

BETTERRETURNS



# Improve beef housing for Better Returns



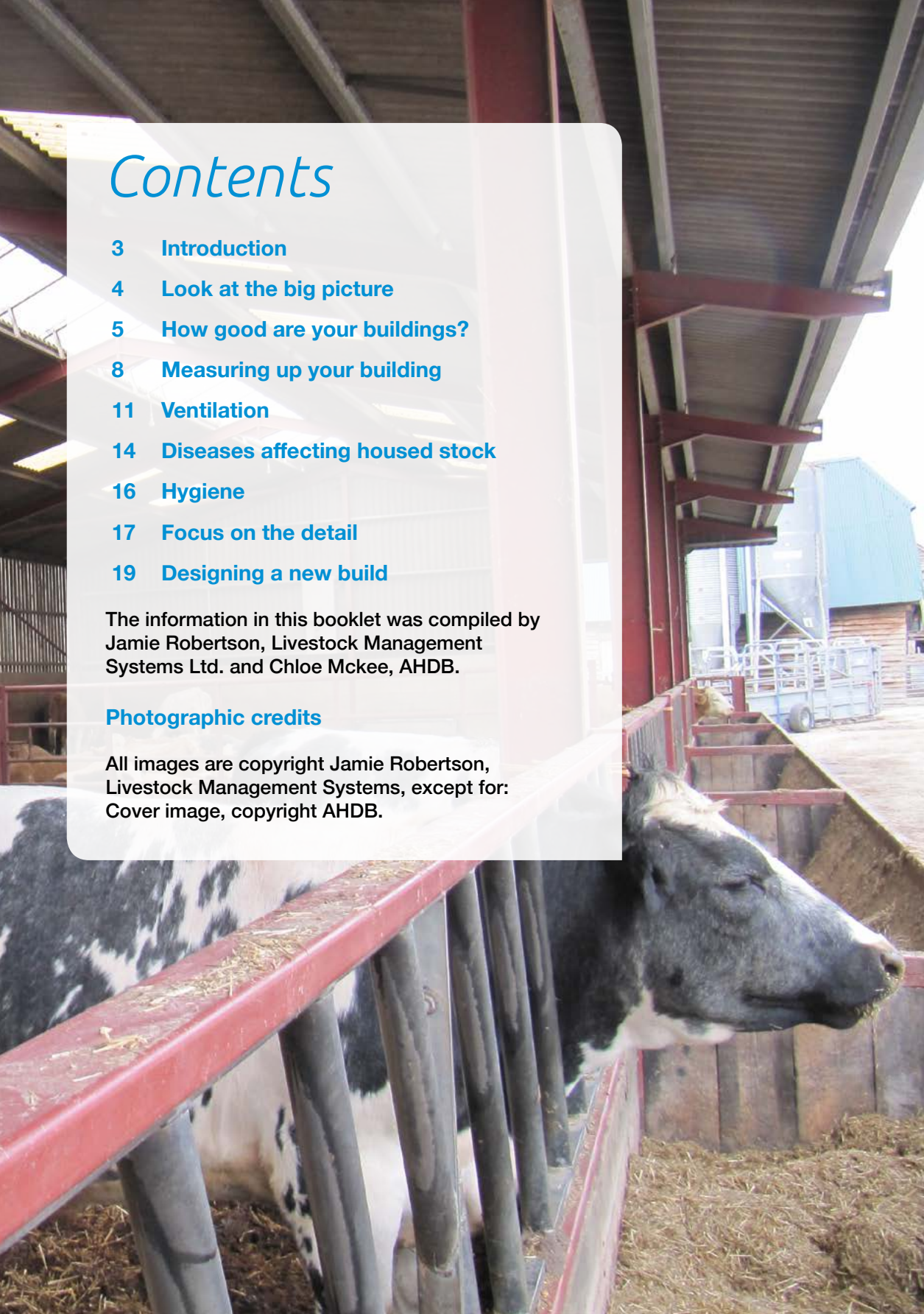
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# Introduction

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Improving existing buildings or designing new builds to the best standards has a lasting and positive impact on animal health and productivity. When making changes, it's essential to take into account animal productivity targets, animal behaviour and needs, space allowances, labour, management preferences, animal handling and safety and return on investment.

The beef sector has changed considerably in the last few decades due to knowledge gains in agronomy, nutrition, genetics and health. A clear assessment of the issues contained within your own buildings will point to areas that will benefit the whole system of production.

There are five crucial factors that affect the environment around cattle: ventilation (fresh air), humidity, bedding, temperature and hygiene. Whether cattle are housed in cubicles, straw yards or slats, the target is the same: maximise ventilation on a still day, without exposing livestock to elevated wind speed when the wind is blowing. This is essential to prevent life-threatening diseases such as pneumonia. Moisture management is also key to managing health. Good ventilation, coupled with effective drainage and rainwater management will reduce costs.

This manual provides advice on how to assess your buildings and the small changes that can make a big difference to the performance of your enterprise. If you're considering investing in a new building, there are key areas to consider at the back of this manual.



**Chloe McKee**  
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# Look at the big picture

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Housing brings stock together in a relatively confined environment and possibly in new social groups. Therefore, conditions must be right to minimise undue stress on livestock or stockpersons.

Take a fresh look at your buildings, or ask someone else to do so. It may well be that there are simple ways to make big improvements.

On many farms, there is scope to make changes to stock buildings and layout that will deliver big benefits to efficiency of labour, use of feed and animal health and performance.

Building improvement does not necessarily require large capital investment or major re-organisation. What it does need is some thought and a willingness to try out new approaches.

Visit successful units and see how others are making good use of their buildings.

- Ensure lighting is adequate to inspect stock at all times
- Machinery access for effective daily feeding is worth investment. Occasional cleaning out should not compromise hygiene between pens
- Ventilation is perhaps the most critical issue to reduce the risk of disease build-up
- Water access must be adequate to ensure all stock can drink without bullying
- Staff access must enable easy access without climbing fencing or opening cumbersome gates
- Pen sizes should be adjusted to reduce stress and make it easier to manage matched groups of animals for optimum performance
- Windproof against the prevailing wind but not preventing fresh air access
- Joined-up layout makes movement of animals simple and stress-free
- Feeding areas can be improved to reduce both animal stress through bullying and feed waste
- Drainage avoids build-up of dirty water and leaving animals on damp bedding



# How good are your buildings?

The following checklist will help you look afresh at your buildings. Be brutally honest!

Table 1. Essential provisions

Essential provisions		Yes	No
 <p><b>Floor space</b></p>	<p>Check Red Tractor Standards (Table 2) to see if the building is competent. Are there poor conditions in the pen?</p> <ul style="list-style-type: none"> <li>• Draughts</li> <li>• Damp</li> <li>• Temperature</li> <li>• Poor air quality</li> </ul> <p>These effectively reduce choice pen area.</p>		
 <p><b>Floors and bedding</b></p>	<p>Do all pens drain effectively?</p> <p>Remedial action will pay a return forever. Prevent ingress of rain and ground water.</p> <p>Exposed concrete: non-slip and non-damaging?</p> <p>Slats competent?</p>		
 <p><b>Group size</b></p>	<p>Are animals in manageable-sized groups?</p> <p>Steers and heifers should be less than 40 animals/group. Bulls should be less than 20 animals/group.</p>		
 <p><b>Grouping</b></p>	<p>Are groups well matched in terms of sex and size, horned/not horned?</p> <p>Do pen sizes force more mixing than desirable?</p> <p>Does age range within pen add health risk?</p>		
 <p><b>Feeding</b></p>	<p>Can all stock access unlimited quantities of clean drinking water at all times?</p> <p>Are drinkers and troughs cleaned?</p> <p>Is water quality known to be reasonable?</p>		

Table 1. Essential provisions continued






Essential provisions		Yes	No
 <p>Water</p>	<p>Can all stock access unlimited quantities of clean drinking water at all times?</p> <p>Are drinkers and troughs cleaned?</p> <p>Is water quality known to be reasonable?</p>		
 <p>Ventilation</p>	<p>Is fresh air available throughout your buildings?</p> <p>Look for good inlets to bring in fresh air, and good outlets for stale air. Calculate using BRP+ <b>Better cattle housing design</b> online document.</p> <p>Is solid cladding on building side facing main wind direction? Change to Yorkshire boarding to maximise free air delivery.</p>		
 <p>Hygiene</p>	<p>Are the floor and pen walls easy to clean?</p>		
 <p>Lighting</p>	<p>Must be 50 lux for general areas and inspection; 200 lux for performance. Well distributed; avoid creating shadows.</p> <p>Are south-facing roof lights creating excess heat in all-year-round housing?</p>		
 <p>Handling facilities</p>	<p>Are these adequate for safe and easy handling of all categories of stock you manage?</p> <p>See the BRP manual <b>Improving cattle handling for Better Returns</b>.</p> <p>Check and remove items that will distract stock from moving steadily; changes in floor surfaces, shadows (lighting), clutter/debris.</p> <p>Make race sidewalls solid, make corners into curves.</p>		

Table 1. Essential provisions continued

Essential provisions		Yes	No
 <p><b>Equipment condition</b></p>	Do you regularly inspect and maintain barriers, gates, pens, floors, etc. to ensure stress-free handling and avoid injury to staff or stock?		
 <p><b>Capacity</b></p>	Sufficient capacity to meet routine needs such as cleaning, quarantine, and to deal with crises, such as infections?		

Housed cattle need constant care and attention from staff who are well-trained in their nutritional and environmental needs. Table 2 shows guideline housing space allowances.

Table 2. Loose housing space allowances

	Liveweight (kg)	Solid floors (m <sup>2</sup> /head)		Slatted floors (m <sup>2</sup> /head)*
		Bedded area	Total area (incl. feeding and loafing)	
Suckler cows	400	3.50	4.90	n/a <sup>#</sup>
	500	4.25	5.85	n/a <sup>#</sup>
Growing/ finishing cattle and youngstock	200	2.00	3.00	1.10
	300	2.75	3.95	1.50
	400	3.50	4.90	1.80
	500	4.25	5.85	2.10
	600	5.00	6.80	2.30

Source: Red Tractor Assurance Standards 2017. Notes: <sup>#</sup>Non-slatted lying area must be provided. \*Fully slatted concrete floors should not be used for breeding cows and in-calf heifers

For specific detail on housing of beef cattle, refer to BRP+ **Better cattle housing** available online.

The Rural and Industrial Design and Building Association can provide advice on good design [ridba.org.uk](http://ridba.org.uk)

# Measuring up your building

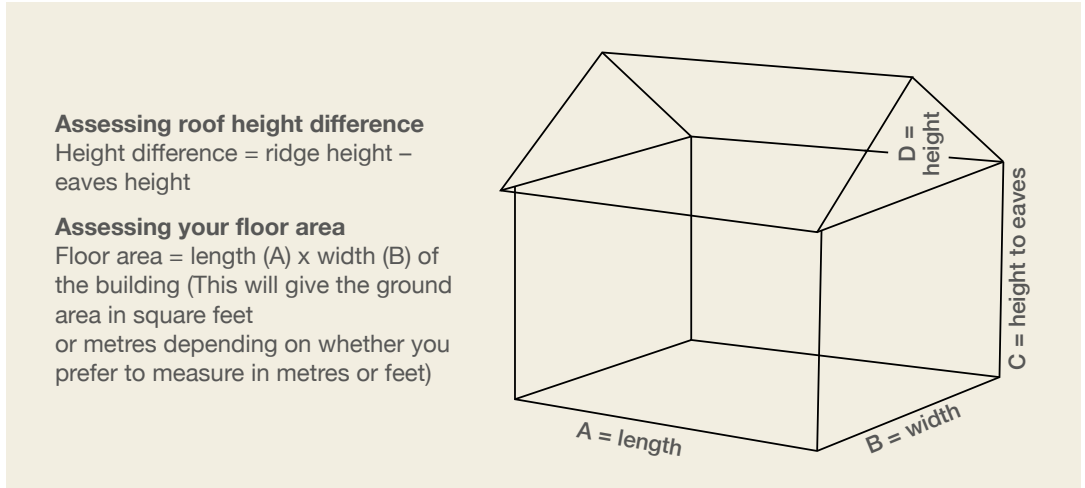
## What is the ventilation capacity of the building?

It is important to measure any livestock building to ensure that floor space and ventilation capacity are adequate for the number of animals you intend to house.

### Assessing your floor area

Floor area = length (A) x width (B) of the building

This will give the ground area in square feet or metres, depending on how you prefer to measure.





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Use the maximum number of stock housed under the individual roof, at their maximum liveweight, to calculate the maximum building stocking density

Note: Estimates are perfectly adequate, do not attempt to climb on roof when measuring up, or exceed safe working heights on ladders or platforms.

Use a tape measure to measure one bay length; length of the building = number of bays x bay length. Building width can be paced out.

Eaves height above 2.5 m is not an animal requirement if the ventilation capacity is competent for still air conditions. Height above 2.5 m is a design requirement for machinery. The important design detail is the height difference between the eaves and the ridge. The steeper the roof slope, the better the stack-effect ventilation.

Building height difference estimation: either extract from existing plan diagrams, or calculate from roof slope using the calculator in BRP+ **Better cattle Housing Design**.

The ventilation capacity of a naturally ventilated building is defined by the area of outlet and the area of inlet. If inlet is restricted, or maybe non-existent in one sidewall, there cannot be a good distribution of clean fresh air throughout a building. If outlet is restricted, there can be no ventilation by stack effect when wind speeds drop, or in a building where inlets are problematic.

Temperature within a livestock building should never be controlled by restricting ventilation – either inlets or outlets. The principal temperature impact on cattle comes from air speed (wind chill), then from dampness, and only finally from air temperature.

## *Working smarter*

Ask yourself, “If I wasn’t doing this, what else could I be doing?” By assessing current activity and considering alternatives, you can see if improvements can be made. This does not necessarily mean making big changes, but looking at smaller changes that could make a big difference to the performance of the enterprise. For example, saving 10 minutes a day on winter feeding would release 30 hours of labour.

### Getting the basics right:

- Examine daily tasks; invest in making the job more efficient
- Aim to minimise feed waste through alterations to the feed barrier design
- Is excess bedding being used due to leaks in drinkers/troughs and holes in the roof?
- Maintain gutters and downpipes to help maintain a dryer environment
- Provide handling facilities that are easier and safer to use for all treatments
- Provide safe, effective races, pens and ramps
- Provide ready access for transport

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## Is your building adequate?

There are rules of thumb for both inlet and outlet areas:

	Outlet area (m <sup>2</sup> per animal)		Inlet area (m <sup>2</sup> per animal) on each sidewall	
	Guideline	My space	Guideline	My space
Calf up to 100 kg	0.04		0.04	
Young animal 150–300 kg	0.06		0.09	
Store animal				
300–500 kg	0.08		0.16	
Finishing 500 kg+	0.10		0.20	

These rule of thumb figures are based on standard recommended stocking densities on straw, with a 2 m height difference between inlet and outlet height. The total inlet and outlet areas should be estimated on the maximum number of stock in the building at any one time. Total inlet areas are always at least twice the outlet area.



# Ventilation

Correct and adequate ventilation is one of the most important features of any livestock building to ensure efficient production and crucially minimise health disorders.

Most UK farm buildings are poorly ventilated due to inadequate ridge outlet, which prevents stale air from escaping. The result is damp, humid conditions in which a range of respiratory diseases thrive and straw costs increase. Offset the cost of improving a ridge with a general 5% increase in daily liveweight gain.

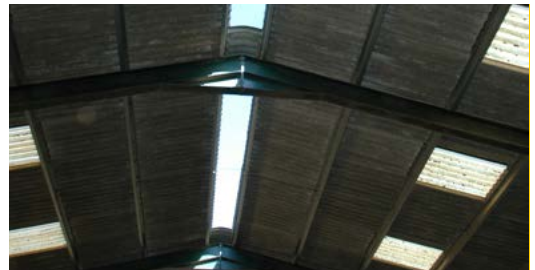
Cobwebs in buildings and condensation on the underside of roofing are signs of poor ventilation.

## Ridge space requirements

In any pitch-roofed stock building, the ridge opening is critical.



Raised ridge. Capping is fine as long as it does not restrict the ridge opening



Open ridge



Ventilated ridge – inadequate. These ridges often supply less than 30% of the ventilation needs

All livestock buildings need outlet area in the ridge or roof, with the main question being, how much? The main determinants of correct outlet area are: stocking density per m<sup>2</sup> (energy density) and the slope of the roof (or height difference between air entering and leaving the building). A steep pitch roof will always work better than a low pitch.

**Least cost improvement is to remove ridge sheets; incoming rain will be equivalent to less than 5% of moisture produced by the stock.**

**Best return on investment is to replace ridge sheet with upstands, which keeps out more rain, or all rain out with a covered open ridge. Upstands also dramatically increase air extraction rates.**

**Example for this building:**



**Length of roof = 10 bays @ 15 ft each = 150 ft = 46 m**

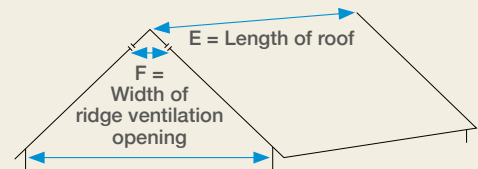
**Width of open ridge estimate 6 inches/150 mm**

**Outlet area estimate 46 m x 0.15 m = 6.9 m<sup>2</sup>**

### Assessing your ventilation outlet area

Assess length and width of ventilation.  
Ventilation space = length (E) x width of opening (F)

Or: count all the individual openings and measure or estimate the area of each opening.



## Testing your ventilation

Wind is the main power source in naturally ventilated buildings. The key design target is to allow the wind access to the building especially from the prevailing wind direction, but to manage air speed and rainwater ingress.

An open ridge will always be an outlet for stale air. This is why it is vitally important to have adequate opening with upstands.

Testing can be conducted using smoke pellets with a minimum 30-second burn, which are inexpensive and can be obtained from most builders merchants and plumbing suppliers. Burning straw to create smoke is high risk and ineffective.

An early, muggy morning is best for smoke testing. This is when the worst conditions can be observed.

- Check how quickly smoke clears from a building and whether there are areas where smoke lingers
- Most airflow is across a building space, driven by the wind – use smoke to show where air may be spread from, e.g. older cattle to youngstock
- Check for areas of high air speed, which can induce stress, and/or reduce weight gain

If smoke clears completely within 2–3 minutes and there are no corners where it lingers, the building can be considered fit for purpose as far as its ventilation is concerned.

If smoke lingers, look at the options to improve the exhaust of stale air. The removal of roof ridges will often remedy the problem.



If smoke lingers in a building, it indicates areas where the organisms causing pneumonia and respiratory disorders will linger and spread from animal to animal.

If you're planning on making alterations to the roof, be sure to observe safe working practices, or employ specialists to carry out the work.

To see how it's done, take a look at the short video **Assessing Ventilation** on the AHDB Beef & Lamb YouTube channel.

# Diseases affecting housed stock

## Respiratory disease

The impact of respiratory disease on a beef enterprise includes:

- An additional 14 days taken to reach breeding weights
- Average daily liveweight gains reduced by up to 200 g/day
- Increased days to slaughter and poorer carcass classification
- High vet costs due to secondary infections, usually bacterial

In addition to pneumonia, there is a range of other respiratory diseases mainly caused by viruses, including:

- Respiratory syncytial virus (RSV)
- Parainfluenza type 3 (PI3) virus
- Infectious bovine rhinotracheitis (IBR) virus

Severity can be increased by secondary infections of bacteria and mycoplasma. The viruses can spread in droplets of water over considerable distances. Fresh air kills airborne virus and bacteria 10–20 times quicker than stale air. Where infections occur, consult your vet for advice on appropriate treatment.

## Pneumonia

Pneumonia is the most common reason for death and poor performance in young cattle from weaning to 10 months of age. Even chronic infections can lead to reduced daily liveweight gain >5% and impaired carcass quality.

Costs per affected animal range between £30–£80, but increase to £500 or more if an animal dies because of the disease.

Pneumonia leads to infected lobes within the lungs of infected animals, even if there are no clinical symptoms. Recent estimates suggest that over 20% of all calves are treated for pneumonia, and more undiagnosed.

Trials assessed the impact of numbers of affected lobes post-mortem and the effect on daily liveweight gain, as well as the impact of infection on average carcass prices. The results estimate reductions in daily liveweight gain at between 72 g and 202 g/day depending on lung consolidation.

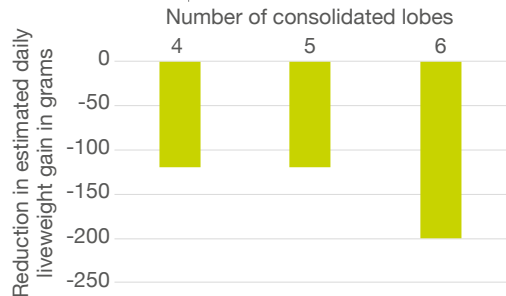


Figure 1. Reduction in estimated daily liveweight gain by number of lobes consolidated

Animals with infected lung lobes demonstrated significantly reduced daily liveweight gain of up to 200 g/day, resulting in lighter carcasses with poorer classification grades.\*

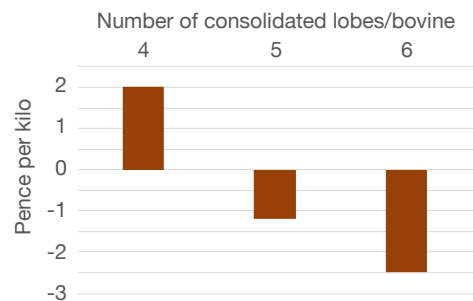


Figure 2. Average carcass grade price premium per kilogram dressed weight

Animals with infected lung lobes demonstrated lower carcass classification grades and reduced price premiums of around £10/head.\* Remember, there's extra finishing costs on top of this, as stock are on farm for longer.

\* Williams, P & Green, L (2007) Cattle Practice, Vol 15, part 3, 244–249

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For more information on respiratory disease, see BRP+ **Better management of bovine respiratory disease.**

## External parasites

External parasites, such as lice and mange, spread more readily between housed cattle. In addition, the denser winter coat and cooler weather favour lice survival. Chorioptic mange is more likely to be seen in adult cattle towards the end of the winter housing period.

Look for behaviour changes; cattle may bite, scratch and rub themselves on feed barriers and gates. Hair loss may be seen on the neck and shoulders.

While the effect on production and growth rates is subject to debate, the potential reduction in the value of hides is costly to the leather industry.

Most insecticides will deal with adult or nymph lice. However, it is important to distinguish whether infestations are of sucking or biting lice before choosing a treatment.

For more information on the parasites that affect cattle, see the **Cattle parasite control around housing** webinar, available on the AHDB Beef & Lamb YouTube channel. For a reference guide on all available anti-parasitic products, see the **Parasite control guide.**

## Ringworm

Ringworm is a good indicator of nutritional or environmental stress. Check feed space, feed quality, effective temperature, dampness, lying space and wind chill.

## Lameness

Maintaining clean housed conditions for cattle is crucial to reduce the incidence of lameness. Some causes of lameness in beef cattle are:

- Foul of the foot
- Digital dermatitis

- Overgrowth
- Sole abscess/sole ulcers/white line disease

If cattle are constantly standing in dung, mud, or walking over very rough surfaces, this can result in foul of the foot and digital dermatitis.

Straw yards should have a scraped concrete feed/loafing passage as well as the bedded lying area. This concrete helps promote hoof wear and prevent the cattle's feet becoming overgrown. It's essential this concrete is scraped regularly, and adequate bedding is used, as reservoirs of infection can survive in wet areas.

Abrasions of hocks and knees, or swelling in the lower leg may indicate poor cubicle design.

**Floors should provide a comfortable footing, be firm and durable and should direct excess liquids towards competent drainage, to provide a relatively dry walking surface.**

Lame cattle are unproductive cattle; infertility is likely to be the single biggest cost implication for the suckler cow, and weight loss for fattening stock.

## Stress

Stressed animals will perform poorly and housing can impact directly on stress levels.

Overcrowding can mean:

- Reduced access to food for weaker animals
- Increased bullying
- Injury from trampling
- Reduction in immune competence
- Higher risk of disease spread

For more information on handling, see **Improving cattle handling for Better Returns.**

# Hygiene

Maintaining good hygiene supports good health and welfare, which will benefit your farm business financially. Competent ventilation and drainage are key to good air hygiene, while effective cleansing and disinfection are essential to remove engrained biofilm on surfaces.

## The risks:

- Pathogens survive in biofilm because most disinfectants do not penetrate engrained biofilm
- Dusty feeds, straw and hay make a severe impact on air hygiene
- Feeders and drinkers are focal points for disease transmission

## Top tips to improve hygiene:

- Use renders and sealants to fix broken surfaces, which are extremely difficult to clean

- Use a steam cleaner and detergent to remove engrained biofilm on surfaces
- Clean feeders and drinkers regularly
- Prevent manure contamination of feeders and drinkers – never step in the feed bunker
- Quarantine new arrivals for 30 days and clean the quarantine area after each use
- Consider changes in management such as batch calving and all-in all-out policies, allowing enough downtime to clean and disinfect housing

Plan hygiene by creating enough alternative space for stock to permit effective hygiene practice – enough time to remove organic matter, apply chemicals for the correct time, rinse, and dry.



This is a reservoir of infection. Poor underfoot conditions can lead to digital dermatitis and foul of the foot. Cattle in wet, dirty conditions are also at an increased risk of slips and falls



# Focus on the detail

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The performance of the enterprise can often be improved with simple, inexpensive changes to buildings.



- 1 Insufficient roof outlet
- 2 Big draughty door spaces and easy access for birds
- 3 Variation in temperature and airflow throughout the building
- 4 Mixed group size

### Suggestions for improvement:

- Remove the ridge covering/sheets
- Use roller blinds in the draughty door spaces
- Put cows with smaller calves into another pen
- Measure temperature and airflow



- 1 No roof inlet and outlet
- 2 No roof lights
- 3 Low eaves
- 4 Airflow and humidity issues

### Suggestions for improvement:

- Allow more natural light into the shed – in this example replace tin sheets with transparent sheeting
- Remove the ridge cover – eaves height above 2.5 m is not a requirement if the ventilation is competent for still air conditions
- Measure airflow



- Wet floor conditions
- High manure levels

Drainage can be improved, by:

- Cutting channels into the existing floor
- Grooved surfaces – professional concrete services can groove existing floors for you
- Check slope gradient – slopes of 1 in 20 should be used where drainage under straw is needed, or around drinkers



Bird proofing on an open ridge

When weather gets cooler, rodents and birds will begin to migrate towards farm buildings, looking for warmth and food.

Your first line of defence is to keep the farmyard tidy, ideally within a 30-metre radius of the farm buildings.

#### **Top tips for vermin control:**

- Clear weeds, long grass and shrubbery from around the buildings
- Remove areas where rodents might nest, such as piles of wood, piping and pallets, if possible
- Seal points of entry such as holes where pipes pass through a wall, and openings around doors and windows
- To prevent access from birds, consider using netting, mesh, roller blinds and doors
- Research has shown that disturbances such as gas guns, rockets and shooting to scare, are most effective when used early in the morning
- Keep feed stores secure and well maintained

# Designing a new build

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Quite small investments can make big differences to the health, welfare and performance of housed cattle. It is always useful to carry out a cost-benefit analysis before making decisions, and be aware that least cost does not necessarily provide best return on investment. However, if you are in a position to invest in new buildings, consider the following:

## Housing system

- Design the layout based on preferred/existing group sizes. Aim to minimise mixing throughout the production cycle
- Define minimum pen width on basis of feed space per animal
- Design access to building for efficient feeding/bedding/daily tasks
- Ensure labour considerations are always included in the design stage
- Visit other units to see good and bad practice, but always question validity of trends
- Make new buildings capable of expansion, if required

## Site choice

- Consider the impact of location in relation to existing structures for daily tasks; for clean air; for ease of animal movement
- Orientation influences impact and frequency of wind/air speed, and solar gain/heating
- Exposure of site or enclosure by existing structures should dictate design of wall cladding
- Compromise is part of the design process; use technology (pumps/fans/automation) to improve design outcomes

## Healthy environment

- Understand the natural airflow from north/east/south/west to deliver clean air
- Ensure designed outlet in the ridge

- If adding a new building alongside an existing structure, make the new build eaves height above or below the existing, to allow fresh air intake between the two
- Large buildings may reduce cost/m<sup>2</sup> but will increase health risks, if housing groups of different ages
- Make the building easy to clean
- Control rodents and prevent bird access

## Good drainage

- Keep lying areas dry; floor slopes minimum 1 in 60; optimum for youngstock 1 in 20
- Slope floors towards drain at front and outside pen
- Make drains simple, large enough (75–100 mm), accessible, and straightest run out of building
- Locate water drinkers/troughs at front of pen and easy to clean
- Ensure valley gutters are safely accessible
- Use sumps and pumps to achieve good surface drainage on difficult sites

## Effective feeding and watering

- Daily feeding is the major use of labour and machinery; consider all options at the design stage
- Consider how to keep fresh feed available 24/7 with available labour
- Check barrier designs that reduce wastage; consider adjustable neck rails for growing stock
- Do an investment appraisal on water costs; consider borehole or roof water

Before designing a new build, refer to BRP+ *Better cattle housing design* or BRP+ *Better calf housing* for more detailed information.

# Beef BRP Manuals

<b>Manual 1</b>	Choosing bulls to breed for Better Returns
<b>Manual 2</b>	Marketing prime beef cattle for Better Returns
<b>Manual 3</b>	Improving cattle handling for Better Returns
<b>Manual 4</b>	Beef production from the dairy herd
<b>Manual 5</b>	Feeding suckler cows and calves for Better Returns
<b>Manual 6</b>	Improve beef housing for Better Returns
<b>Manual 7</b>	Feeding growing and finishing cattle for Better Returns
<b>Manual 8</b>	Optimising suckler herd fertility for Better Returns
<b>Manual 9</b>	Controlling worms and liver fluke in cattle for Better Returns
<b>Manual 10</b>	Better Returns from pure dairy-bred male calves
<b>Manual 11</b>	Managing replacement heifers for Better Returns
<b>Manual 12</b>	Better Returns from calf rearing

See the AHDB website [ahdb.org.uk](http://ahdb.org.uk) for the full list of Better Returns Programme publications for beef and sheep producers.

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