Theme 8: Animal housing

PREVENTION OF HEAT STRESS IN COW BARNS (Level 1)

Topic	Training & information Content
8.1	Farm structures & housing cows/calves/young stock
8.2	Construct small zero grazing unit (SNV handbook)
8.3	Prevention of heat stress in cow barns
8.4	Cow house ground floor plan design (SNV book)
8.5	Best management practice feed fences……..
8.6	Housing & cow comfort (animal welfare)
8.7	Housing & reduction greenhouse emissions
8.8	Use of sensors (activity meter) in dairy herds

1. You will learn about (learning objectives):

- ❑ Factors to consider when making a floorplan.
- ❑ Considerations in floor & cubicle design.
- ❑ Understand the importance of cow movement.
- ❑ critical checkpoints in cow cubicles.

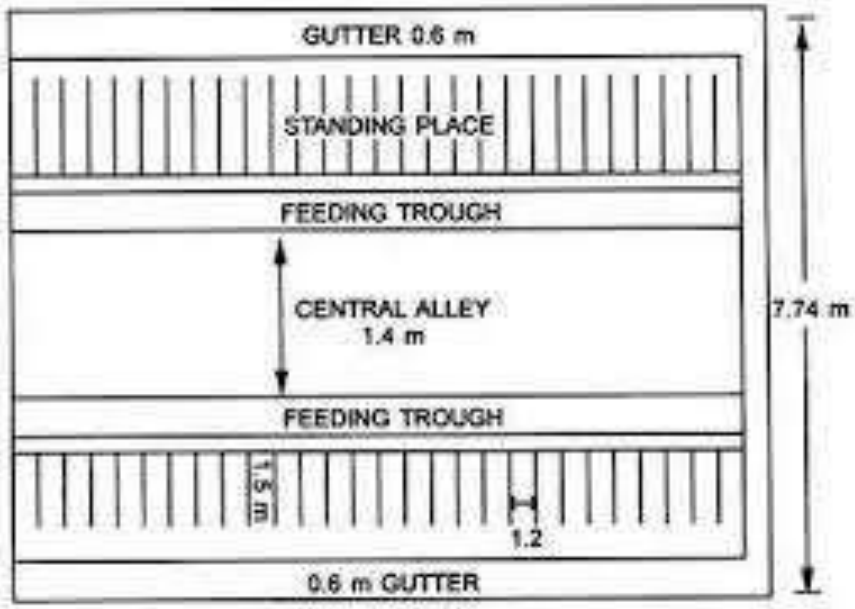
2. Introduction

- Floorplan is a diagram or design of a cow house layout, drawn to scale to allow one map out exactly how one would like details of the cow house to appear.

- Floor plans show relationship between the different compartments of the cow house (e.g. standing or feeding alley, walking alley, resting area, milking parlour etc.)

- Floors should be placed on undisturbed, firm soil (stable ground).

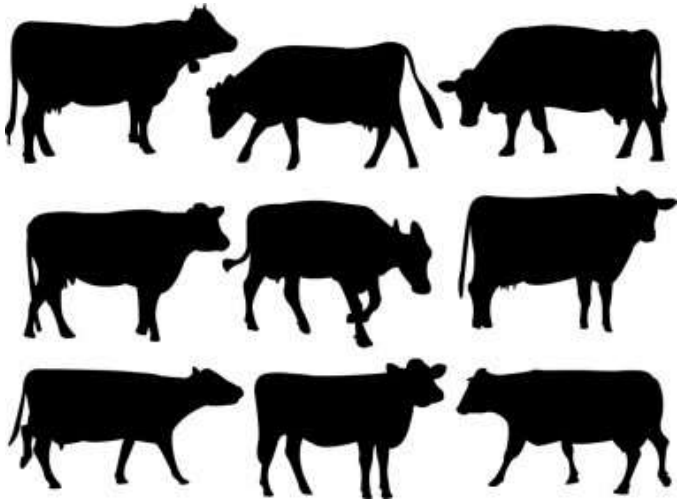
Top view of head to head barn

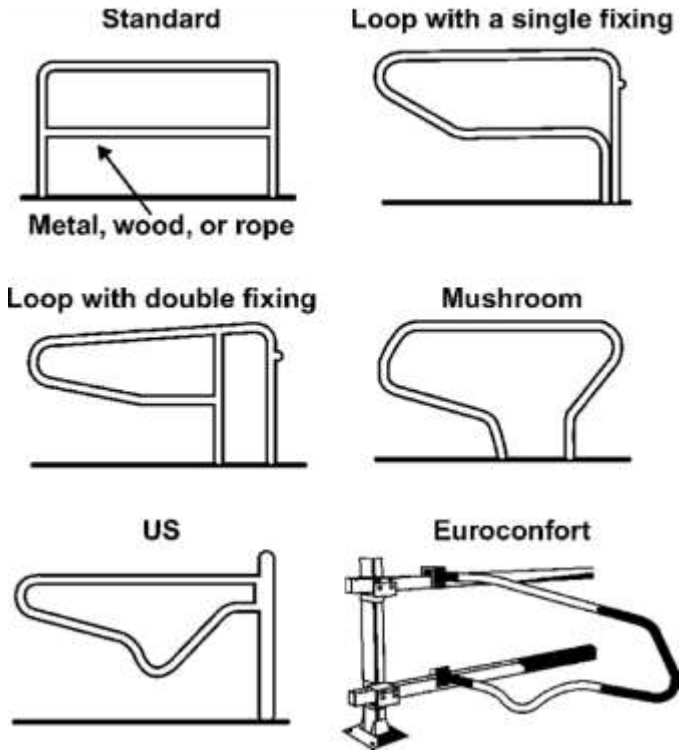


3. What to consider in floorplan measurements

- Animal movement.
- Animal size.
- Cubicle size.
- Cow comfort.

Animal size and movement





3.1. Animal movement

- Step one in constructing a cubicle is first to understand how the cow lays down and stands up.

- In front, a cow needs sufficient space, for her forward movement while standing up.

- The front half of a mature cow represents approximately 55% of her body weight.

- Proper positioning of the legs, with sufficient grip is important in order to use the least amount of energy, the cow needs, to stretch her front leg forwards.

3.1.1 Animal movement, Cont'd: **Cow traffic**

- Cows should walk easily in pastures, on farm roads and in a cow barn/zero grazing unit.

- It is recommended that two cows should be able to move easily, pass each other in either direction in walking alleys.

- A cow should be able to walk in and out of a cubicle at any given time .

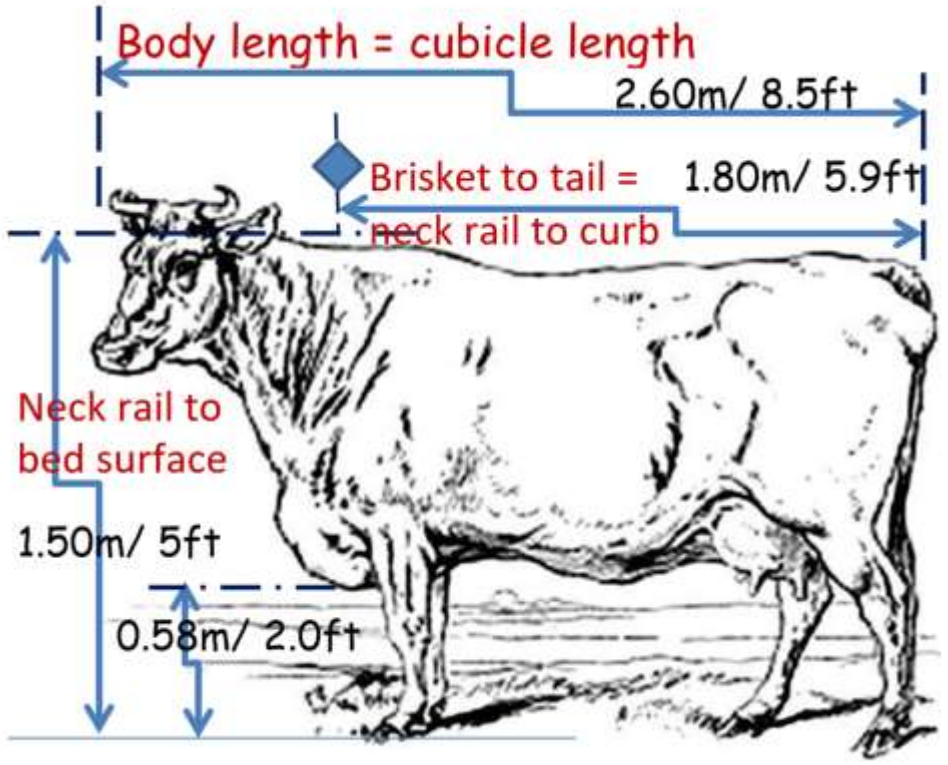
3.2 Animal size

- Step two is to measure the average dimensions of the cow's in the herd before construction.

- Knowing the size of cows is crucial since different cow breeds vary in size and weight.

- But even within the same breed, size of cow's in a herd differs depending on various factors (for example: calf rearing).

- Knowing the size and weight of the cows in your herd will guide the farmer how to make adjustments for his particular herd.

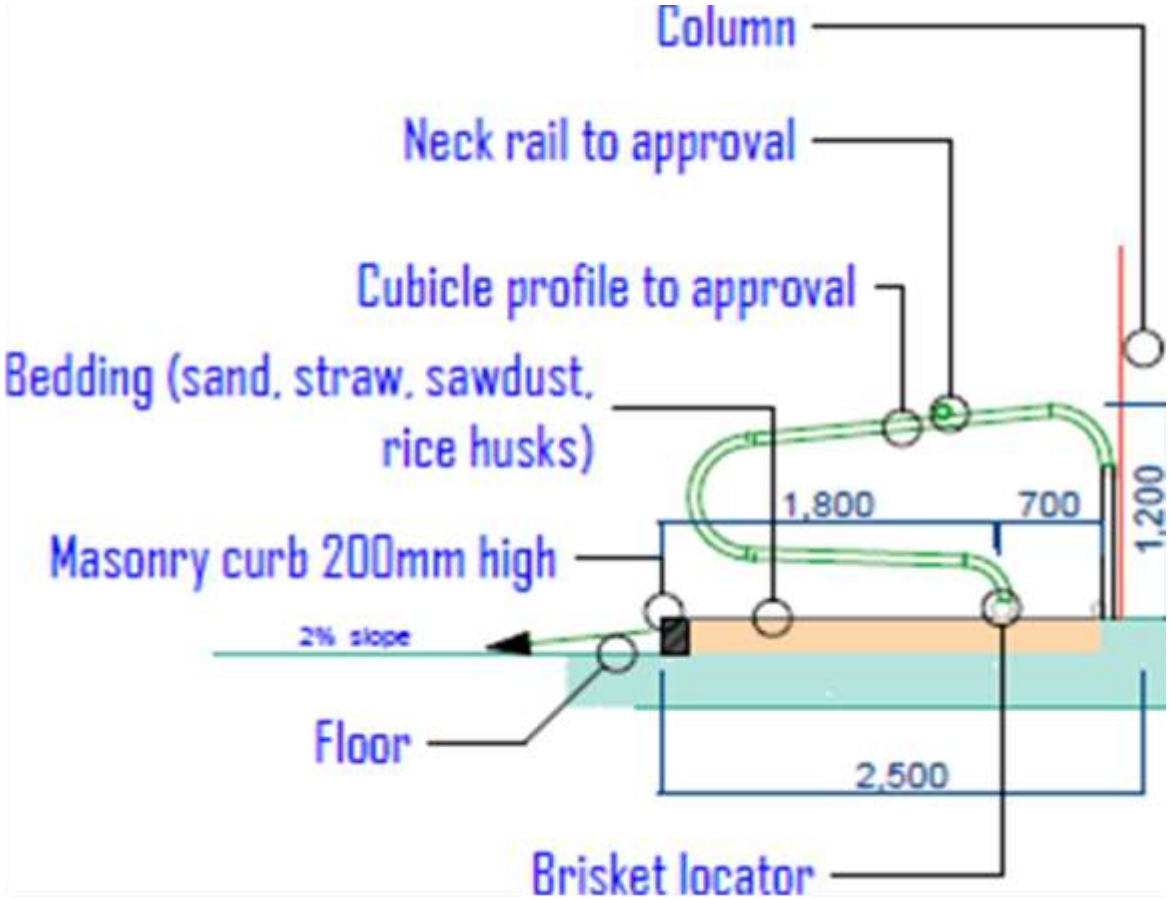


3.3 Cubicle size

- The cubicle has many parts that a farmer should put in mind to ensure that the animal fits well within a cubicle at ease.

- This parts include:
    1) The cubicle dividers
    2) The length and width of the cubicles.
    3) Bedding material
    4) Neck rail
    5) Brisket locator

- No part/object in a cubicle should take up space intended for the cow to rest in.



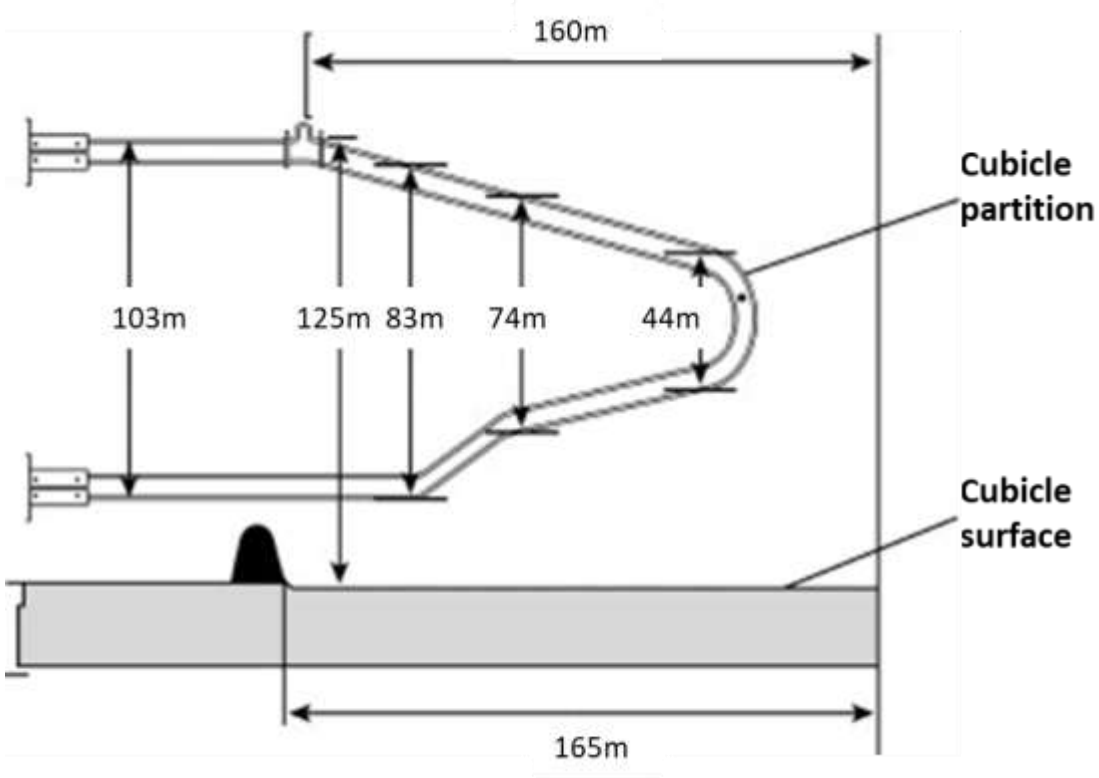
3.3 Cubicle size Cont'd…

- Cubicle for an adult cows should be approximately 2 - 3m long and 1 – 1.5m wide, open head space, neck rail & brisket locator in adjustable positions.

- Cubicle beddings should be dry soft, comfortable and kept clean regularly.

- The neck rail is placed approximately 110-125cm above the bedding.

- Brisket locater may be placed approximately 160-180 cm from the curb of the cubicle.



3.4. Cow comfort

- Space between the dividers and the length of the cubicles should be enough for a comfortable head swing (forward movement of the cow while standing up) of the cow.

- The floor should be able to provide grip and footing for the cow to give the cow confidence and comfort while standing up.

- Without considering dimensions and appropriate structural parts of the cow barn design, cows may experience hinderance in their movements which causes injuries.

4. Resting area

- The cow needs a replication of the natural setting of the resting area, for example: the pasture, there is enough space for the cow to get up and the pasture generally provides a soft bedding.

- Cows always select the best place to lay down in a barn or outside in the pasture by observing the cows we can understand their natural behavior.

- In an indoor setting, the resting areas should therefore be rammed earth with suitable, soft bedding material. Cubicle floors should be comfortable enough for high lactating cows to lay down at least 12 hours per day.

- The resting area should be raised from the walking area at least 25cm above.

5. Considerations in floor & cubicle design

1. Flooring- Wet floors makes cows susceptible to skidding and sliding which can cause injuries when fall is fatal.

2. Headspace- The cubicle needs a minimum width of 115cm for a 135cm high cow for easy head swing.

3. Design- The dimensions of the cubicles can be easily adjusted by movable neck rail and brisket locator.

4. Matching cow sizes with stall dimensions- Within a herd cows can get bigger, smaller, shorter or longer over time these variations affect use of cubicles.

Floor & cubicle design

5.1 Considerations in floor & cubicle design Cont'd…

- Bedding material can either be: soil/sand, chopped straw, sawdust, dried manure, and other dried materials.

- Sand is the best bedding material followed by deep bedding materials such as: sawdust, chopped straw.

- Due to the possibility of homemade mattresses and rubber mats becoming hard, it is important to provide some soft dry material like sawdust which can absorb some urine/manure which needs to be removed 2-3 times per day to keep the laying area dry.

5.1 Considerations in floor & cubicle design Cont'd…

- Research shows 5cm of sawdust should be used on thick (4-6cm) rubber mattresses and at least 10 cm on rubber mat(2-3cm) and minimum of 20cm on a concrete floors.

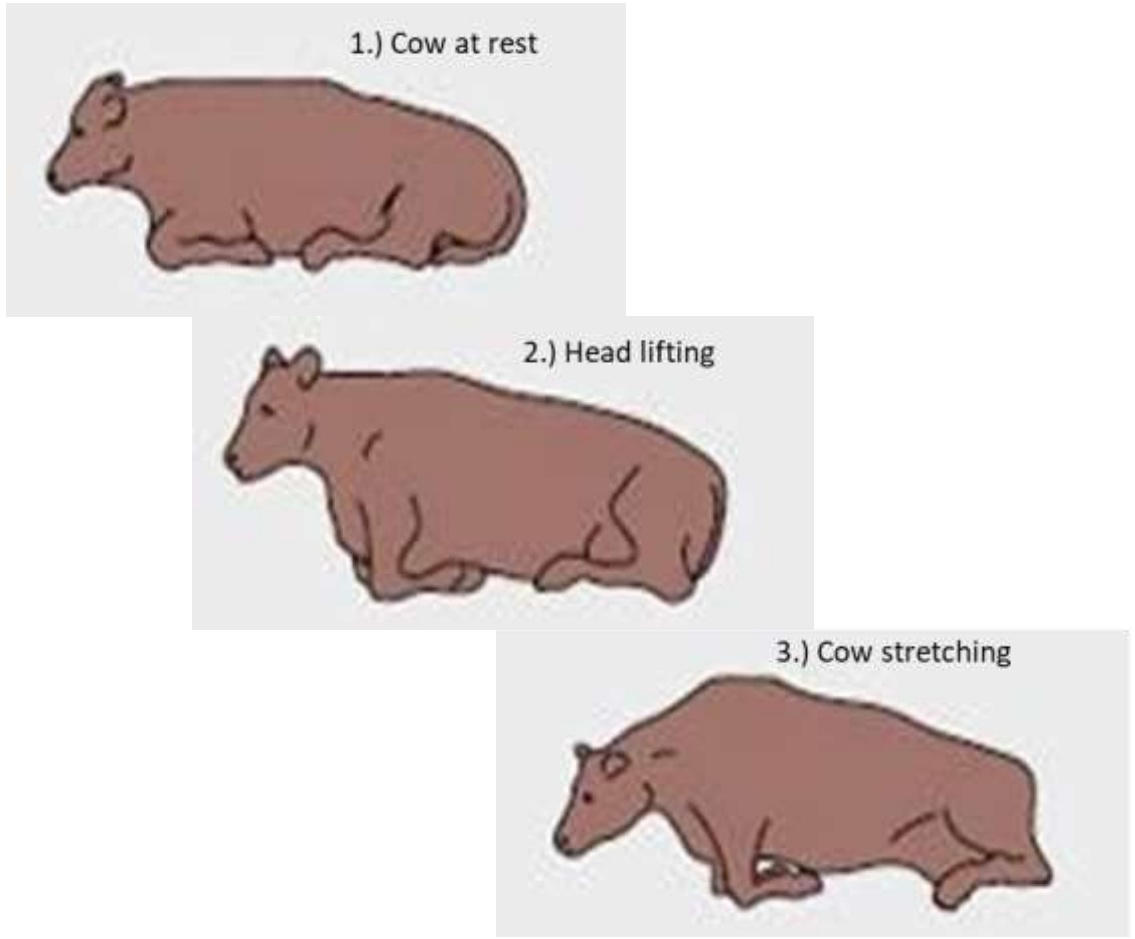
- Stalls should be assessed every 3 months to determine if calves, heifers and cows are still fit comfortable in the cubicles.

6. How a cow is standing up

1) Cow at rest

2) First the cow lifts her head and brings her front legs under her chest.

3) She stretches her head forward as a counterbalance for her back end. The front legs function as the balancing point. This cow is now more than 3m long.

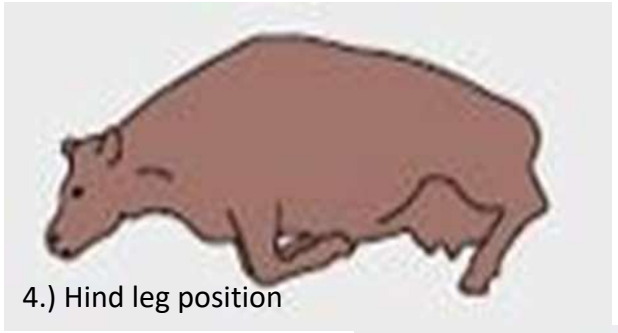


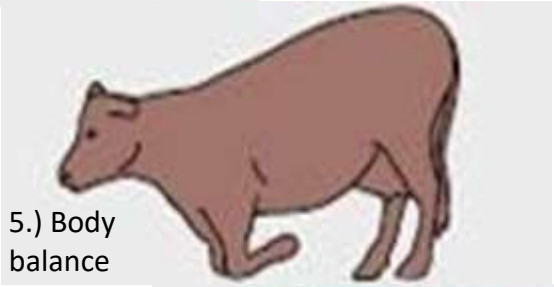
6.1 How a cow is standing up, Cont'd…

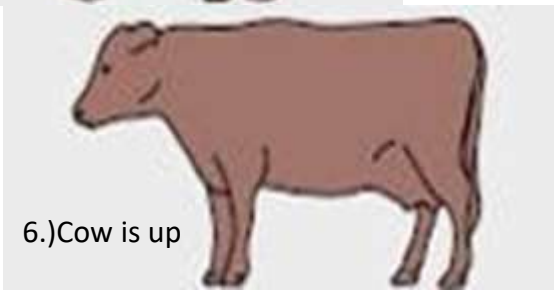
4) The hind legs are positioned under the body. Her head is almost on the ground.

5) The head is being retracted again and the cow puts one front leg forward in order to maintain her balance.

6) Finally, the fourth leg is positioned and the animals can begin walking, but not until she takes a moment to stretch.


4.) Hind leg position


5.) Body balance


6.)Cow is up

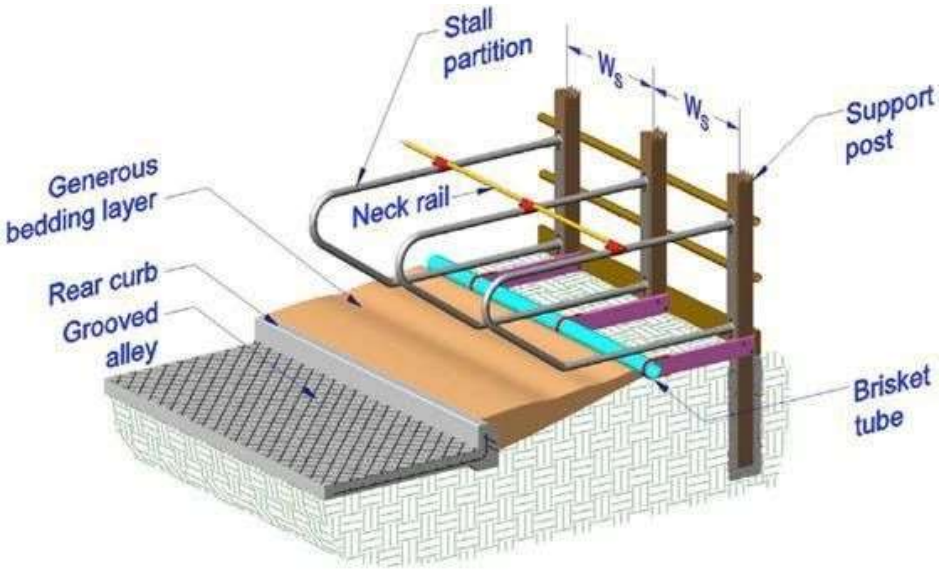
7. Critical checkpoints for cubicles

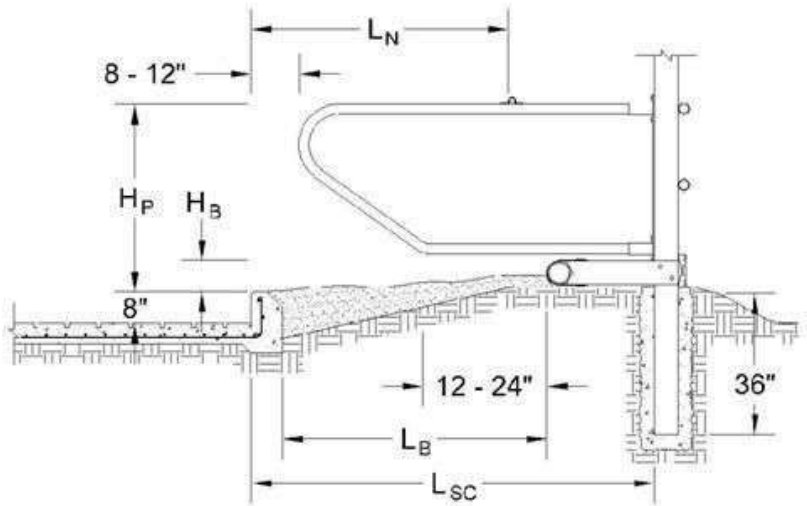
- Cubicles can get in the way of the cow standing up and laying down. If you understand how cows normally lie down, you stall better so that your cows get maximum rest and do not injure themselves.

- To lay down and to stand up, the cow needs enough space to swing her head forward.

- This space can also ensure good ventilation and fresh air circulation in the barn.

- Soft bedding provides a soft landing, soft laying, and a good grip so that the cow's claws do not slip away underneath from her.





Closed Front Freestall with Generous Bedding

7.1 Critical checkpoints in a cubicle, Cont'd…

- Loose, soft bedding material is much better than rubber or homemade mattresses. As long as the thickness of the bedding material is minimum 20 cm or more.

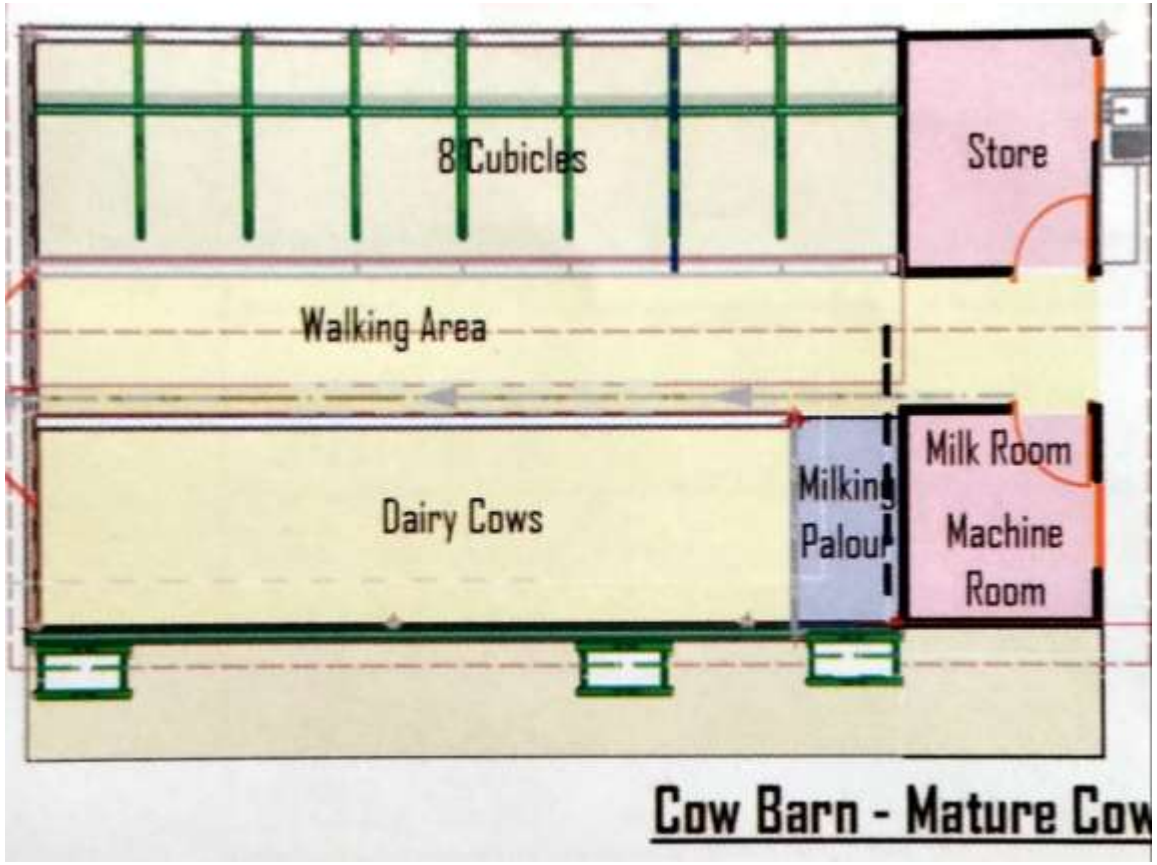
- Loose bedding material needs to be leveled in the cubicles 2-3 times per day.

- Clean out manure and wet bedding material from the cubicles 3-4 times per day.

- Ensure that the top of the bedding material is always dry.

8. Floorspace partitions in a cow barn

- Calves/youngstock.
- Lactating cows.
- Milking parlour.
- Water trough.
- Feeding alley.
- Walking alley



8.1. Calves/Youngstock ground floor plan

- It is recommended that the calf pens are raised.
- The ground floor area below the calf pen should be slanting/elevated & slatted for drainage purpose and easy cleaning.
- For calf pens made of wood, spaced between the wood can be approximately 2.5cm to allow urine and faeces to fall on the ground.
- The ground should always be dry & clean to avoid diseases.
- Where the ground floor is soil, it should allow seepage/drainage of water/urine.

8.2 Lactating cow ground floor plan

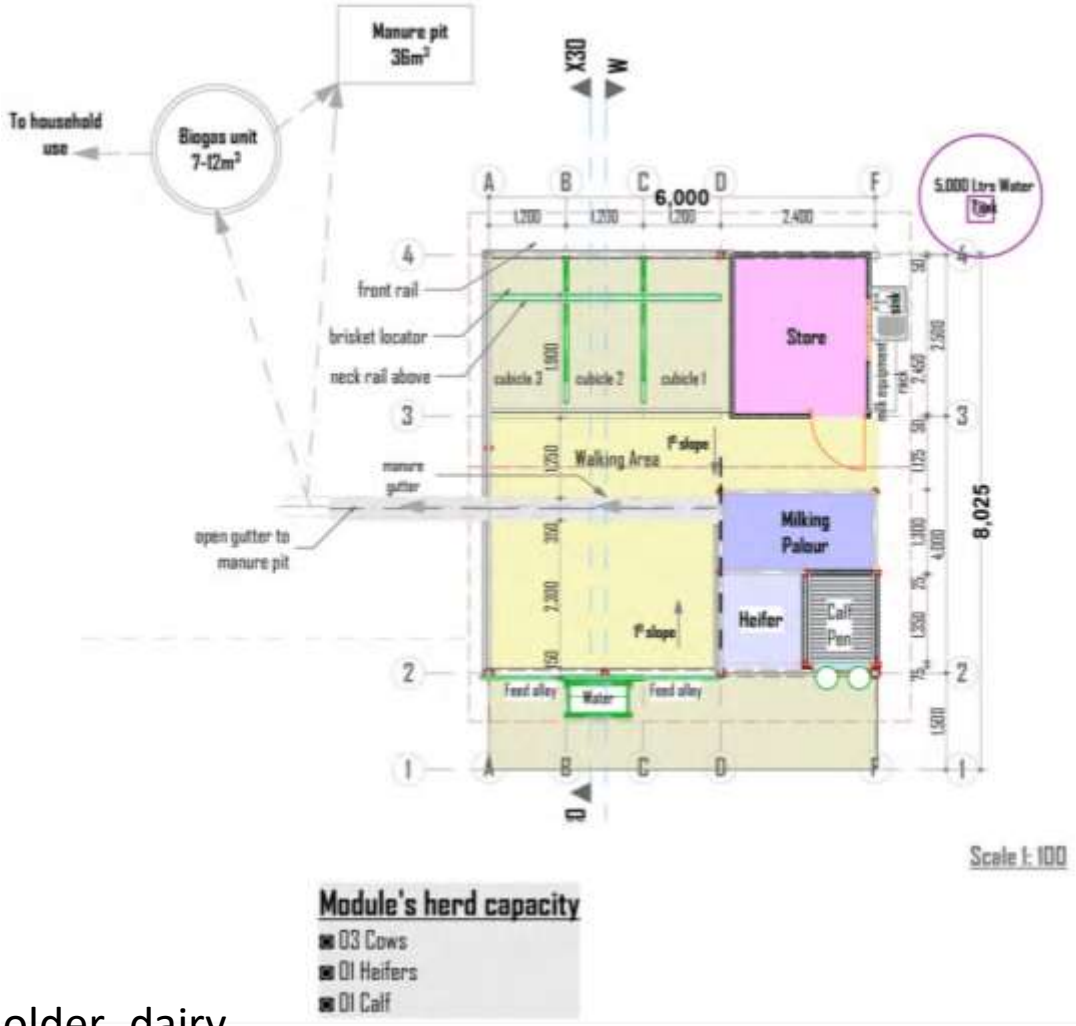
- Cow barn floor are for an adult cow should be approximately 6 – 6.5 meter square.

- Floor should slant at a gradient of about 2 – 3 cm from the resting area to the manure storage channel.

- Floor should be roughened and maintained dry always.

- Group cows according to: stage of lactation and exception can be made for first calvers who are generally a bit smaller.

https://snv.org/assets/explore/download/kmdp_-_handbook_modular_cow_barn_design_for_smallholder_dairy_entrepreneurs_0.pdf

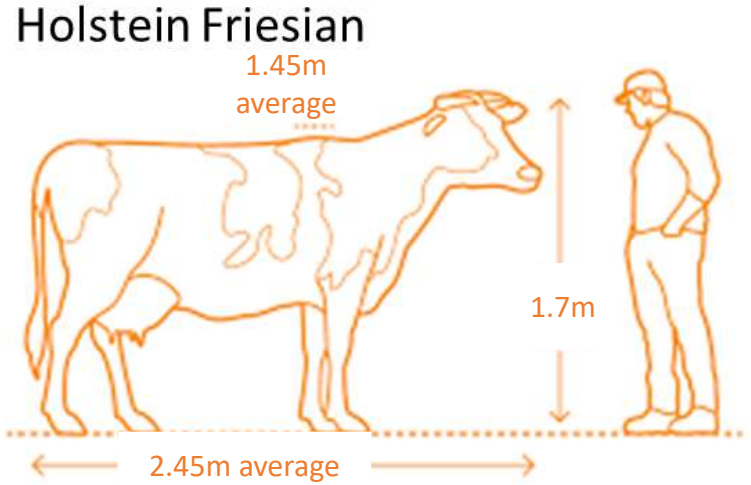


8.3 Milking parlour

- The milk parlour should be constructed with considerations of both the cow and worker.

- Floor space should accommodate the cow and worker to be able to either do hand milking or attach & detach a milking machine at ease.

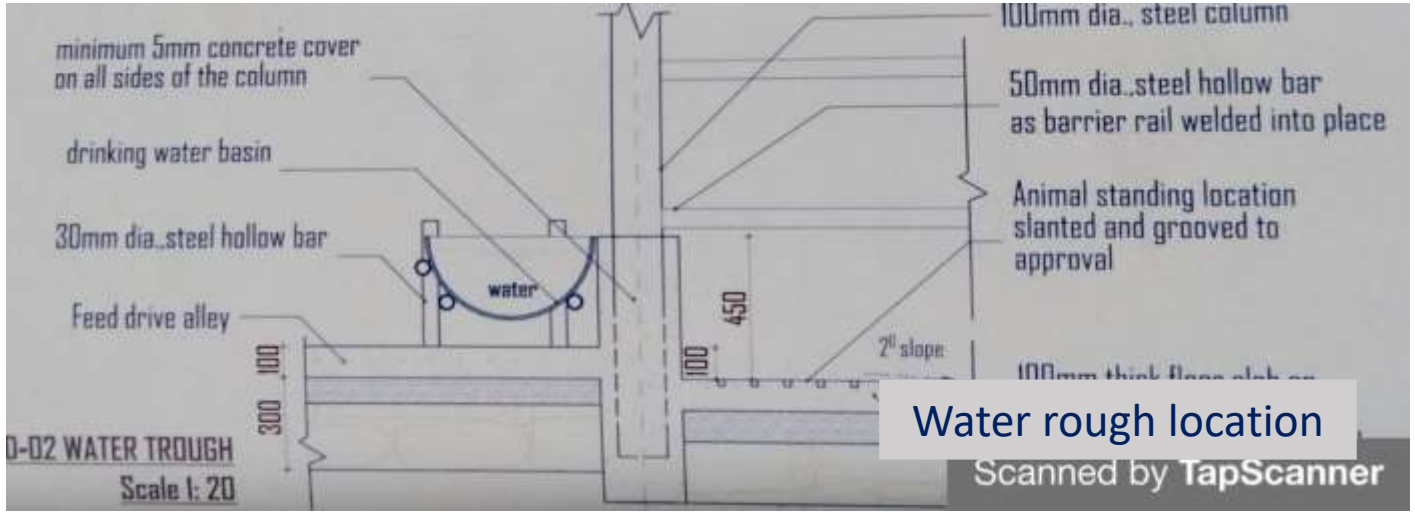
- Space set aside could be more especially for the worker depending on the type of milking parlour.



8.4 Water trough

- Water trough should be centrally located where cows are able to spot (corner of the barn).

- For semi-permanent water troughs (metal) should be firm by adding reinforcement to withstand push and pull that cows can get into when in the drinking spot.



8.5 Feeding alley

- Feeding alley is a pathway after the feed fence either in one row or between two rows with cows facing one another in a cows barn.

- The feeding alley dimensions vary depending on the farmers choice of feed delivery.

- It should be on uniform ground and levelled to avoid stagnant water.

8.6 Feeding alley, Cont'd: **Dimensions**

- For a single row feeding alley a farmer can either decide to place concrete partly or fully in a feeding alley (table).

- Farmer may place concrete for 1.25-1.5m wide to accommodate unlimited feed, feed leftovers should be less than 5%.

- For a two row, with cows facing each other feeding alley it is recommended to have space of 5m.

8.7 Construction of the walking alleys

- All walk alley should be constructed of good quality concrete (15 cm thickness), with an iron concrete grid (diameter: 6 or 8 mm, grid distance: 15 cm).

- All longitudinal walkways should be on a slope of 1.5 to 2.5% (1.5 to 2.5 cm per 100 cm) in two directions: towards the center and towards the manure dump.

- For easy cleaning, the holding pen can be built on a slope of 3-5 % away from the milking parlor towards the manure dump.

9. Example of bad cubicles

- Poorly built floors (uneven/cracked floors).
- Poor bedding (hard floors).
- Poorly constructed cubicles (position of cow in the cubicle).
- Cleanliness (wet floors & poor dung/manure management).

9.1 Example of bad cubicles Cont'd: **Poorly constructed cubicles**

- **Signs of a short resting area to cow size:**
  - Cows laying diagonally since there is not enough space at the front.
  - Or the neck rail is too far backwards.
- **Signs of a large resting area to cow size:**
  - Cows depositing urine and manure in the cubicle.

10.Floor and hoof health

- It is important to consider when making the floor plan that the hooves are in constant contact with the floor when the cow is standing or walking.

- Hoof health is important because hoof injuries can cause lameness and this is generally a greater problem for confined cows compared to cows that are grazing.

- Hooves bear the weight of the cow and any problems, injuries predispose cows to lameness.

- Cows prefer soft and dry surfaces to walk and rest comparable with a green lush pastures.