodation for six to eight calves per pen but it can be scaled up to larger pens as long as adequate eave inlet is provided. This design usually consists of two rows of open fronted pens facing each other.

KEY POINT:

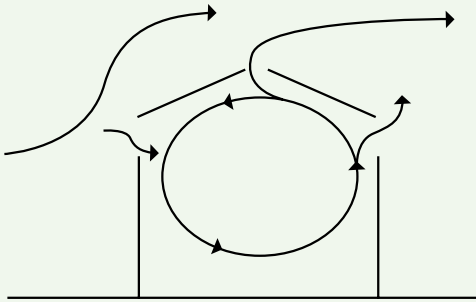
It is important that ventilation is never restricted in order to raise air temperature.

6 Design problems

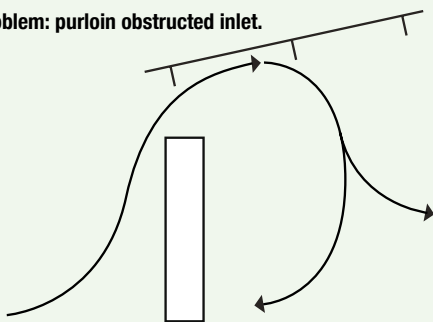
Common Design Problem	Consequences	Recommendation
Inadequate roof pitch, <math><15^\circ</math>.	Causes air to be deflected downwards leading to draughts.	Pitch of 22° recommended.
Inappropriate inlet location & poor design.	Leads to reduced effectiveness and downward deflection of air.	Eave inlets are ideal, 1.8-2.5m above floor. Gable ends are less effective.
Space boarding restriction of inlet.	Causes inadequate flow of air across the house.	Ensure space boarding is not covering or obstructing inlets.
Spaces under doorways and pen divisions.	Can cause low level draughts.	Reduce spaces, fill gaps.
Large height differences between inlets and floor.	Influence the pattern of airflow in windy conditions. Reduces the stack effect in calm conditions.	Have height difference of <math><3\text{m}</math> between inlets and floor.
Obstruction of the outlet.	Reduces effectiveness of ventilation.	Simple open ridge space works best. Make sure that capped ridge outlets are properly designed and constructed.
Buildings wider than 10m.	Makes it difficult to get an even airflow across the building as the roof pitch tends to be lower, creating poorer air circulation.	Can be overcome by using spaced roof sheets or raised roof sheets.
Poor site location.	Major impact on air flow.	Ensure shed is positioned at right angles to the prevailing wind. Use mechanical ventilation.





Calf house Ventilation

Problem: excessively high eaves.



Problem: purlin obstructed inlet.

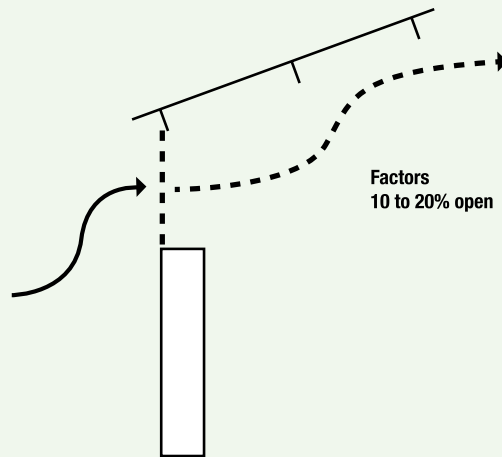


SW		NE	Ideal
S		N	OK
W		E	OK
NW		SE	Poor

KEY TIPS:

In Ireland we have wind more than 90% of the time, even on sheltered sites, from the south west mostly. The coolest winds tend to be easterly and northerly, so naturally ventilated houses should be sited with this in mind.

7 Space boarding/perforated sheeting



Perforated inlet material slows down air and gives a more even distribution. Gaps of 20-25mm between boards 50-200mm, to give an area 0.08m²/calf, are suitable for most houses. On exposed sites reducing the gap to 12mm and the space to 0.05m²/calf gives good results, especially if the house is not more than 12m wide.

8 Mechanical ventilation

In poorly located sites, and in existing houses not designed for natural ventilation, mechanical ventilation may be the only option. Mechanical extraction fans should always be fitted to the highest point of the house roof apex.

Fans should have a minimum extraction capacity of 34m³/hour/calf. Inlet design is important to ensure good mixing of air without draughts. The inlets should be long and narrow, situated at eave height but not more than two metres above floor.

KEY TIPS:

In calf sheds you can use smoke pellets to test the airflow. Preferably choose a still day for the test. The smoke should rise and clear through the outlet areas in about two minutes. If that is not the case try to modify outlet and inlet areas. Mechanical ventilation should only be considered if there is no other way to improve airflow.