

Requirements

- The width of any individual stall or pen for a calf shall be at least equal to the height of the calf at the withers, measured in the standing position, the length shall be at least equal to the body length of the calf, measured from the tip of the nose to pin bone, multiplied by 1.1
- Calf pens must be large enough to allow calves to groom themselves, lie down and stretch their limbs and rise without any difficulty and must also allow visual and tactile contact with animals in adjoining pens/hutches
- From 8 weeks of age, calves must be group housed (unless an animal is kept in isolation on the advice of the veterinary surgeon).

The principles of housing and management that apply to adult cows are no different to those for youngstock and heifers. Regulations, legislation, welfare codes and quality assurance schemes are all-embracing, from birth to the abattoir.

Therefore, regardless of the age of the youngstock, from calf to down-calving heifer or type of housing (cubicles, straw yards, pens or hutches), the accommodation must provide for the animal's needs.

Air space is just as crucial as floor area. One of the major causes of mortality, and less than optimal performance throughout the life of cattle, is pneumonia. It is especially common in housed animals and the disease can often be avoided if buildings are well designed and operated correctly with good ventilation and are well drained and managed, ie not overcrowded and mixing of different aged animals is avoided.

As with adults, there are advantages and disadvantages of housing youngstock in cubicles and straw yards. If cows are to be housed in cubicles, it is arguable that

cubicles for the young cattle should be the housing of choice. However, it must be stressed that the cubicles need to be suitably sized for the age, which means cubicles of various sizes for age groups.

16.1 Calf housing

It is essential to provide calves with a clean, dry bed in well ventilated but draught-free conditions, ie where air flow is less than two metres per second. Housing calves individually or in groups is a matter of the facilities available. In order to enable calves to see and touch one another, pen divisions must not be solid.

From 8 weeks of age calves must be group housed (unless an animal is kept in isolation on the advice of the veterinary surgeon).

Think about

Regardless of housing type, a newborn calf needs to be kept in a temperature of not less than 7°C. By one month of age, a calf can comfortably withstand temperatures around freezing point.

It is important that calves are kept out of draughts, as this has a negative impact on the lower critical temperature. Low temperatures are rarely a problem in GB conditions with housed animals, the majority of problems usually relate to high temperatures and humidity within a building.

The width of the individual stall/pen for a calf from birth to eight weeks of age must be at least equal to the height of the calf at the withers, as measured in the standing position. The length shall be at least equal to 'the body length of the calf, measured from the tip of the nose to the caudal edge of the pin bone multiplied by 1.1. In practice, this means pens at least 1.5 x 0.9m, but preferably 1.8 x 1.0m.

Individual calf pen



Think about

A calf should always have a dry bed. Concrete floors should have a minimum slope of 5% (1 in 20) to allow effective drainage of water and urine. The installation of duckboards on which bedding can be placed will also help to keep the calf dry. A drainage channel at the front of the pen will also help to remove water and urine.

When kept in groups, the unobstructed space allowances available to each calf are as in Table 16.a.

Table 16.a - Space allowances for group housed calves

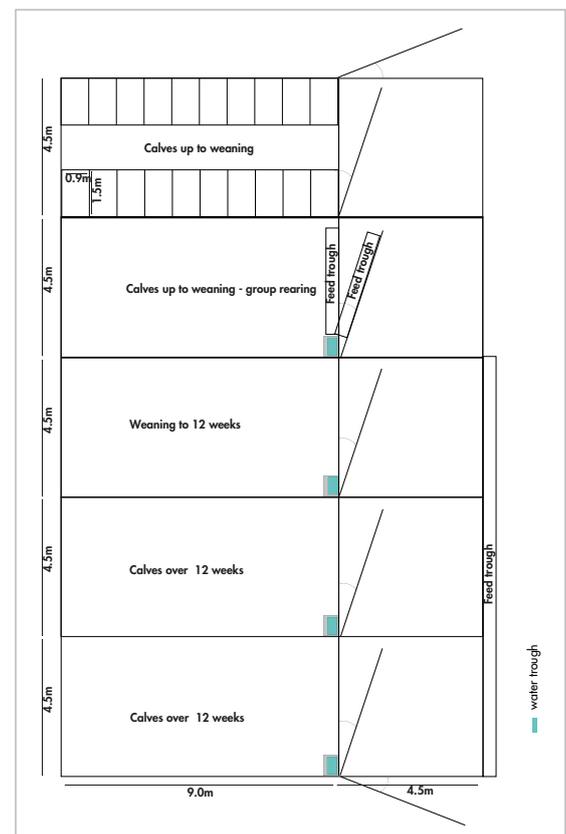
Weight of calf (kg)	Approximate age (months)	Minimum (statutory) area (m ² /calf)	Recommended area (m ² /calf)
45	0	1.5	2.0
46-99	0-2	1.5	3.0
100-149	3-5	1.5	4.0
150-199	5-7	2.0	5.0
>200	7+	3.0	6.0

In practice, this can lead to calf rearing layouts which move animals from individual pens to larger groups as they mature. An example layout is shown in Figure 16.a.

Think about

It is recommended that calves are housed in groups no greater than 12, this makes it easier to identify sick calves and allow prompt treatment. Not only should there be no more than 30 calves sharing the same air space, they should not share space with older cattle.

Figure 16.a – Individual calf pens, suitable to house 20 calves. Larger pens for group rearing post weaning.



Think about

Air space is critical with a minimum of 6m³ air space per calf at birth, increasing to 10m³ by 2 months of age and at least 15m³ by 6-7 months. The greater the number of calves in a single air space, the greater is the risk to health.

Calf hutches are very popular, for good reason. Calves will usually be much healthier than those kept in buildings due to the abundance of fresh air.

Calf hutch



Calf hutches are often of a size to house individuals, although larger hutches are available. Each hutch must have an outside run for the calves to move around and be in fresh air. The hutches should be situated on either free-draining concrete or on a porous base, such as chalk, ensuring that any effluent goes to a suitable site for disposal. Plenty of clean, dry bedding (normally straw) needs to be provided which should be disposed of after each batch of calves. Ideally, the hutches should be moved after each batch to minimise disease risks. Although hutches are considered to be the best form of housing for calves, there are downsides, namely, stock people having to feed and check the calves in all weathers.

16.2 Automatic calf feeders

Many farms are now rearing calves on automated machines in group pen, calves should be trained on the automated machines.

Think about

As calves fed on automatic systems will consume significant volumes of milk, pen drainage is essential to remove urine and keep the bedded area dry.

Automated calf feeder



The pen should be designed so that calves can only drink from a concrete standing, away from the bedded area to assist in bed cleanliness. This is sometimes achieved by installing a small slatted area.

There needs to be easy access to the machine for operators to be able to clean and service the machine and the surrounding area needs to be well drained to deal with the waste water produced during the daily cleaning cycle.

16.3 Building drainage

As previously referred to, prevention of humidity is crucial in youngstock accommodation. This can be aggravated by poor drainage, especially where calves are bucket fed, around automatic feeders and by water bowls and troughs. This may require a drainage channel underneath the buckets with good falls to a drain, usually outside the building. With *ad libitum* milk feeding, large amounts of urine are a direct consequence. The profile of the floor must be to allow ready drainage away from the bedding (fall of around 5%).

16.4 Building ventilation

Dust and gas can have adverse effects on the health of the calf and young animal which then often extend through to lactation. Not only does dust irritate the respiratory tract and mucous membranes, it leads to permanent damage to the lungs and encourages growth of microorganisms. Ammonia at levels of 25ppm will irritate the mucous membranes and also make the animal more vulnerable to respiratory diseases.

Studies show that ammonia levels in the first four months of life severely impact on the age at first calving. Although carbon dioxide is not poisonous at levels above 3,000ppm, it can adversely affect cattle due to less oxygen being present. Hydrogen sulphide is highly toxic with levels above 50ppm known to kill cattle – the main cause of this problem being agitation to below ground slurry stores. Almost all infectious diseases occur by direct aerosol spread between calves so it is vital that there is good ventilation to allow for removal of infectious organisms. Similarly, an increase in humidity will favour virus and bacterial survival.

Not only is air space critical but so is ventilation rate, this is the amount of air replaced within a building in a given time. The aim is a minimum air change within a building of 10 times each hour, increasing in the summer up to around 60 air changes per hour. The purpose is to keep the air fresh. Studies from the USA show that higher humidity and mean temperatures within the calf housing result in a delayed first calving.

Natural ventilation requires the right balance of inlets and outlets. If the warm air is able to exhaust from the ridge of the building, this draws fresh air into the building through the side inlets. This air change ensures the stack effect is maintained.

Think about

The inlet and outlet areas should be about 0.05m² and 0.04m² per calf respectively, with the outlet being at least 1.5m above the ventilation inlet.

At a relative humidity (RH) above 75%, pathogens and viruses can survive for several minutes which increases their chance to spread from animal to animal. However, at RH levels below 75%, viruses die very quickly after

exhalation. Within many calf buildings, the humidity is such that viruses can survive for around 40 minutes creating a reservoir of infection in the air which means the disease is rapidly spread.

Think about

A constant supply of fresh air is essential in preventing respiratory and other diseases, together with improving production. Good ventilation removes stale, damp air which helps ensure that viruses and bacteria cannot survive for long outside the animal.

Ventilation should never be restricted in an attempt to raise air temperature. In all but the minority of situations, natural ventilation will be adequate. However, if artificial (fan) ventilation is required then it must only be controlled manually or by humidity sensors, never by a thermostat.

Think about

Natural ventilation is the most efficient and least expensive system for providing an optimum environment within a building.

Buildings will naturally ventilate best when they are sited at right angles to the prevailing wind direction. Although, in practical terms in GB, the occurrence of the prevailing wind is only slightly higher than that from the other directions.

To ensure adequate ventilation, it is important that the building is designed or adapted 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.

In GB, wind speed is above 1m/sec for more than 95% of the time. This means that, for the majority of time, there is sufficient generating force to provide the necessary air changes within a correctly designed building by natural ventilation.

Calf and youngstock housing often tend to be buildings that have been made redundant for adult cattle.

Think about

It is imperative that the limitations of old building designs are overcome for the sake of health and productivity of the next generation of animals to go through the milking parlour.

As with cow housing, the design of a successful natural ventilation system is complex and requires a number of points to be considered:

- Span of the building
- Location of the building relative to other buildings or obstructions (buildings and trees disrupt airflows for a distance of 5–10 times their height)
- Pitch of the roof
- Stocking rate
- Weight of each animal
- Bedding system.

Although the aim is to use natural ventilation, occasionally mechanical ventilation may be required in some calf buildings due to design constraints but should be the last option. This may be essential with animals housed during summer months to minimise the effects of heat stress. Fans assist air movement to provide a cooling effect and so increase heat loss from animals.

16.5 Bedding materials

For loose housed animals of any age, bedding options are the same as for cows. With the price of straw becoming a serious issue and with the quality of cereal straw varying from year to year, other bedding materials are commonly being considered, examples of these include sand, sawdust/shavings, bark peelings, waste paper and gypsum waste. Studies of various materials by the University of Arkansas found no significant differences in output of calves housed over a 6-week period on different materials, although straw and wood shavings provided more warmth and absorbency compared to products like sand. Although efficient use of bedding is very important, care must

be taken to ensure that the cleanliness and welfare of young animals are not compromised.

16.6 Straw yards

Although all straw yards may be considered suitable for calves, ie animals less than six months of age, for more mature youngstock, the bedded area should be supplemented with a scraped concrete feed passage. The yard should be rectangular in shape. A concrete passage will help promote hoof wear and prevent feet becoming overgrown.

Think about

Aim for a passage width of 2m for animals less than a year of age, which should be scraped regularly at least 3 times per week.

A small step (usually 0.2m and no more than 0.3m for older heifers), should be provided between the feeding area and the straw beds. This will help retain the straw and prevent manure flowing onto the bedded area during scraping.

16.7 Cubicles

Cubicles must provide a clean comfortable lying space for the heifer calf. The calf must be able to enter and leave the cubicle easily and lie down and rise without interference or injury. Poorly designed cubicles and inappropriate management can lead to problems such as cubicle rejection in adult life, wet and soiled cubicle beds and physical injury to the animals.

The length of the cubicle needs to be adequate to allow the heifer to rest comfortably and rise without injury. The position of the animal when lying down and standing are usually controlled by brisket boards and headrails. A correctly located heifer calf means that urine and dung fall into the scraped passage and not onto the cubicle base.

There needs to be sufficient distance between cubicle divisions to allow the calf/yearling to lie comfortably while ensuring she is unable to turn around. She should

not come into contact with the cubicle partition in such a way that could cause injury, be it when she lies down or rises. When an animal rises from a lying position, it lunges forward to transfer its weight from the hindquarters onto the forequarters. To accommodate this transfer of weight, the animal thrusts the head forward and this lunging space must be designed in the cubicle. If the forward lunging space is restricted, difficulty in rising will be experienced.

Table 16.b – Cubicle dimensions

Weight (kg)	100	150	200	300	400	500
Width (m)	0.55	0.6	0.7	0.85	0.95	1.10
Length (m) (against wall)	1.5	1.6	1.7	1.95	2.15	2.4
Length (m) (head to head)	1.4	1.5	1.6	1.8	2.0	2.25

Cubicle length - The total length of the cubicle should provide body space, head space and lunging space. Cubicle length is very dependent on the size of the animal. It is better to have a cubicle too long as the effective length can always be reduced.

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As a guide for calves (0-6 months), the cubicle should be 1.6m long when installed against a solid wall, increasing to 2.15m for animals up to 12 month of age. Knowing the weight of the youngstock at each stage is essential.

Cubicle width – Cubicle width must allow the animal to rise and lie easily. But if the width is excessive, the animal will tend to lie at an angle in the stall or turn around. The width of the cubicle will be determined not only by the size of the animal but, in part, by the choice of cubicle division. Slightly wider widths are required if there is a rear support leg.

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For calves, the width will be around 0.55m, increasing to 0.95m for animals up to 12 months of age.

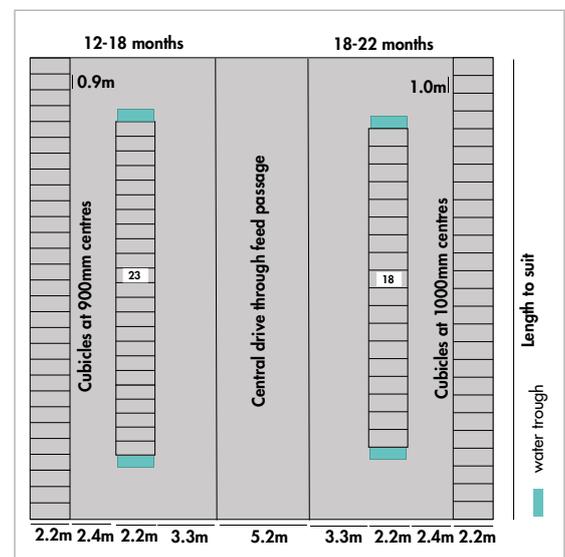
16.8 Cubicle dimensions

Cubicles need to be designed for the size of animal at the end of each housing period. Researchers in Denmark in 2001 produced guidance in the Housing Design for Cattle booklet which outlines cubicle dimensions for youngstock. This is illustrated in Table 16.b.

Division design - There are many types of cubicle division on the market. Whatever the type, they must provide the animal with maximum comfort, provide security/protection, prevent injury and ensure that she is correctly positioned both standing and lying. The space sharing division, such as the suspended cantilever type offers more room allowing slightly narrower widths.

The main benefit of the suspended cantilever division is that both height and width spacing can be altered at any time. This provides flexibility, especially where animals are growing rapidly.

Figure 16.b – Dairy youngstock cubicle housing (suitable to house 49 animals at 12-18 months of age and 39 animals at 18-22 months of age. (5% additional cubicles)), with a central drive-through feed passage.



16.9 Number of cubicles

As with dairy cows, there should always be at least 5% more cubicles than animals within a calf management group. Overcrowding leads to reduced lying times and increased lameness which is often carried through to adult life. There is also more bullying with an increased risk of injuries. As with layouts of cubicle buildings for adult animals, there should be no dead ends and cross-passages provided at approximately every 20 cubicles.

16.10 Space allowance for feeding

Although feed may be *ad lib* and available 24 hours per day, it has to be recognised that there are peak periods for feeding during the day, eg immediately after fresh feed is put down. If there is competition for feed space during this period, subordinate animals will give way to dominant animals, modify their feeding behaviour and their growth rates are likely to suffer. If bullying is a problem, pregnancy rates are likely to suffer. Feed trough space is given in Table 16.c.

Table 16.c – Feed face required for young cattle eating simultaneously

Weight of animal (kg)	Width of feed face (m)
<100	0.30
100-199	0.35
200-299	0.40
300	0.50

Animals should be able to pass behind those already feeding without disturbing them. This means the passage should be at least 2m wide.

16.11 Water

As cattle are herding animals they are sociable in their behaviour. Adequate trough space or water bowls must be provided to allow at least 10% of the group to drink at anytime. The water trough should be located at the correct height for the animal – again, often a problem in practice with rapidly growing animals.

Further reading

- Code of Recommendations for the Welfare of Livestock: Cattle. 2003. (PB7949). Defra Publications, Admail 6000. London SW1A 2XX
- Housing design for cattle – Danish recommendations. 3rd Edition. 2001