

Cow Cubicles

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During the housing period when cubicle houses are fully occupied problems due to cubicle defects or design spring to mind. The most common defects of cubicles are cubicle beds that are too short and/or too narrow. The question whether cubicle divisions need to be replaced or not, because of rusting of the legs or because they are just too restrictive, also springs to mind. Some farmers may be thinking of providing some extra cubicles and others may be planning a fairly major development.

It is relatively easy to list the faults in an existing cubicle house, but when it comes to making recommendations for the “perfect cubicle” it’s not nearly as clear-cut. Before we look at the design and dimensions of cubicles it is important to look at the lying down and getting up behavior of cows.

Lying time and frequency

Lying down has a very high priority among cattle. Dairy cows prefer to lie down when ruminating. A cow normally lies down for 10 – 14 hours per day spread out over 15-20 periods. A lying period typically lasts for a half an hour to three hours. During long lying periods – in the middle of the day or during the night – the cow rises, stretches and lies down immediately again, usually, on her other side. Cows spend more than half of their lives lying and during a whole year a cow lies down and rises 5000-7000 times.

Lying down and getting up behavior

The natural lying down behavior begins when the animal sniffs at the ground while it slowly moves forward in search of a suitable place to lie down. When the cow has found a suitable place, it shuttles its head from one side to the other to examine the place. Then it bends its front legs, kneels and, finally, carefully moves one hind leg under its body and lies on it. The lying down behavior requires enough space so that it can be carried out in a normal way. The head and body of a fully developed cow are thrust forward 0.6-0.7 meters during the lying down process.

When the cow wants to get up in a natural way it firstly rises to its knees and afterwards the hind part of its body is swung up via its knees, which function as a rocking point. This movement is one of the greatest physical activities of cattle. Natural lying down behavior is the reverse of the movements of the natural getting up behavior.

In the open, cows often carry out lying down and getting up activities in one continuous movement. When cows are kept indoors their movements may be hampered by space shortage and/or hard and slippery flooring. Lying down and getting up movements may be interrupted at different stages or the movements may be carried out abnormally. Where cows exhibit abnormal lying down/getting

up behavior its frequency increases with age. Each lying down/getting up procedure may last for several minutes instead of the usual 15-20 seconds and 5-6 seconds, respectively. At the same time there is a higher risk that the cow will injure herself. An example of abnormal lying down behavior is where the cow bends one or both knees about to lie down, then stops and gets up again and stands on all four hoofs again. An example of abnormal getting up behavior is where a cow rises like a horse, not on her knees but with her front legs straight.

Cattle Movement Pattern

The natural getting up movements of cattle are shown successively in figure 1. The figure also shows the horizontal movement of the cow as she gets up. Each square in the grid is 0.4m by 0.4m (16 inches by 16 inches). Figure 1 is from a report "Housing Design for Cattle – Danish Recommendations" published by The Danish Agricultural Advisory Centre. A fully grown cow makes use of up to 3.0 meters to get up and lie down. The moving-forward motion is about 0.6 meters, and the head/neck can come within 0.2 meters of the cubicle bed.

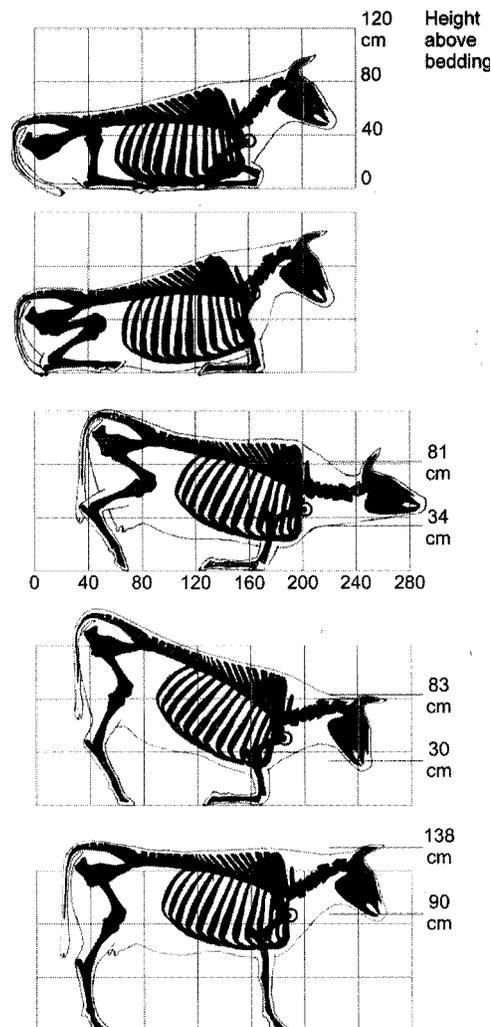


Figure 1 Natural getting up behavior of cattle

Cubicle recommendations for cows

There should be one cubicle per cow. Cubicles must provide a demarcated, comfortable and sheltered resting place. The design of cubicles should provide a clean, dry and deformable bed as well as making sure that it is easy for the cow to lie down and get up again. Cubicles consist of a resting area and an unobstructed opening towards the front of the cubicle for the cow to thrust her head through when she rises and lies down. The generally recommended features and dimensions of cow cubicles are outlined below in table 1.

Table 1 Features and dimensions of cow cubicles

Width (centre to centre) +/- 0.025	1.15 meters
Total length (rows towards wall)	2.3 – 2.6 meters
Total length (rows head to head and single rows with no front wall)	2.21 – 2.45 meters
Brisket board/pillow from rear kerb (if fitted), +/- 0.05m	1.75 meters
Neck rail from rear kerb, +/- 0.05m (measured horizontally)	1.70 meters
Height of neck rail, +/- 0.05	1.15 meters
Cubicle bed slope +/- 1%	5%
Bedding height above the passageway floor	0.2 – 0.25 meters

Width

The recommendation for width assumes that the cubicles are modern space sharing ones with no support leg at the kerb (e.g. cantilever, mushroom types, etc.). The width can be made wider but it is generally felt then that cows won't lie straight, which defeats the purpose of having freedom to lunge forward when getting up, as well as leading to more work in cleaning dung off the rear of the beds. For older non-space sharing types the width should be about 1.25 metres. There should be a compact partition wall or division plate at the end of each row next to a crossover point to protect cows against draughts and manure splashes. The width of the cubicle next to a closed side partition/wall should be increased by about 10% up to about 1.25-1.27 meters in order to compensate for the lack of space sharing. Draughts caused by ill-fitting sliding doors at the ends of passageways should be eliminated.

Length

The length of the beds is probably the most important dimension for the reasons outlined. Many people will be reluctant to go for very long beds because of the extra costs. A widely held view is that cows will adapt to their environment, so that there is no need to go for the full length. I would feel that the length should be as long as possible and preferably towards the mid-to-top of the range outlined in table 1 and not lower than the lower end of the range. Let your supplier know the length of the cubicle beds so that the cubicle division itself will be the right length.

Single rows of cubicles without front walls/partitions appear to work well, saving some space by allowing the cows to use the space in front of the cubicle to lunge forward.

Neck rail

The purpose of the neck rail is to ensure that the cubicle bed is kept clean. The cows will not lie down too far forward if the neck rail is positioned correctly and they will also position themselves correctly while standing without dunging on the bedding. The neck rail is generally placed across the top of the cubicle divisions and secured with 4-bolt clamps. The position of the neck rail should be adjustable and be placed about 1.7m measured horizontally to the kerb or 1.9-2.05 meters measured diagonally to the kerb.

The height of the neck rail should be about 1.15m (+/- 0.05), measured vertically between the bed and the underside of the rail. A lower neck rail is restrictive and won't function as it should. Some neck rails have been put in at 0.9m and at this height they are very restrictive.

Cubicle bed slope

A good slope helps the cow stay in position on the cubicle bed. It also provides drainage if necessary. The cow's natural tendency is to lie up-the-slope in the field. This makes it easier for her to get up and lie down. It also lessens the pressure on the knees which have to take a lot of pressure during getting up and lying down.

If there is sufficient slope in the bed a brisket pillow/board is not generally necessary. A 5% slope in a 2.4 meter cubicle bed is about 0.125m (5 inches). If the slope is less than 4% a brisket pillow/board will prevent the cow from moving too far forward in the bed which would cause her difficulties rising. The brisket pillow/board can be made from a rounded off wooden plank (sloped forward) or a prefabricated plastic pillow. A concrete mound should not be used. A low rail should not be used because there is a danger that a cow could get a leg caught under it.

Mats/mattresses

Research has shown that the ideal mat or mattress will reduce the pressure on a cow's knee by up to one third compared with the pressure on it if it was on a concrete floor. It follows that the mat/mattress should compress relatively slowly and should not reach the limit of its compression due to the pressure exerted on it by the knee. This means in effect that the mat/mattress should neither be too hard nor too soft.

Space between the kerb and the cubicle division

The cubicle division should end about 0.225 - 0.25m (9-10 inches) from the rear kerb. Some feel it should be more and others think it should be less. If it is too much there is a danger that cows will stand across the ends of cubicles or back

into a cubicle. If it is too small it may injure cows as they walk along the passageway or as they turn to line up with the cubicle.

Kerb height

It is difficult to satisfy all the requirements when it comes to the kerb height. A low kerb may entice cows to back in to the cubicles. A high kerb will help to prevent slurry from splashing on the cubicle bedding and will encourage the cow to draw its tail on to the cubicle. More splashes are likely from slurry falling on solid passages than on slatted ones.

Research from Sweden indicates that a high kerb in association with hard floors can lead to lameness and hoof disorders. To simulate the shock load a cow's hind leg can get while backing out of a cubicle try it yourself without holding on to the cubicle division. A general recommendation is to make the concrete surface of the kerb 0.15 – 0.225m (6-9 inches) above the passageway. The thickness of the mat or mattress is on top of this, making the bedding height above the passageway floor somewhere in the range of 0.175 – 0.25 meters (6-10 inches). Take the thickness of the mat into account when deciding on the height of the kerb.

Bottom rail of the cubicle division

The rear part of the bottom rail of cubicle divisions must be positioned so that cows cannot get caught under it. This distance varies with the design and height of the cubicle and the slope in the bed. Most bottom rails slope upwards to the rear and a general recommendation is to allow in the order of 0.55 – 0.62m (22-25 inches) from the bed to the underside of the bottom rail. This should be measured at a point about half to a third of the bed length from the rear. It is important to get recommendations from your supplier to make sure any requirements particular to their design can be followed.

Importance of cubicles

Cubicles play an important role in providing a comfortable, injury free and hygienic environment for housed cows. While designing the “perfect cubicle” is not easy and may not be possible, recommendations have been refined greatly over the years through research and observations and innovations by manufacturers, farmers and advisers. Farmers who feel that their cubicles are causing problems should take measurements and observe cows using the cubicles to see can they get to the root of these problems. Farmers thinking of installing new cubicles or renovating existing cubicle houses should carefully consider putting a good bit of thought into getting the design right.