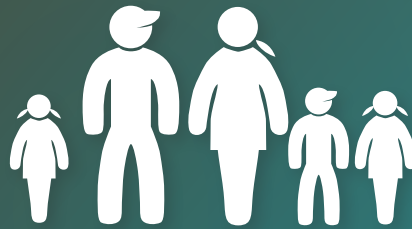


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THE BARN; A SOURCE OF COMFORT



PRACTICAL GUIDE TO EVALUATING AND IMPROVING **COMFORT IN THE BARN**



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PRACTICAL GUIDE TO EVALUATING AND IMPROVING **COMFORT IN THE BARN**

This guide is a summary of the main points and recommendations provided in Valacta's *The Barn; A Source of Comfort* training session. This practical tool is designed to help you to evaluate your cow's comfort, associate problems with their probable causes, and explore possible solutions.

The numbered references can be found on page 18.

PRODUCTION TEAM:

Julie Baillargeon, M.Sc., Agr., Technology Transfer and Research Project Coordinator and **Steve Adam**, Agr., Dairy Production Expert on Animal Behavior, Comfort and Well-being. With the collaboration of **Diane Lequin**, agr., Strategic Advisor.

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1

HOW DO I KNOW IF MY COWS ARE COMFORTABLE?

Below are some of the indicators that can help you to detect a comfort problem within your herd:

- 1. Injuries**
- 2. Rising and lying**
- 3. Rest**
- 4. Abnormal behavior**
- 5. Lameness**

A close look at these indicators can often reveal a problem with the cow's environment. When housing does not completely meet a cow's needs, she will often develop a typical behavior or show specific signs that we need to be able to recognize.

1. INJURIES

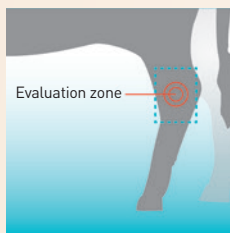
It is NOT normal for the cows in your herd to be injured. Injuries should sound an alarm and make us consider their cause. A close look at any kind of injury can reveal an underlying problem, but in this guide, we will specifically cover injuries to the neck, hocks and knees.¹

HOW ARE INJURIES EVALUATED?

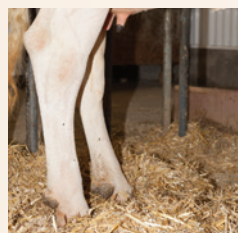
The evaluation zone for the three types of injuries and the description of the scores attributed to each one are illustrated in Table 1.1.

TABLE 1.1

HOCK INJURIES



Score 0



- No swelling
- Coat intact, coat slightly worn or damaged
- No lesions

Score 1



- No swelling or swelling less than (≤ 1 cm)
- Bald area
- No lesions

Score 2



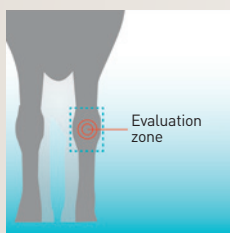
- Moderate swelling (1-2.5 cm) and/or lesion on the bald area

Score 3



- Major swelling (≥ 2.5 cm)
- May have a bald or wounded area

KNEE INJURIES



Score 0



- No swelling
- Coat intact, coat slightly worn or damaged
- No lesions

Score 1



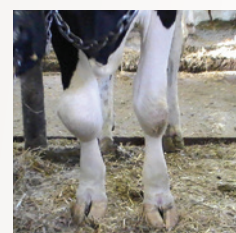
- No swelling
- Bald area
- No lesions

Score 2



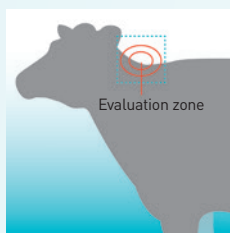
- Moderate swelling (≤ 2.5 cm) and/or wounded skin or crust
- May have a bald area

Score 3

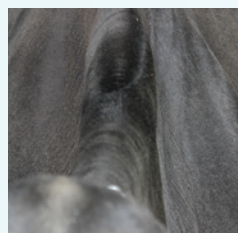


- Major swelling (≥ 2.5 cm)
- May have a bald or wounded area

NECK INJURIES



Score 0



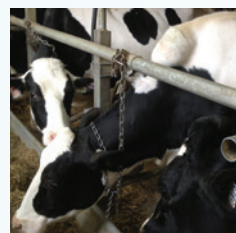
- No swelling
- Coat intact, coat slightly worn or damaged
- No lesions

Score 1



- No swelling
- Bald area
- No lesions

Score 2



- Wounded skin or crust and/or swelling
- May have a bald area

Note: Injuries outside of the illustrated areas are not taken into consideration for this evaluation.

WHERE DO YOUR INJURY EVALUATION RESULTS STAND?

Table 1.2 will help you to compare the prevalence of injuries in your herd with the results from 240 other dairy farms in Quebec, Ontario and Alberta:

- 100 tie stall farms (60 in Quebec)
- 111 free stall farms
- 30 farms equipped with a robot milking system²

TABLE 1.2 – PERCENTAGE OF INJURED COWS WITH SCORES OF 2 OR 3 OF THE 240 FARMS EVALUATED²

HOCK INJURIES		Tie Stall	Free Stall	Robot
Percentile of Evaluated Farms				
Top 25%		3-26%	0-15%	0-9%
Mid-Range		27-51%	16-46%	10-38%
Bottom 25%		52-85%	47-82%	39-65%
KNEE INJURIES		Tie Stall	Free Stall	Robot
Percentile of Evaluated Farms				
Top 25%		0-13%	0-3%	0-6%
Mid-Range		14-44%	4-21%	7-18%
Bottom 25%		45-72%	22-78%	16-36%
NECK INJURIES		Tie Stall	Free Stall	Robot
Percentile of Evaluated Farms				
Top 25%		0-3%	0%	0%
Mid-Range		4-52%	1-9%	1-19%
Bottom 25%		53-84%	10-65%	20-45%

OTHER INJURIES

Other types of injuries can also indicate that there is a problem with housing. For example:



Trampled teat



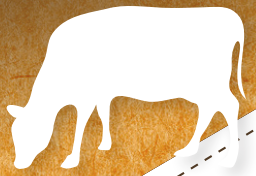
Wounds on the interior hock



Wounds caused by a stall divider



If a cow gets up
≤ 6 times/day her risk
of being culled goes
up by 102%.⁴



2. RISING/LYING

FREQUENCY

Cows normally get up from 10 to 15 times a day³. If they rise less frequently, we can expect that there may be a problem with their environment that is interfering with their normal behavior.








QUALITY

A cow should normally rise and lie using a series of typical movements. Any deviation from this typical sequence such as brisk movements or hesitation should tell us that some element of their housing is disturbing their desire to rise or lay or requiring them to adjust their behavior.

Rising

WHAT TO LOOK FOR?

The cow:

-  1 Lifts her shoulders slightly.
-  2 Throws her head forward to give herself momentum.
-  3 Moves her shoulders forward (16 inches) and her head forward (24 inches).
-  4 Brushes the ground with her muzzle.
-  5 Anchors her back feet on the ground then lifts her back end.
-  6 Takes one step forward (around 18 inches).
-  7 Lifts her front end.

Lying

WHAT TO LOOK FOR?

The cow:

-  1 Smells the ground.
-  2 Practically presses her muzzle to the ground.
-  3 Bends the first front leg.
-  4 Lowers her front end letting herself fall to her knees one at a time.
-  5 Brings her back legs under her body.
-  6 Drops her hips to the ground.
-  7 Repositions her legs.

DURATION

In an ideal environment, a cow should be able to rise or lie in a relatively short period of time. If this is not the case, we should suspect that one or several elements in the cow's environment are interfering with her intentions or movements.

- **RISING: 3-5 seconds** starting from when she begins to throw her head (step 2), until she is completely standing up⁵.
- **LYING: ≤ 5.2 seconds** starting from the moment that the first front leg is bent (step 3), until all 4 legs are well positioned under her⁶.

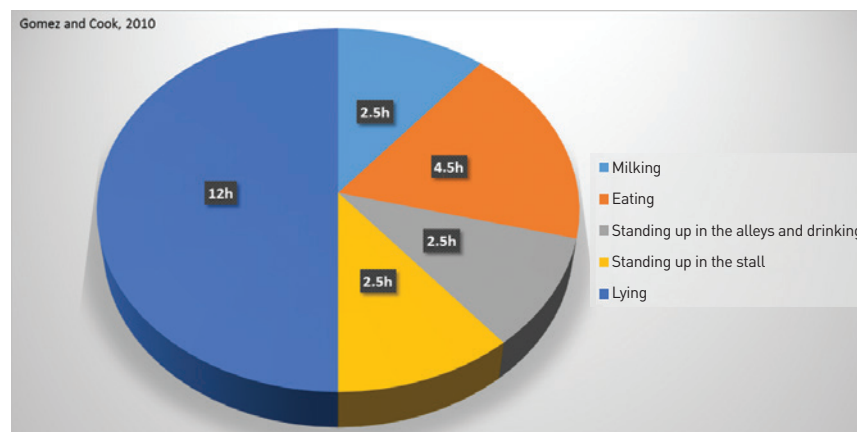
Ideal resting time:
14 hours (minimum
12 hours)⁷.
Each extra hour
of rest = 1.7 kg
more milk⁷.

3. REST

In an average cows typical daily routine, more than half of the time is reserved for rest (figure 1.3)¹⁵. If the sleeping area does not provide enough comfort, the cow is unable to benefit from adequate resting time and her performance will most definitely be affected.

When the cows are at
rest ≤ 9 hours/day
or ≥ 15 hours/day,
their risk of being
culled increases by
67%⁴.

FIGURE 1.3 – A COW'S REGULAR DAILY ROUTINE.¹⁵



STALL STANDING INDEX⁸

Cows will normally rise to eat, drink or exercise. They should not be in the standing position without a reason. The Stall Standing Index can help you to evaluate the number of cows that are standing for no real reason.

$$\text{*Stall Standing Index} = \frac{\text{\# of cows standing in a stall}}{\text{total \# of cows in a stall}}$$

**This index has only been scientifically validated in free stall housing.*

OBJECTIVE: $\leq 20\%$

If the result is $\geq 20\%$, we can presume that these cows are standing up for periods of more than 2 hours and potentially have a lameness problem.

STALL USE INDEX⁹

This tool is used to detect if the stalls are being well used by the cows for lying.

$$\text{* Stall Use Index} = \frac{\text{\# of cows lying in a stall}}{\text{total \# of cows not eating}}$$

** This index has only been scientifically validated in free stall housing.*

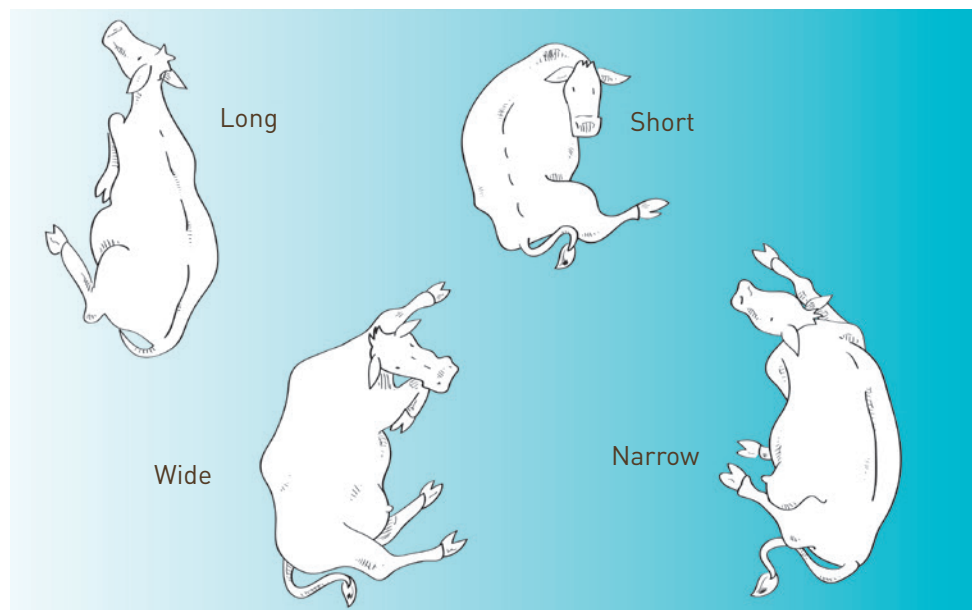
OBJECTIVE: $\geq 75\%$ of cows should be lying 1 hour after milking.

4. ABNORMAL BEHAVIOUR

A cow's body should normally be in an upright position, parallel to the stall division panels and perpendicular to the rail. When she is lying, a cow usually adopts one of the positions illustrated in figure 1.4. When the cow is standing, she should stand on all four legs with each of them well anchored to the stall surface.

Cows that deviate from these normal resting or standing positions are telling us that something about their housing is interfering with their natural behavior. It is important to observe your cows at different times of the day and take note of their behavior on a regular basis.

FIGURE 1.4 – NORMAL RESTING POSITION



Adapted from Kammer, 1982 and G. Rietveld, 2014.

EXAMPLES OF ABNORMAL BEHAVIORS



Perching



Kneeling



Diagonal position (standing up or lying)

5. LAMENESS

Lameness is often an indication of a comfort problem. It is important to learn how to detect lameness and to determine the possible causes in a cow's environment.

2

WHAT ARE THE MOST COMMON CAUSES OF DISCOMFORT?

After having taken note of one or more indicators of discomfort for your cows, the next step is to analyze the housing elements that may have brought about these problems. There could be one or many causes, depending on the situation in your barn.

TABLE 2.1 – COMMON COMFORT PROBLEMS IN THE BARN

PROBLEMS OBSERVED		TIE STALL	FREE STALL
1. Injuries	HOCKS	Stall too narrow Stall too short Chain too short Not enough bedding Stall surface too hard Brisket board too high Not enough exercise Slippery stall surface	Stall too narrow Not enough bedding Stall surface too hard Brisket board too high Slippery stall surface
	KNEES	Feed bunk too low Chain too short Slippery alleys Not enough bedding Stall surface too hard Stall too short Tie rail not far enough forward	Slippery alleys Not enough bedding Stall surface too hard
	NECK	Tie rail not far enough forward Chain too short	Feed rail not far enough forward
	TEATS	Stall too narrow Stall has no divider Stall surface too hard Stall slope Slippery stall surface Not enough bedding	Stall too narrow Stall surface too hard Stall slope Slippery stall surface Not enough bedding

TABLE 2.1 – COMMON COMFORT PROBLEMS IN THE BARN (CONT'D)

PROBLEMS OBSERVED		TIE STALL	FREE STALL
2. Rising	ABNORMAL	Stall too short Slippery surface Brisket board too high No brisket board Poorly adjusted trainer Tie rail not far enough forward and/or too low	Neck rail too low or too far back Slippery surface Stall too short No brisket board Poorly adjusted deterrent strap Poorly positioned brisket board
3. Lying	ABNORMAL	Stall surface too hard Tie rail not far enough forward and/or too low Stall too narrow	Stall surface too hard Stall too narrow Neck rail too far back
4. Rest	INADEQUATE DURATION	Surface too hard Stall too narrow Stall too short Not enough bedding	Surface too hard Stall too narrow Stall too short Not enough bedding
5. Abnormal Behaviors	PERCHING	Stall too short Tie rail too far back Surface too hard or not enough bedding	Neck rail too far back Neck rail too low Deterrent strap too low Lameness Stalls too short Surface too hard or not enough bedding
	DIAGONAL POSITION	Tie rail too far back Tie rail too low Stall too short	Stall too short Neck rail too far back Neck rail too low
	KNEELING	Feed bunk too low Tie rail too far back Tie rail too low Feed too far away Electric trainers too low	
	DOG-SITTING POSITION		Not enough space to get momentum Stall too short Brisket board too high

3

WHAT ARE THE COW COMFORT RECOMMENDATIONS ACCORDING TO TYPE OF HOUSING?

Once you have determined the causes of discomfort in your housing situation, you can start to look at finding solutions. Solutions will vary from one farm to the next according to several factors: feasibility, available budget, cost-benefit, priorities, etc. You don't always need to make big costly changes in order to improve on cow comfort in the barn. Every little thing counts and it is better to move forward slowly than not to move at all.

Depending on what the situation is like in your barn, implementing the perfect comfort standards can sometimes be unmanageable. If this is the case, consider compromises or alternative solutions. In this chapter, we will share the up to date, recognized standards for the different elements of dairy cattle housing for tie stall and free stall barns.

DAIRY CATTLE HOUSING RECOMMENDATIONS

1. Surface

Regardless of the type of housing, the cow resting surface should meet the following criteria:

- Soft
- Non-slip
- Non-abrasive
- Dry

There are two kinds of solutions to providing an adequate resting surface for cows: a) **mattresses and bedding** and b) **bedding only**.

Note that bare concrete and hard rubber mats are not considered to be acceptable resting surfaces, unless accompanied by abundant amounts of bedding.

The use of more bedding results in longer resting times and increased frequency of rising and lying¹⁰.

It is important that the bedding remains dry because humidity is associated with a decreased resting time in cows¹¹.



A) Mattresses and Bedding

There is a growing number of cow mattresses available on the market. Each type has its advantages and disadvantages and will vary in both durability and price. It would be difficult to say which is « the » best mattress. As always, it is important to make the best choice for your situation by making the most advantageous choice for your barn on your budget. One thing is sure however, regardless of what you choose, **the use of bedding remains essential** and will help compensate for the disadvantages of the various mattress types.

Why use bedding?

- To maintain cleanliness
- To reduce humidity
- To reduce friction
- To improve softness

How much bedding?

The quantity of bedding required will vary according to the type of bedding used and the surface that it is used on. As a rule, the harder the surface, the more bedding that will be needed. One thing is for sure, as far as comfort goes, there is never too much bedding!

B) Bedding Only

Well designed and well maintained, these types of solutions bring together all of the criteria required to offer significant resting comfort to cows being housed in a barn:

- Deep bedded stall
- Stall on sand
- Deep bedded straw or compost pack
- Deep bedded manure solids pack

It is almost always possible to modify existing facilities to transform them to deeper stalls.

Each type of bedding has advantages and disadvantages that can influence your choice.

TABLE 3.1 – WHAT TYPE OF BEDDING SHOULD YOU CHOOSE?

BEDDING	CHARACTERISTICS	ABSORPTION
Cereal straw	Good insulator Good for comfort Variable availability	Average to good
Shavings/sawdust	Must be kept dry Good availability Good for composting Fine particles	Good
Switchgrass	Excellent yield (8.5 T/ha) Production cost similar to cereals Often used as a groundcover to control erosion of riverbanks Takes 2 years to become established Can be dusty when chopped	Good
Crop residues Flax/corn/soybean/ canola	Fibrous/coarse Difficult to harvest dry Possible soil contaminants/mold Inexpensive	Good
Peat moss	Superior absorption Odors absorption Fly control Can be dusty Loses capacity to insulate when wet Dark color	High
Recycled manure	Good for comfort Potentially harbors pathogens Needs to go through a composting or digestion process Variable levels of humidity Milking method must be impeccable Need to consider cost of equipment and storage Reduced cost of bedding inputs Dark color	Good
Sand	Superior comfort Very little insulating properties Can be challenging to handle Abrasive for equipment Particle size comparable to the “mason” category ** Grains s < 3 mm (< 1/8 in.)	Must be filtering

TABLE 3.2 – **CSA STANDARDIZED PARTICLE SIZE FOR MASON¹²

SCREEN	% PASSING THROUGH
5.00 mm (#4)	100
2.50 mm (#8)	90–100
1.25 mm (#16)	85–100
630 µm (#30)	65–95
315 µm (#50)	15–80
160 µm (#100)	0–35
80 µm (#200)	0–10
Bottom	0

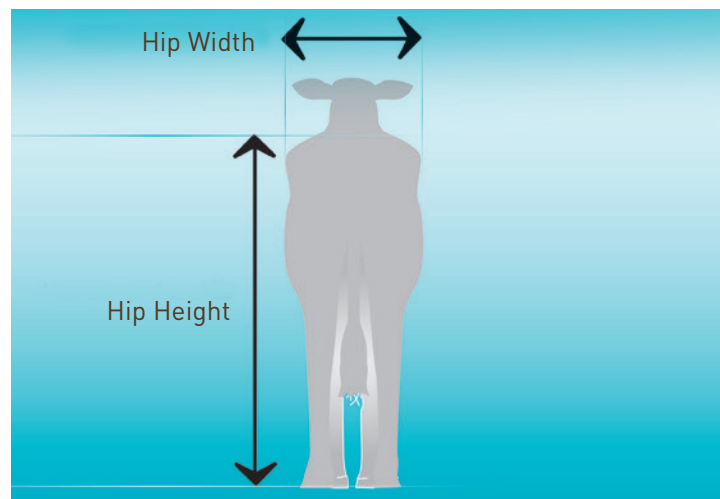
2. Stall Dimensions

Stall dimension charts have traditionally been based on cow weight. Cow measurements, however, will vary from one individual to the next when compared to weight. It is therefore preferable to consider actual cow size, using the following two measurements:

Hip height (HH) and hip width (HW) (Figure 3.1).

Using actual cow measurements to determine the width and length of your stalls will insure that you provide comfort that is adapted to the cows in your herd.

FIGURE 3.1



To determine the ideal stall dimensions for your barn, you will need to measure the HW and HH of a few adult cows in your herd (minimum 5), calculate the average and then insert those results into the equations recommended in figures 3.2 and 3.3.

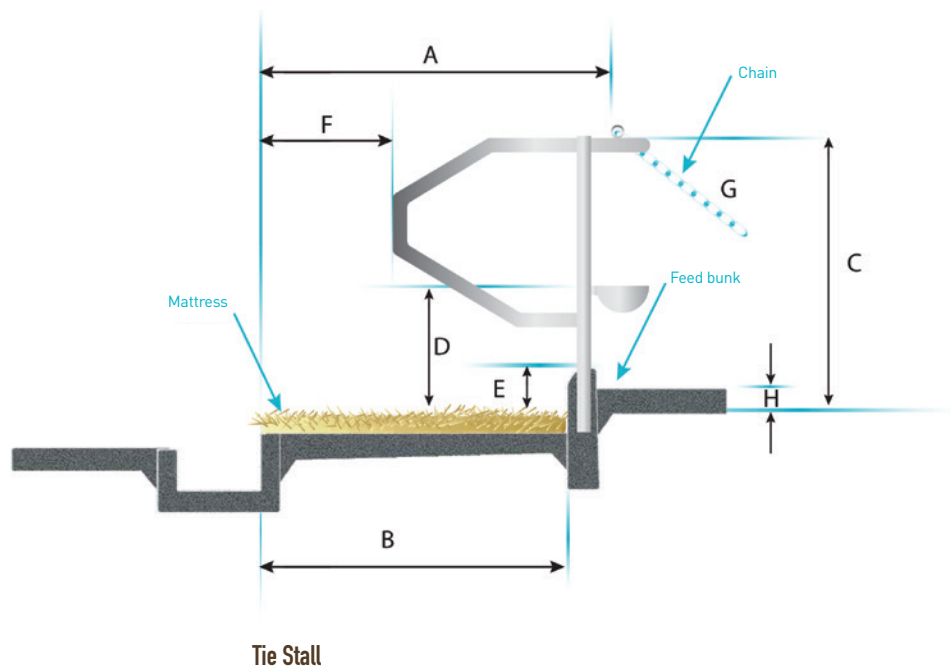


FIGURE 3.2 - TIE STALL HOUSING RECOMMENDATIONS (inches)¹³

A	Distance from tie rail to the gutter	$(1.2 \times HH) + 14$
B	Stall Length	$1.2 \times HH$
C	Tie rail height	$0.7-0.8 \times HH$
D	Water bowl height	≤ 18
E	Brisket board height	≤ 8
F	Distance from the division to the gutter	≥ 30
G	Chain length	$(0.7-0.8 \times HH) - 8$
H	Height from the top of the feed bunk to the top of the bedding	≈ 4
	Stall width	$2 \times HW + 6$ Add 2 inches if there is not enough clearance for the hips.
	Distance from the gutter to the trainer	48 Holstein 42 Jersey

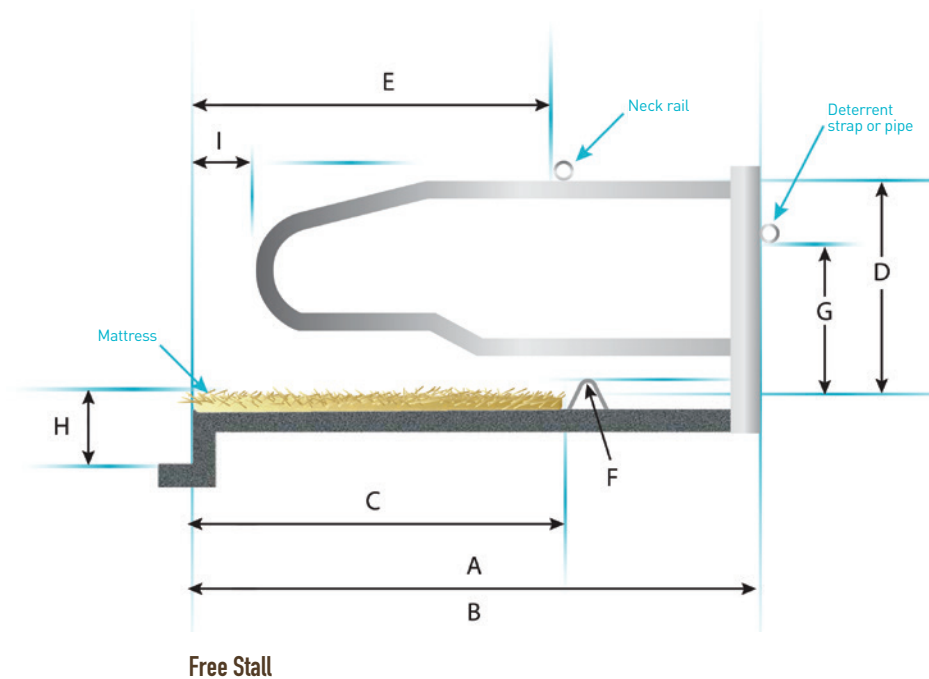


FIGURE 3.3 – FREE STALL HOUSING RECOMMENDATIONS (inches)¹⁴

A	Total length (facing a wall)	2 x HH
B	Total length (head to head)	1.8 x HH
C	Platform length	1.2 HH
D	Adjustable rail height	0.83 x HH
E	Adjustable rail distance	1.2 HH – 2"
F	Brisket board height	≤ 4
G	Deterrent strap or pipe height	0.6–0.7 x HH
H	Platform height	≤ 8
I	Space between the division and the alley	12–14
	Stall width	2 x HW
Add 2 inches if there is not enough clearance for the hips.		

For bedded straw pack or composted bedding, a minimum space of 120 sq. ft. per cow is recommended.

3. Stall Dividers

FIGURE 3.4 – STALL DIVIDERS – FREE STALLS

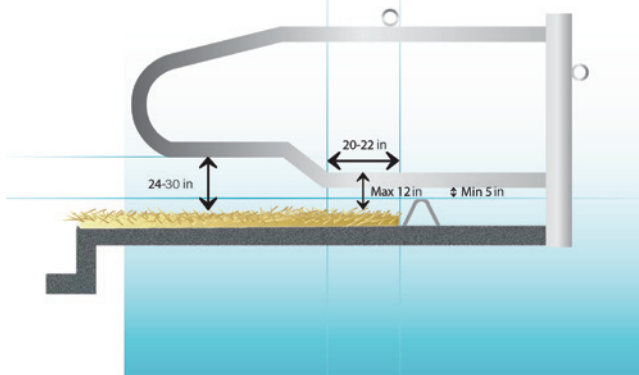
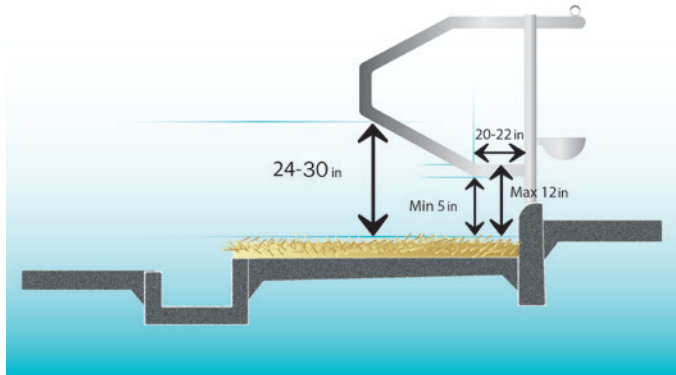


FIGURE 3.5 – STALL DIVIDERS – TIE STALLS



4. Alleys and passageways (ft.)

(Adult cow housing)

Feed alley width-with stalls	14
Feed alley length-without stalls	13-14
Between two rows of stalls	10-12
Alley with a row of stalls	9-10
Passageway between two rows	6.5
Passageway with water trough	14
Number of passageways (in addition to the 2 ends)	1 for 20 stalls (two row barn) 1 for 15 stalls (three row barn)
Space between the robot and the first obstacle	Min 15-17 free movement

5. Water troughs

- Minimum flow of 12 L per minute
- 3.5 linear inches per head
- 2 water troughs per group
- Maximum of 50 ft. to go to drink
- Positioned facing the exterior of a passageway

6. Feed bunk space (inches)

- Lactating cows: 24 per head
- Dry cows: 30 per head
- Transition cows: 30-36 per head

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The valacta logo, which consists of the word 'valacta' in white lowercase letters inside a blue teardrop-shaped graphic.