

# A System to Evaluate Freestalls

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## ■ Take Home Message

- Freestalls can be evaluated using four critical points of adequate surface cushion, adequate body resting space, lunge room for head thrust and an unobstructed "bob-zone", and adequate height below and behind the neck rail.
- Surface cushion is the most important factor in determining stall usage.
- If the stall allows a full forward lunge, the configuration of the stall divider has little importance.
- If side lunge is required, the exact height of the divider rails is critical.

## ■ Introduction

Because of the variety of stall configurations and cow body sizes, there is a need for a stall evaluation system based upon the functional needs of the occupying animals for space to rest and accommodate the movements associated with rising. We have developed a system to evaluate four critical points of: 1) adequate surface cushion, 2) adequate body resting space, 3) lunge room for head thrust and an unobstructed "bob-zone", and 4) adequate height below and behind the neck rail. The system has been converted into a sequential flowchart shown in Figure 1. All four factors must be considered together as many stalls have multiple deficits and the correction of a single flaw will not solve a usage problem.

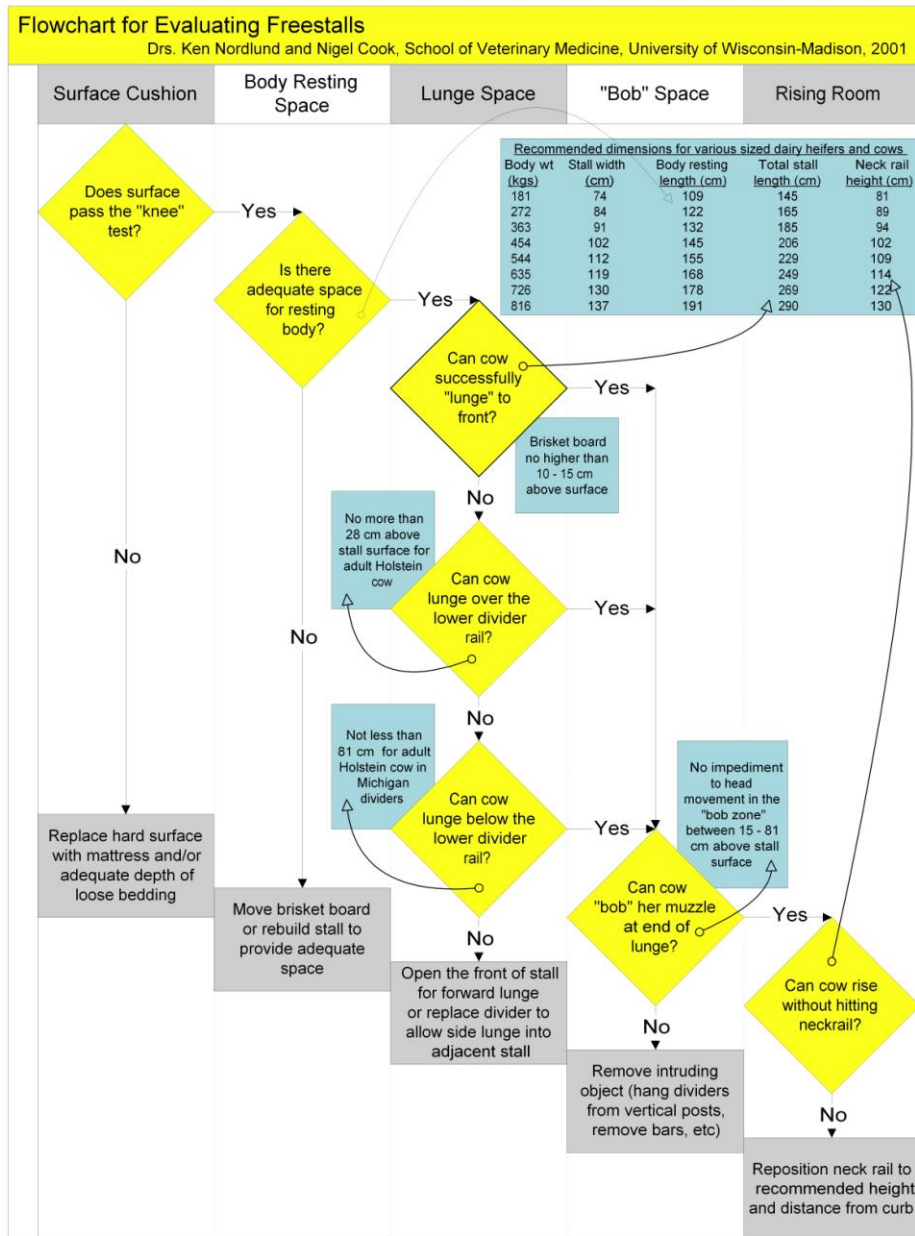


Figure 1. Flowchart for Evaluating Freestalls

### **Resting Surface Cushion**

The stall surface must be comfortable enough to attract a cow to lie down in the stall rather than elsewhere. In our opinion, surface cushion is the single most important factor in determining stall usage. The surface should be soft and moldable from front to rear. Many deficiencies of stall design will be tolerated if the bed is soft and comfortable. Many materials can be used satisfactorily to provide cushion, but the bedding materials that support bacterial growth should be avoided as they can become a risk factor for mastitis. Sand at a depth of 15 cm or more is the preferred bedding material (Bickert, 2000; Cook, 2002). Thick rubber crumb-filled mattresses and the newer, thicker air pocket or foam filled mats can provide an acceptable level of cushion over the entire stall surface and require less maintenance than sand stalls. However, current research by the author is showing reduced resting times, increased lameness, and poorer hygiene scores on mattresses compared to sand.

### **Adequate Body Resting Space**

The stall platform needs to be large enough to accommodate the resting cow's body. Defining this resting space in the front with a "brisket-board" helps to position the cow properly within the stall, reducing fecal contamination on the rear platform and the likelihood of entrapment in the front of the stall. The platform should slope about 4% toward the rear (Bickert, 2002).

The body resting space is defined as the area between the stall divider rails from the rear edge of the stall platform to the point where the stall surface meets the brisket board. The body resting space does not include space for the cow's head nor for lunging in the rising motion. Using data from several current publications, recommended stall dimensions were regressed against body weight (McFarland and Gamroth, 1994; Bickert, 2000; Holmes, 2000). Using the resulting regression equations, stall dimensions for a wide range of body weights were determined and are presented in the table in Figure 1.

The brisket board should not protrude above the bedded surface by more than 15 cm, and preferably be limited to about 10 cm. Brisket boards of excess height can prevent the cow from extending her front leg forward while resting, as well as extending her front leg forward as she completes the rising motion. If high enough, it will interfere with the forward "lunge" motion described below. While wooden boards can be acceptable, flexible plastic barriers with rounded edges are more comfortable for cows.

### **Lunge and "Bob" Room**

Total stall length should accommodate the body resting space requirement for the cow plus the "lunge and bob" space required for rising. Photographic analysis of mature cows rising on pasture indicates that a forward lunge space

of 69 to 98 cm is used in the rising movement (Cermak, 1988). A separate component of the forward lunge is a downward “bob” as the cow’s head reaches full extension. A 635 kg Holstein cow would need 168 cm body resting area plus 69 to 98 cm of unobstructed forward lunge area for a total stall length of 236 to 266 cm.

If any impediment prevents the forward lunge and bob, the cow must lift more weight with her rear legs. If the foot slips, this will contribute to bedding loss from the stall and possible injury to the cow.

If the recommended total length is not available, the stall can be modified in one of several ways. First, the front of some stalls can be opened so that cows can lunge their heads forward through the barrier. It is a common practice to construct two rows of stalls of inadequate total length adjoined “head-to-head” with the assumption that the cows will lunge into the headspace of the stall to the front. Where two rows of short freestalls are arranged head-to-head, the combined length of the two stalls should be at least 1.85 times the recommended total stall length for a single cow.

The more common modification of short stalls is to provide a stall divider that allows the cow to lunge to the side into the adjacent stall. The most common design requires that the cow lunge between two rails and is called a “wide-span” divider. It is recommended that the lower rail be no higher than 28 cm above the stall surface and the upper rail should not be lower than 101 cm (Bickert, 2000). A clinical report describes where a lower divider rail was raised to approximately 46 cm and resulted in significant increases in rates of mastitis and culling or deaths due to injuries and entrapment (Nordlund et al., 2001).

Another variation of a side-lunge divider is the “Michigan” divider, designed to allow a cow to lunge below the lower rail. For adult Holstein cows, there should be 81 cm of clearance below the lower bar where the lunge occurs (Bickert, 2000). Brisket boards are not usually recommended with this divider as they may intrude into the lunge space. In our experience, it is common to find these dividers hung too low, making it difficult for cows to rise and resulting in poor stall usage.

While there is a general awareness of the need for lunge room, we frequently find that the “bob-zone” is compromised. The “bob-zone” is the portion of the lunge space from about 10 cm above the stall bed to about 76 cm high. Sometimes this space is filled with reserves of bedding. Another infringement of the bob-zone sometimes occurs with a construction technique of mounting the stall dividers on transverse horizontal pipes that run across the front of the stall. If the total stall length does not allow for a full forward lunge behind the pipe, the “bob-zone” will be compromised and result in reduced stall usage. The dividers should be mounted on vertical posts so that there are no forward obstructions in this zone.

### **Room to Rise below the Neckrail without Obstruction**

The neck rail acts to provide lateral structural support for the dividers and helps position the cow while standing in the stall so that she does not soil the stall platform with urine and feces (Bickert, 2000). A cow should be able to rise without hitting the neckrail and a polished underside indicates that it is incorrectly located.

As measured from the rear curb of the stall, the neck rail should be positioned forward at a distance equal to the body resting length or more. When a brisket board is used, the neck rail should be positioned directly above the board or further toward the front.

Recommendations for height of the neck rail vary considerably. Traditional recommendations have located the neckrail at a height 15 to 25 cm below that of the withers. For example, in a Holstein herd where first lactation cow wither height may average 137 cm and older cows average 142 cm, the neck rail might be positioned 117-122 cm high.

### **■ Summary**

Dairy cow freestalls can be evaluated satisfactorily on four points that reflect the movement of a cow into, down, up and out of the stall: surface cushion, adequate body resting space, “lunge and bob” room, and rising space below the neckrail. All of the factors must be considered together as many stalls have multiple deficits and the correction of a single flaw will not solve a usage problem. Correction of stall deficits can increase cow resting time and cleanliness and have a substantial positive effect on dairy cow health, longevity and productivity.

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