Cow Comfort

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 new Greenmount Campus dairy unit on their farm business.

The need for comfort

The comfort of the modern dairy cow is of paramount importance to ensure high productivity and to meet animal welfare standards. The design of cubicles and lying surface material must provide a sufficiently comfortable environment to encourage cows to lie in the cubicle for between 12 - 14 hours per day. Cows must be able to exhibit natural behaviour when lying down and standing up in cubicles.

Recent research carried out by Kingshay Farming Trust, based in Somerset, England, has shown that reduced lying time is a risk factor for early culling through increased stress levels. Inadequate lying time may also have negative effects on fertility and lameness. Greater lying times are linked to a 28% higher blood flow to the udder and thus improved milk yields. More immediate visible signs of uncomfortable cows are flank, knee and hock damage.

Poorly designed and managed cubicles can lead to poor occupancy, wet and dirty cubicle beds, increased risk of mastitis and lameness as well as physical damage to the cows.

The importance of cow comfort and increased lying times cannot be stressed enough as the following recent research studies have found:

Cows with longer daily standing times have been found to have more claw lesions and lameness (Leonard et al., 1996: Galindo and Broom, 2000).

Cows spending more time perching (with only front feet standing in the cubicle) have been found to be more likely to become lame (Galindo et al., 2000; Proudfoot et al., 2010)

Dippel et al 2011 concluded by saying "standing with the front feet in the cubicle and the hind feet in the alley is associated with increased risk of claw haemorrhages later in lactation. These results indicate that dairy barns should be designed and managed to minimize time cows spend standing with their front feet in cubicles".

Problems associated with poorly designed cubicles

Cow Behaviour	Typical Causes
Perching – front feet in cubicle/ back feet in passage	Neck rail not positioned correctly Uncomfortable bed
Diagonal standing – standing diagonally across bed	Wide cubicle/ lack of lunging space Neck rail not positioned correctly
Diagonal lying – lying diagonally across bed	Wide cubicle /lack of lunging space
Standing too far forward in the cubicle	Neck rail positioned too far forward
Lying too far forward in the cubicle	Wrongly positioned or no brisket board
Dog sitting – cows stand up front feet first	Lack of forward lunging space

The design of the cubicle must be robust, suitable for the size of cows in the milking herd and must allow for adequate adjustment to ensure optimal cleanliness.

CAFRE DAIRY UNIT - BUILDING OVERVIEW

The CAFRE cubicle building measures 67m long by 31m wide. The layout is a simple design with a central feed passage and two rows of cubicles on either side to provide 178 cubicles. This layout allows for easy movement and management of different groups of cows, whilst still providing ample feed space. There are also central and end cow cross over passages to provide efficient cow flow through the building (more information on cow flow is available in the "**Cow Flow**" Technical Note).

It is essential to give cows plenty of roaming space both at the feed barrier and while moving throughout the building. Passage widths are as follows:

Between rows of cubicles – 3m
Behind the feeding barrier – 4m
Central feed passage - 6m

Number of cubicles

The Red tractor Scheme has a requirement of at least one cubicle per cow. However the Farmed Animal Welfare Code of Practice 2013 has a recommendation of 5% more cubicles than cows. Recent research in the USA found that for every 10% increase in stocking rate above 80% occupancy, there is a reduction of 0.73kg milk per cow per day. Overstocking of cows (more cows than cubicles) can result in:

- Increased soiling of hooves and cubicles
- Reduced lying times
- Increased lameness

The CAFRE Dairy Unit will be managed to provide 5% more cubicles than cows.

Cubicle dimensions

Regardless of the design of cubicle it is important to get the bed length, slope and kerb height correct at the building stage. The following cubicle dimensions were used in the CAFRE Dairy Unit for large Holstein-Friesian cows based on a range of international standards:

- Cubicle length (solid front) 2.85m (9ft) for extra lunging space
- Cubicle length (facing passages) 2.40m (8ft)
- Cubicle bed slope 2.5% (60mm or 2.5”)
- Cubicle division width 1.15m centres (3’9”)
- Kerb height (including mattress) 0.175m (6”)
- Bed length 1.70m (5’6”)
- Neck rail height 1.32m (52”)
- Neck rail diagonal 2.2m (87”)

Key design points for cubicle divisions:

1. **Freedom for forward lunging -** there should be no obstruction in front of the cow restricting lunging. This means no horizontal rails above 15cm. Posts supporting cubicles to the side of the cubicle is acceptable if forward lunging is not otherwise restricted. If bed length is restricted, consider a cubicle that allows good sideways lunging.

2. **Neck rail adjustability** - adjustability should be up and down as well as forward and backwards. Some cubicles will allow this flexibility and it is helpful over time to be able to adjust head rails to suit your the herd if cow size changes. Cow cubicle use, both in terms of lying time and lying position, is often dictated by head rail location. It is therefore essential that the best position can be achieved.

3. **Brisket board/pipe adjustability and height**
   Adjustment is crucial. If the brisket board is integral to the cubicle design this can complicate any future adjustment. Maximum height of the brisket board should be less than 120mm. Comfort of the brisket board needs to be considered. Narrow wooden

boards do not offer the best comfort when cow legs are rested on the brisket board/pipe.

4. **Long term wear ability.** Cubicle construction must be robust to ensure long term use. Floor fixing requirements need to be compatible with floor/concrete strength.

Cubicle divisions installed in the Cafre dairy unit

Pictured above right is the cubicle installed in the Cafre Dairy Unit. The advantages of this design include:-

- Ground level lower support rail does not interfere with forward lunging.
- Upper support rail is positioned high enough not to interfere with forward lunging but low enough to stop animals walking through.
- Fully adjustable brisket board with round, comfortable edges.
- Sloping top rail allows for neck rail positioning according to animal size, allowing it to stand fully in the cubicle before lying down.

Mats/Mattresses

Comfortable lying surfaces for dairy cows are equally important as having the correct type of cubicle division. It has long been accepted that bare concrete cubicle beds with bedding material on top are no longer acceptable for today's dairy cow.

Rubber and top cover quality is very important in any mat/mattress. Because it is thick it may not necessarily hold its shape or last. Likewise a top cover's durability will depend not only on rubber quality but also the strength and the bonding of the textile that is used to help it keep its shape and make it last.

Foam/latex underlay whilst being more comfortable than recycled rubber may compress or lose its shape more quickly. This will depend on the quality of the material being used. Basically, more comfortable products may have a shorter lifespan than those that are not as comfortable.

Key design points for cubicle mats or mattresses

1. **Length of housing period? –** the longer the housing period, the more comfortable the product needs to be.

2. **Bedding use? –** if low levels of bedding product are to be used the product needs to have high levels of comfort.

3. **Cubicle design –** the product must work well with the chosen design for ease of installation and durability.

4. **Durability?** – some products will last longer than others, but this could be at the expense of cow comfort.

5. **Cleaning?** – some products will stay in shape better than others. These may flatten where the cow lies and rise at the cubicle division,

which leaves cleaning the cubicle more difficult.

6. **Will bedding get underneath?** – a continuous roll of mat/mattress firmly fixed is less prone to accumulating bedding underneath. Single mats will cause more of a problem as bedding can get underneath more easily.

Cubicle mattress installed in the Cafre dairy unit

Based on Kingshay trials mattress assessment criteria, the Kraiburg KEW Plus mattress was installed in the Cafre dairy unit due to the following features:

- Comfort and shock absorption from 3 functional layers
- Independently performance tested
- 10 year guarantee

Evaluating cow comfort in the dairy cow cubicle house

There are several ways of measuring the level of comfort in a cubicle house. These measures were devised in the USA. These assessments should be taken when cows are most motivated to lie down, typically one to two hours after milking, or approximately two hours before milking.

- Cow Comfort Index (CCI) – the proportion of cows in contact with a cubicle that are actually lying down. This should be in the region of 85% or greater. This measure gives an indication of the cow's motivation to enter and lie down in a cubicle. However, it does not give any indication of how long the cow spends lying.

- Stall Standing Index (SSI) – this measures the proportion of cows that are in contact with a cubicle that are standing (inverse of CCI) Increased SSI means that a cows daily standing time is increased and should be less than 20%. Anything greater than this is associated with standing times in excess of two hours per day and lameness problems.

- Stall Use Index (SUI) – assesses the proportion of cows within a house that are lying down divided by the cows that are not actively feeding. This reflects the comfort level of the cubicles and the wasting time idling in passageways waiting for a cubicle to become available. This should be greater than 75%.