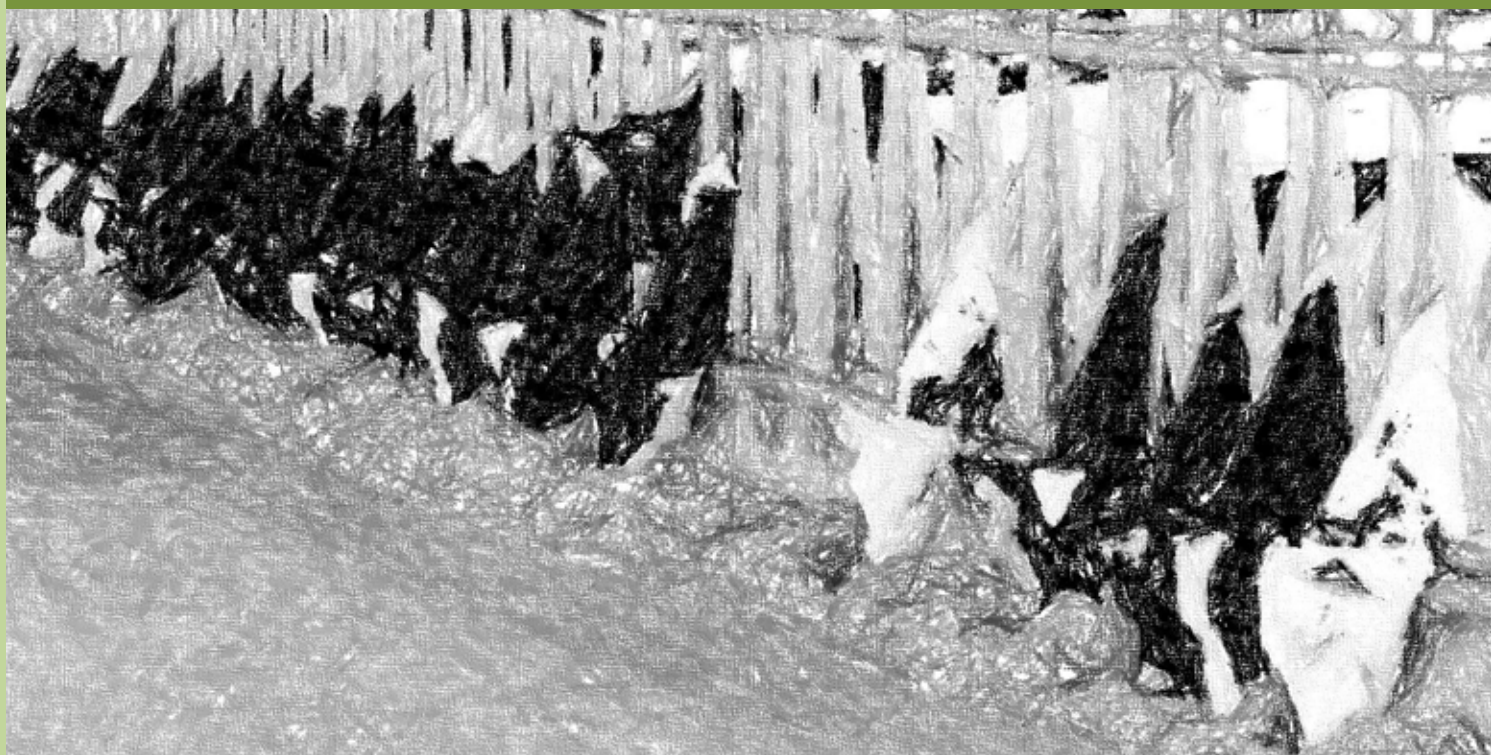


ANNEX 1



Best and worst practices

ANNEX 1: BEST AND WORST PRACTICES

I. Concrete works

Concrete is the most commonly used material of choice for building floors, pavements, driveways, sidewalks, steps, basements/pits and industrial floors. It is relatively inexpensive to install and provides an attractive, durable surface that is easy to maintain. Proper attention to the standard practices and procedures for constructing exterior or interior concrete can yield a concrete surface that will provide long-lasting, superior performance.

For the best results and quality concrete in construction projects the following procedures are of great importance:

- Remove all vegetation, soft soils, and rocks so that support for the slab is uniform. If possible, place concrete on undisturbed, firm soil (stable ground)
- Set forms so that the concrete slab surface slopes a minimum of two percent, or 1/4 inch per foot, this provides adequate drainage.
- Use a poker vibrator to drive off trapped air and increase bonding ability in addition to a scratch template, typically, a piece of 2-by-4 or 2-by-6 lumber equal to the specified slab thickness with stakes attached to the top surface at each end, or a string line across the top of the forms to ensure proper slab thickness.
- Do not use high-slump concrete. Control water additions at the truck. A good slump for most flatwork placed by hand: five inches. For slabs struck off with mechanical equipment: two to four inches. Even high slump caused by admixtures can be detrimental as the paste content (and shrinkage) of the upper portion of the slab can be greater than the lower portion of the slab leading to increased warping.
- Strike off the surface while keeping a small amount of concrete in front of the straightedge to fill in low spots. This helps to prevent birdbaths in the finished surface.
- Do not perform any finishing operation while bleed water is present on the surface. Do not dust dry cement on the surface to soak up bleed water.
- Use a Groover (i.e. a machine to make grooves) to make contraction joints in the fresh concrete. Make sure the groove depth is one quarter of the slab thickness. Or use expansion joint at predetermined spacing or saw joints using either an early-cut saw or a conventional saw. Early jointing helps prevent cracking.
- Do not steel trowel concrete that contains more than 3% entrained air. Hard troweling of air-entrained concrete may cause surface deterioration.
- Start curing the concrete immediately after completion of finishing operations.

Table 19. Cement material requirement for concrete flatwork

Nominal maximum size aggregate, mm	Cement materials, kg/m ³
37.5	279
25.0	308
19.0	320
12.5	350
9.5	362

II. Electrical grounding of iron-works

All iron should be grounded well! Meaning the maze in the reinforced-concrete, cubicle dividers, posts, feed- fence, machines and most certainly the milking parlour are connected with the electric ground cable of the electrical wiring system. This ensures that there will be no problem with stray voltage and it increases safety for everybody including the cows.

III. Flooring of walk-ways

- Construct high quality concrete walkways: resistant to erosion and to high load (i.e. manure scraping with tractors)
- Assure sloping towards the direction of the manure dump: 1 to 2%
- Assure sloping towards the centre of the walkway: 1 to 2%, with the lowest point ≥ 2 m from the feed fence and ≥ 1 m from the curb of the beds
- Provide enough grip for the cows to walk: don't polish.

Instruction for constructions of walk ways for cows:

- All walk ways 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 walk ways 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 centre and towards the manure dump.
- For easy cleaning, the holding pen can be built on a slope of 3-5 % away from the milk parlour towards the manure dump.
- To provide sufficient grip for the cows, the concrete must not be polished. And in most cases grooving is necessary. In barns with sand bedded stalls, usually it is not needed to groove the concrete.

Options for grooving:

- Use a wooden block with copper or iron pipes of 2.5 cm diameter around it, at a distance of 7.5 cm, "jitter bug". The jitter bug is pulled longitudinally over the concrete after it has hardened for about 2 hours, so that grooves are made of 1.0 – 1.5 cm wide and 2.5 cm deep, at a distance of 7.5 cm.
- Cut grooves after the concrete has completely hardened, with a diamond concrete cutter. The best option is to make a diamond-shaped pattern, with grooves of 2.5 cm wide, 1.0 - 1.5 cm deep, at a distance of ~ 7.5 cm.
- Pull a special designed plate over the wet concrete to make grooves of 1.0 – 1.5 cm wide, 1.0 cm deep, at a distance of 5.0 cm between the grooves.

Perhaps other options are available. Before using these, consult a barn design expert to make sure that this will not create problems for the cows or other issues.



Figure 6. Wet concrete floors
 Wet concrete floors easily get slippery preventing cows to walk safely and comfortably.



Figure 7. Flat concrete floors
 Bad Practice: Flat concrete floors (not sloped) remain wet, as urine and other fluids do not run off.



Figure 8. Sloped floors
 Good Practice: Example of a floor that slopes over lengths and towards its centre. The lowest point should have been further away from the feed fence, so that the eating cows stand as little as possible with their hind feet in manure and urine.



Figure 8b. Sloped floors

Bad practice: the slope of the floor is too steep. The hole in the floor is dangerous: cows might break a leg or injure themselves when they accidentally step into it.



Figure 9. Dry concrete floors

With relatively little cow traffic and good ventilation with dry air, manure can dry up on the floor of walk alleys. This creates a very slippery situation. When this occurs, the floor should be sprayed with (waste) water or manure fluids before scraping.



Figure 10. Grooves

Good Practice: Grooves are 1.0 – 1.5 cm wide, 1.0 cm deep and 5.0 cm apart, and were constructed when the concrete was still wet.



Figure 11. Longitudinal grooves

Good Practice: Longitudinal grooving is the easiest to construct. This barn has beds with sand bedding. Sand that is walked out of the beds provides grip in the walk alleys.



Figure 12. Uneven floors

Bad Practice: Uneven floors make it difficult for cows to safely walk around. They also present a risk to the cows and can result to bruising of the soles and development of solar ulcers. Uneven floors also take much more time to clean than even floors.

Posts to support the roof

Summary:

- In general: the smaller the number of posts, the more flexible and simple the barn
- Posts should as much as possible be positioned on a place that is not in constant contact with manure and moisture, like the platform of the stalls
- Posts should be rounded and not have perturbations that can cause injuries to cows
- Iron posts are smaller and much more durable than wooden posts, for these reasons iron posts can be a better long term investment than wooden posts.



Figure 13.Floors and support posts (1)

Posts are very vulnerable to corrosion, erosion and rotting at points where they have intensive contact with moist, urine and manure. Install good protection.



Figure 14. Roof design

Good Practice: This is an example of a simple and cheap roof.



Figure 15. Floors and support posts (2)

Good Practice: On the left the posts are constructed in a small wall (small diameter post). On the right side the posts are constructed on top of a smaller concrete wall (large diameter post). Thus, the walls are not very vulnerable to crack and the posts are protected from moisture and manure.



Figure 16. Floors and posts distances

Good Practice: The distance between posts and the width of the stalls are matched, which saves construction materials and ensures that the posts do not block the cows when lying down or getting up.

d.) Construction of the feed trough

- Cows and young stock should be able to eat in a physically optimal position, without being disturbed by constructions
- It should be easy to put feed in the feed trough
- All animals in a group should be able to eat at the same time
- It should be easy to clean the feed trough and to remove feed refusals (leftovers).

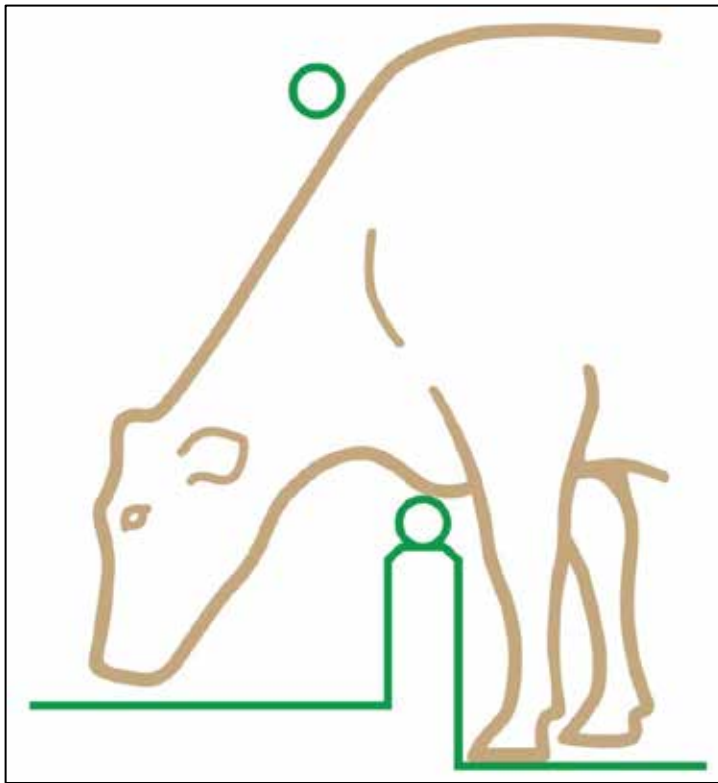


Figure 17. Correctly positioned feed fence

Good Practice: Correctly constructed feed fence and feed trough, with the cow eating comfortably.

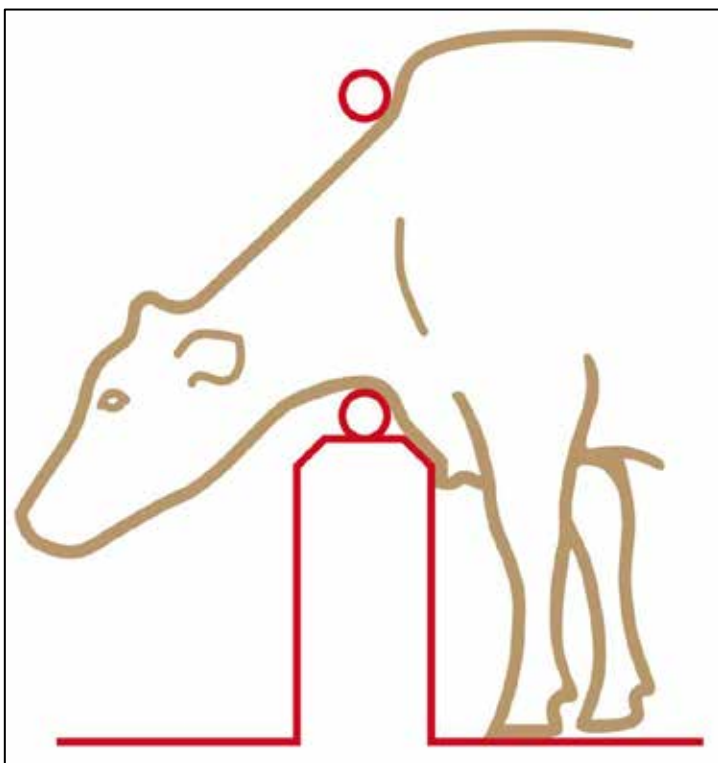


Figure 18. Wrongly positioned feed fence

Bad Practice: An overview of most commonly made mistakes in construction a feed fence and feed trough: trough too low, wall too wide and too high, neck rail too low and too far backwards towards the cow.



Figure 19. Swedish feed fence
Good Practice: This type of feed fence, “Swedish Feed Fence”, can be used for young stock with a high variation in body size. Here the dividers are made of steel.



Figure 20. Swedish feed fence from wood
The Vetoice/The Friesian Modular Dairy Barn recommends a Swedish feed fence for young stock. Here this feed fence is made of solid wood. Neck opening for young stock: 20 cm.



Figure 21. Feed fences for young stock
A feed fence that is far too small for the size of young stock in this pen. All feed fences need to be well dimensioned to the size of the young stock, except for Swedish feed fences.



Figure 22. Cleaning of feed troughs

Rotting feed residues (resulting in moulds) increases the risk of feed heating up and reduces the feed intake. Therefore a feed trough should be cleaned at least once a day.



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