

Designing your footbath using the footbath fitness test

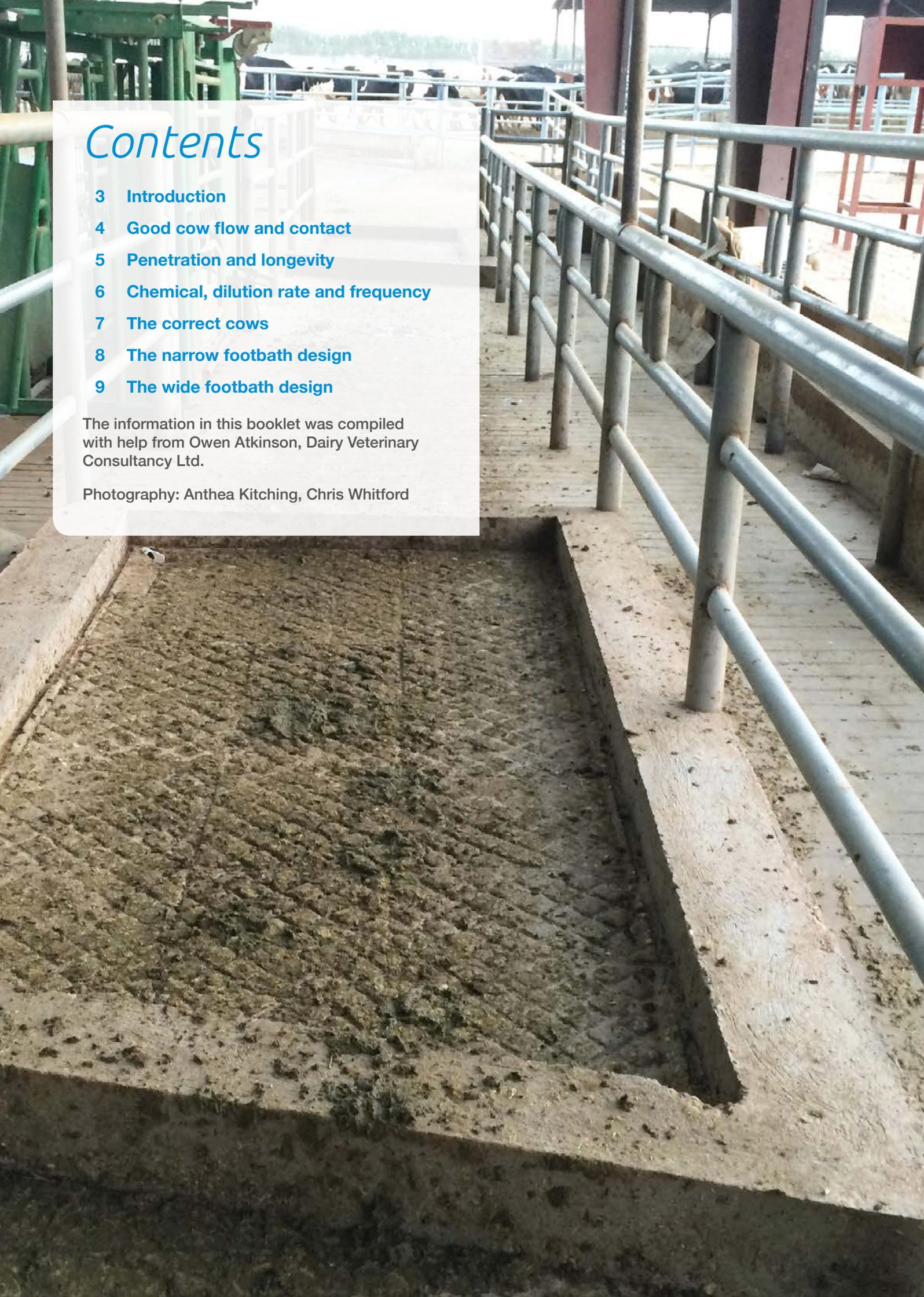


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Introduction

Building an effective footbath is an essential part of dairy farm design.

Footbaths are useful for disinfecting the feet as part of the control of digital dermatitis (DD) and heel horn erosion. Some farms use formalin, zinc sulphate or copper sulphate in an attempt to harden the hooves, but the benefit of this aspect of footbathing is less certain.

Ineffective footbathing may make infectious conditions, such as DD, worse by encouraging spread and by reducing the skin's natural defences.

There are two basic footbath designs that can work well: narrow or wide (see diagrams on pages 8 and 9).

Work through the footbath fitness test to see if you can improve your footbath design and use.

Good cow flow and contact

Do your cows walk through steadily and willingly?

Good cow flow means less splashing, which wastes less solution and reduces the risk of contaminating teats. A steady pace also allows longer contact time with the chemical, and is less stress for cows and people.

The bath should be:

- Familiar. This improves with frequency of use. Cows like routine!
- Comfortable to walk through. The floor should not be ridged or slippery. Rubber matting allows cows to walk with more confidence
- Not a bottle-neck. Where cows are walking in single file, i.e. exiting a rotary parlour platform, or along an exit race, a narrow footbath works well. If a fast throughput of the whole herd is required, wide footbaths work better so that one hesitant cow does not cause a backlog. Make sure the area beyond the footbath has a good walking surface and does not become a pinch point

You can assess the effectiveness of the cow flow by looking at the heads of the cows: heads held high are a bad sign. When they are not stressed (i.e. not on 'high alert'), cows naturally walk with their heads held low and they look where they place their feet.

Does the disinfectant solution reach the right parts of the foot and for long enough?

- The solution must cover the skin above the hoof, including at the front of the foot. This means having a depth of at least 12 cm
- Two foot dunks are generally better than one. This means having a bath which is at least 3 m long: 3.5 m long ensures that every foot is dunked at least twice, whichever foot the cow leads with; less than 2 m long might mean that not every foot is dunked even once
- Good cow flow ensures a better contact time
- Be wary of systems that rely on spraying the heels as these might not get solution to all areas of the feet, particularly the front. Spray systems can be useful for cleaning the heels before disinfecting before feet are dunked in a footbath



Penetration and longevity

How clean are the feet?

- No footbath will be effective when dirt is caked on the skin so the disinfectant cannot reach where it needs to go
- Pre-bathing in water (or a weaker disinfectant solution) can help clean the feet before the main disinfectant bath, but power washing is better. An automated jet-wash bath can be useful to clean heels and reduces splash on the teats and udder
- The areas immediately before and after the footbath are important; many a footbath fails because the passageways here are deep in slurry. A good solution is to site the footbath over a slatted passageway

If a cleaning pre-bath is used, separate the pre-bath by at least 3 to 5 meters to allow water to drain off the feet before entry to the solution bath. This separation also reduces faecal contamination in the solution bath.



How many cows can pass through the bath before replenishment?

This question relates to some extent to the previous one: dirty feet and dirty passageways before the bath inevitably lead to greater contamination. All disinfectants have a much reduced effect when they are contaminated by slurry (despite what you might be told by the salesmen!).

- Good cow flow helps reduce mucking in the bath. Stressed cows are more likely to muck in the bath. Look for no heads up
- As well as being inactivated by contamination, chemicals are generally stripped out of the bath as cows pass through and the chemical binds to the cows' feet. Topping up with extra chemical throughout use can be useful, but it takes guesswork to know how much to add to maintain the correct dilution
- A better idea is to regularly replenish the whole bath with a fresh solution using the correct dilution rate. A good rule of thumb is not to have more than one cow passage per litre of solution, before replenishing. For example, a 300-litre bath is good for a maximum of 300 cow passages
- There are some baths that regularly replenish solutions automatically, either on a timer basis, or on a cow-count basis. These are particularly useful for larger herds and can be a good solution to the problem. Maintenance is required to ensure they automatically empty and refill properly

Beware of high contamination for permanent footbaths, for example those cited at cross-overs in cubicle houses, or baths placed at the exit gates of robotic milkers. These baths can become grossly contaminated more quickly than you might first think; normal cow traffic soon exceeds the one cow per litre rule.

Chemical, dilution rate and frequency

Is the disinfectant suitable?

There is research evidence that formalin (2–4%), glutaraldehyde (2–4%) and copper sulphate (4–5% for non-acidified, 1–2% for a buffered acidified solution) can all have beneficial effects in controlling DD.

There are other commercial products on the market with claims for control of DD. Some contain peracetic acid or organic acids and there is some evidence to support their use.

The use of parlour washings should NOT be used; they have been largely discredited. The high pH can deactivate formalin, glutaraldehyde and copper sulphate; and the wetting agents (soaps) can soften the skin, making cows more prone to DD.

Hypochlorite is particularly adversely affected by organic matter (such as faeces) so it is quickly rendered ineffective in a footbath.

Antibiotics in footbaths are not suitable. As well as being expensive, there is no evidence they are any more effective than other disinfectants and their use in footbaths is irresponsible, risking antibiotic resistance developing in the environment.

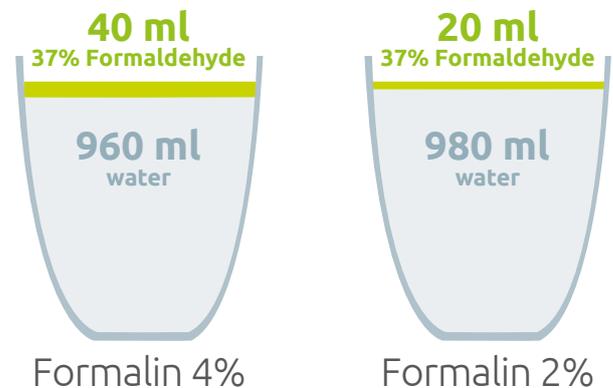
There does not appear to be a perfect footbath disinfectant:

- **Formalin** is banned in a few countries as a footbath solution, due to possible human health problems from the fumes, if not dealt with carefully (carcinogenic). It should always be used where there is plenty of ventilation, for example, outside. Formalin is not an environmental risk in the sense of accumulation, because it is a natural gas in the environment and evaporates quite rapidly, and the chemical degrades in slurry stores to carbon dioxide and water
- **Glutaraldehyde** is also carcinogenic
- **Copper sulphate** is banned in some countries as a footbath solution because of its accumulation in soils. Copper sulphate is an environmental hazard if discarded onto pasture. Acidified copper sulphate enables lower levels of copper sulphate to achieve the same effect in the footbath. This can also reduce the cost, as copper sulphate is relatively expensive compared with formalin

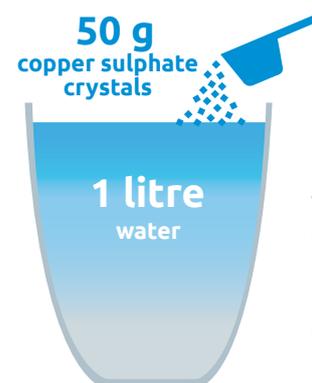
Consider the environmental temperature when footbathing. Very cold water will make most chemicals less effective, so bear in mind when footbathing in the winter. Warm weather means that volatile chemicals such as formalin evaporate sooner, so will quickly become ineffective if the solution is not prepared freshly.

What volume is your footbath? How much chemical do you need to add?

Knowing the volume of your bath is essential so you can calculate how much chemical to add to make the right dilution rate:



It is recommended to use 2% strength for a week, before increasing to 4%, to allow the cows to get used to it. It can also be suitable for a maintenance level in herds where DD is well controlled.



Some of the copper remains in suspension rather than fully dissolving. Acidified copper sulphate solutions mean a greater proportion is dissolved and so a lower concentration can be used.

Copper sulphate 5%

To calculate the volume of your footbath, measure the width, the length and the depth, in cm. Multiply all together, then divide by 1000 to give the answer in litres.

For example, a footbath that is 60 cm wide, 300 cm long and 12 cm deep has a volume of $(60 \times 300 \times 12)/1000 = 216$ litres.

Some footbaths are on a slope: take the average depth (in the middle).

Use the AHDB Footbath Calculator to calculate how much chemical to add to get the correct dilution rate.

For automated systems, calculate how much chemical you are using each week to check the calibration is still correct.

For example, an automatic footbath, 300 litres volume, which is operating at 3 fresh baths per day, using formalin added by an automatic dispenser. For a 4% solution, you should be using approximately 1000 litres of formalin per month:

3×300 litres per day, 7 days per week = 6300 litres;
@ 4% = 250 litres formalin per week.

The correct cows

How often should your cows pass through the footbath?

The correct frequency depends on the extent of the problem:

- Percentage of the herd infected (prevalence)
- Seriousness of the lesions
- Cleanliness of the feet

Studies into the frequency of footbathing are scarce but current evidence suggests that, for herds with a low prevalence of DD, a regimen of footbathing after four consecutive milkings every two weeks can be effective in preventing DD.

Conversely, in high prevalence herds, cows should be footbathed every milking to properly control DD.

Remember however, if bathing isn't done well, it will not matter how often it is done, because it still won't work!

A more scientific way to make the decision on the correct frequency suitable for your herd, is to screen the whole herd before starting the use of the footbath and repeat the screening 6–8 weeks later to measure the effect.

Which animals are being foot bathed?

Ensure that heifers and dry cows are footbathed, too. These cows often have low grade DD, which can flare up after calving. Footbathing can keep it in check.

How easy is footbathing on your farm?

The bath should be easy fill, easy empty, easy clean.

It should be easy to use as part of the normal routine – or it won't get done!

Access to the bath should be easy for all groups of animals. For milking cows, a permanent footbath cited in the parlour exit race is the most obvious choice. If it is part of the exit race (rather than a diversion) this means cows will be used to walking through it, even if it is not in use. Never put a footbath in the entrance to a shed or parlour as it becomes a gravel trap, as well as affecting the cow flow of the whole herd.

Wide footbaths are good for cow flow – but require a larger volume. A width of 1.5 m allows two cows to pass through simultaneously, but larger herds will benefit from having a width of at least 2 m.

A good space in front of the footbath means it is less likely to be a bottleneck, reducing stress on you and your cows. A well-positioned permanent single footbath might be good for all groups of cows, including dry cows and heifers, which can be walked through regularly.

The floor of the bath should be on the same level as the approach and exit floor. Avoid footbaths that cows have to step down into: they don't like this. Cows prefer same level to stepping over a curb (e.g. 20 cm high) into a bath. Avoid slopes into or out of the bath. Use flat-

topped curbs rather than rounded, as cows can see these more easily so can better judge their foot position.

Drainage design for easy cleaning is important. A hole and a bung in the lowest corner works, but makes for slow rinsing out. A sluice gate, 20–30 cm long, in the lowest corner and sliding into inserted rubber slots makes cleaning out quicker. A 10–20 cm plug hole drain in the bottom is good for baths positioned over slats or a channel. Drainage points built into a side extension at the lowest corner of the bath protects plug bungs from damage from the cows' feet.

For rapid filling, consider a raised water tank (e.g. 1000 litre IBC container), particularly if water pressure is low.

If footbathing, for you, is a dirty and difficult chore, consider what you should do to improve it. Generally, plastic troughs that need to be positioned each time they are used, and emptied by tipping out, do not make for easy footbathing. Cows often don't like walking in plastic footbaths, particularly if the floor surface has ridges, and, if they are temporary, they interfere with the normal routine of the cows.



Footbath bung

The narrow footbath design

The narrow design is favoured by large herds in the USA, particularly where cows exit a rotary parlour one by one and walk in single file down a long exit race. A narrow bath requires less solution than a wide bath. This can be advantageous for small herds, but, for larger herds, a more frequent replenishment is required.

Rule of thumb

One litre solution per cow passage.

A footbath, which is 50 cm wide and 300 cm long, filled to 12 cm deep, has a volume of 180 litres. It must be cleaned and refilled after a maximum of 180 cow passes.

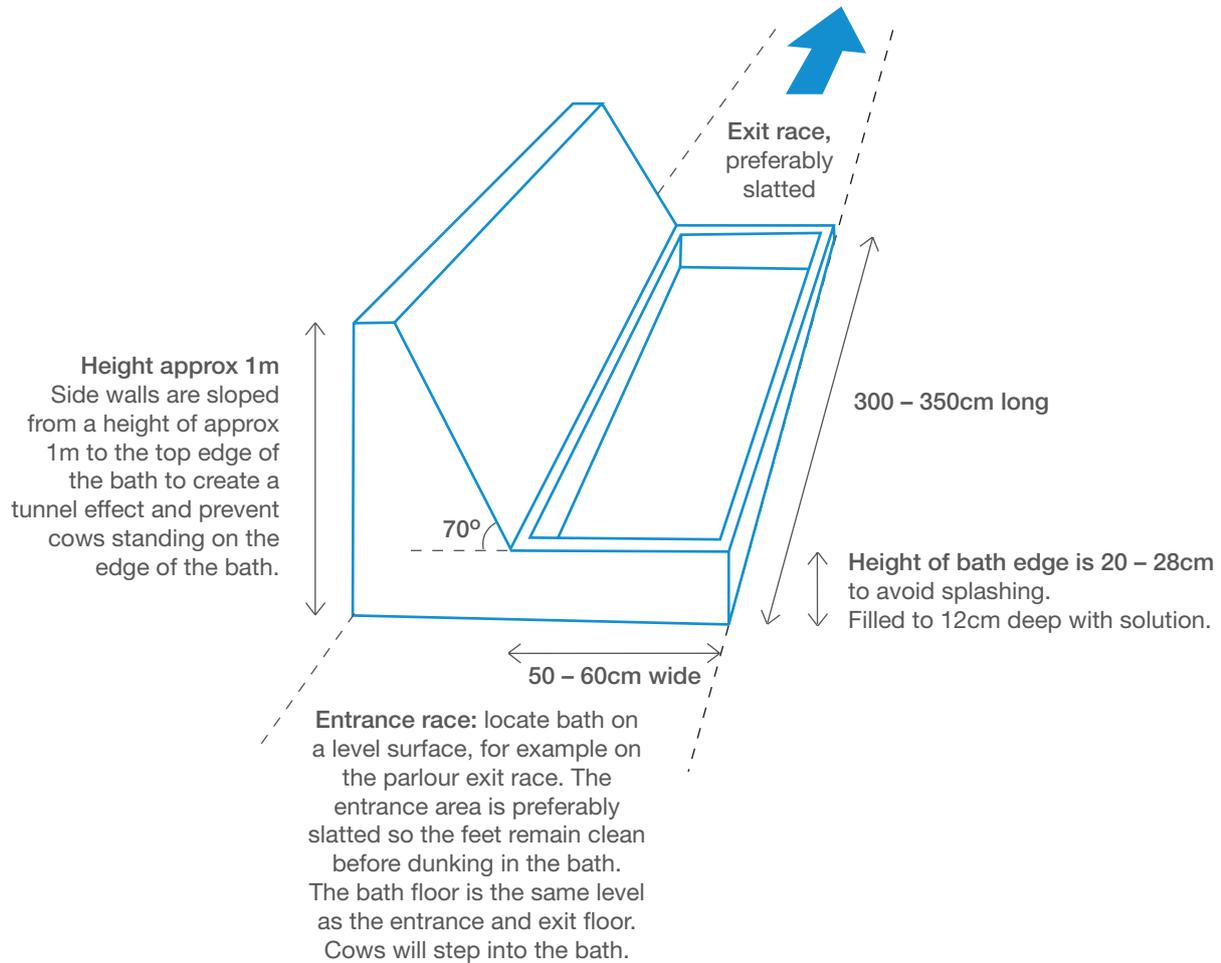


Figure 1. Narrow footbath design overview



Narrow footbath designs

The wide footbath design

An advantage of a wide bath is better cow flow, particularly if large numbers of cows exit a herringbone parlour at once (e.g. long herringbone parlours favoured by block-calving farms). A larger volume of solution is necessary and this will be costly (for smaller herds) but requires less replenishment for larger herds.



Wide footbath design

Rule of thumb

One litre solution per cow passage.

A footbath, which is 200 cm wide and 300 cm long, filled to 12 cm deep, has a volume of 720 litres. It must be cleaned and refilled after a maximum of 720 cow passes and refilled after a maximum of 180 cow passes.

Some like to have an angled leading edge to their footbath curb. This can make hosing down in front of the footbath easier because dirty water will flow to one side. It does not make any difference which foot cows lead with when entering the bath and it is not an important feature for cow flow.

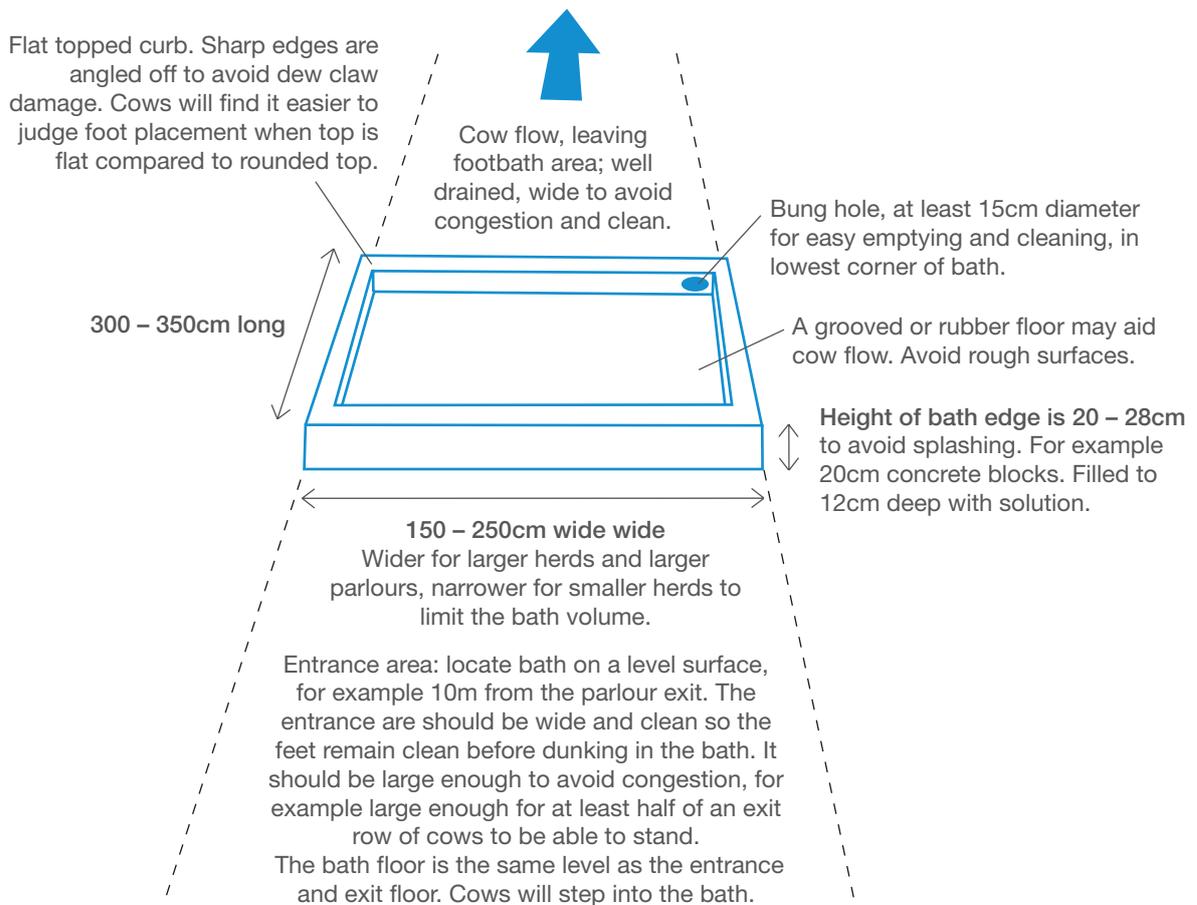


Figure 2. Wide footbath design overview

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