Building design to reduce lameness

By Nick Bell

Considerations

- A building for cows of tomorrow:
  - Higher yields?
  - Higher dry matter intakes?
  - Higher concentrate or more yield from forage?
  - Slightly smaller cows?
  - Cows with more open teat canals?
- A building for herds of tomorrow:
  - Larger herds
  - Less labour
  - Split herds

Topics

- New concrete
- Stocking rates
- Cubicle design and dimensions
- Feed barrier design
- Loafing areas and yards
- Collecting yards and parlour exits

Dangers of new concrete

- New concrete can cripple herd in a few weeks (sole bruising, sole ulcers and toe ulcers
  - Sharp points of concrete
  - Caustic alkali content
- This can be reduced by
  - Careful tamping by experienced agricultural builder
  - Grooving or laying patterns instead of tamping
  - Using low alkali concrete (pulvarised fuel ash cement)
  - Using acid washes (muric acid)
  - Allowing prolonged cure times (1-3 months) before exposing cows to concrete
  - Pulling concrete blocks over sharp concrete (e.g. in an old scraper)
  - Exposing cows to concrete in a controlled way e.g. few hours per day to start with
  - Only exposing stale cows to new concrete
  - Hardening feet with daily 5% formalin
- The best solution to highly abrasive concrete may be to lay rubber matting

Grooving

- Probably better to tamp concrete than work smooth and groove (you will need to groove concrete as it ages anyway)
- Hexagon patterns can be set into fresh concrete by specialist machinery
- Areas where cows turn can be prioritised for treatment
- Grooving should have
  - 6-10mm deep grooves
  - 10mm wide grooves
  - 40mm between lines
  - Diamond cut not flailed
- Parallel lines (striped) patterns at right angles to direction of walk are needed for passageways
- Diamonds or squares are needed where cows turn direction

Preparing old, eroded concrete

- Occasionally the existing concrete is intact but excessively sharp or eroded. This can be corrected with:
  - Planing
  - Working cement into top surface
  - Rubber mats on turning points
  - New layer of concrete on top
  - Resin coat (used to repair silage clamp bases)
  - Bitumen

Planing sharp concrete

- Contractors that groove will often have the machinery to plane sharp concrete too

Stocking rate targets for typical 700kgHolstein-Friesian

Measure	Target
Cubicle space	5-10% extra cubicles
Straw yard space	6.6m2 per cow or 1.5m2 per 1000L milk expected
Loafing	3m2 per cow
Feed	60-70cm per cow (40cm ad lib)
Water	10cm per cow

Suggested cubicle stocking rates for Holstein-Friesians

Rows per feed barrier	Group	Spare cubicles	Typical feed space per cow	Typical loafing space/cow
One	Fresh	5-10%	139-146cm	5.5m2
Two	Highs	5%	70cm	4.9m2
Three	Lows	5%	37cm	2.6m2

Falls on alleys

- Yards with falls on them will drain better and conditions will be drier under foot
  - Flood wash systems need 3% falls
  - Tractor scraped systems can benefit from a 5% fall
  - Automatic scraper systems are at a major disadvantage with a typical limit of 1.5%
- Avoid falls across the width of alleys as much as possible

Alleys need to

- Be wide enough to
  - Prevent deep slurry build up (feed alley and cubicle alley mostly)
  - Minimise cows blocking behaviour
  - Avoid bottlenecks of cow activity

Feed alleys

- Feed alley 4-5m wide for 700kg HF to minimise slurry build up and bullying
  - Ideally space so 2 cows can pass behind a cow feeding (1.1m+1.1m+1.8m)
  - More space if cows are large or if feed alley is also a cubicle alley

Cubicles alleys

- At least 3-4.5m wide i.e. wide enough for two cows to pass with a cow stood half-in a cubicle (1.1m+1.1m+0.8m).
- Wider if
  - double cubicle alley
  - large or high yielding cows
  - few connecting passages

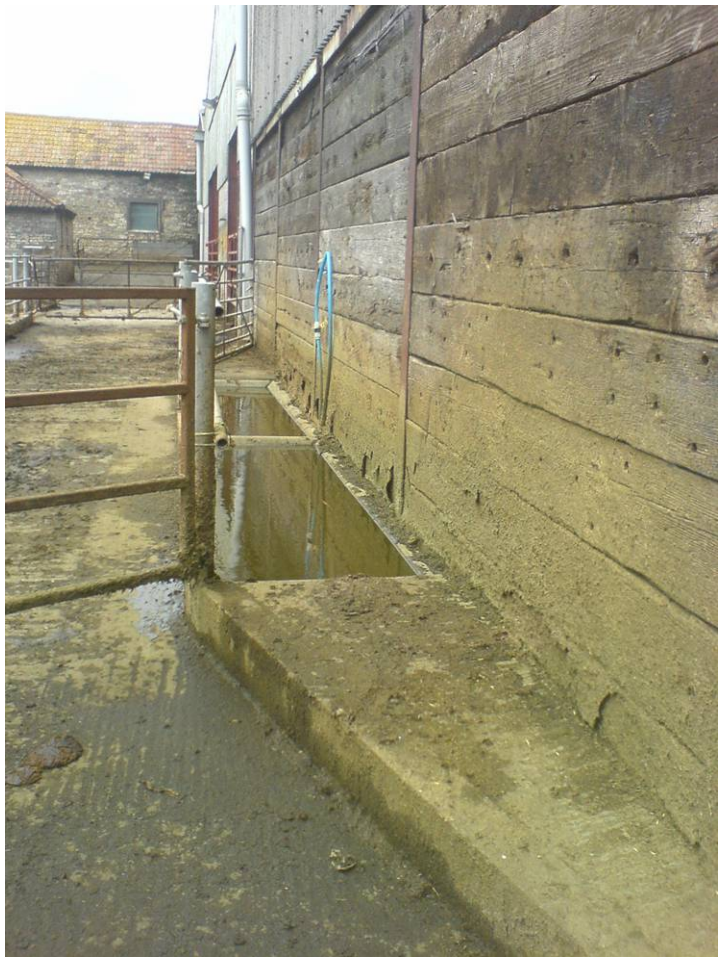
Connecting alleys

- Should be
  - 4.8m for end passes (useful for tractor scraping)
  - 3.6m plus water trough for passes within a cubicle row and with a water trough
  - 2.4m wide if no water trough
- They should be raise on a kerb unless tractor scraping is desired
- Placed every 20 cubicles to avoid bottlenecks of cow activity
- Sloped for good shedding water
- Kerbs to aid scraping
- Slightly more tamped for grip
- Tip – placing the water trough on the outside of the wall can create more space inside the shed and give water trough space in an outside loafing area, but can make scraping more difficult unless you use a kerb

Water troughs

- Tipping water troughs greatly aid cleaning
- Raising on a kerb aids cleaning

Kerbs to scrape against



Collecting yard

- If cows are reluctant to enter a parlour check:
  - Stray voltage (ask your vet or parlour specialist)
  - Look for any factors disturbing the cows (uncomfortable plastic foot baths, crossing lines or grids, rough handling)
- The collecting yard should be no wider than parlour
- Cows should travel in a straight line from an entrance at the back of a rectangular collecting yard
- Where significant channelling or turning of cows occurs or grids/slats cause problems then this may be offset by matting (opposite)
- Sloped for drainage and hosing down
- If a backing gate is used then it
  - Should not be electrified
  - If electrified, then this should be used on rare occasions and used to train cows to a buzzer or bell

Parlour exits

- Wider the better (larger turning circles for large cows)
- Mats on sharp or hazardous turns (on exits to rotary is common)
- Mats on cow length steps
- Gradual slopes may be better where cows are bunching and not able to place feet carefully

Steps vs slopes

Comfort groups

- Straw yards are recommended for
  - Freshly calved heifers
  - Freshly calved cows
  - Transition cows
- Cows prefer to lie against walls so they should be
  - Rectangular
  - No more than 30 foot deep

Cubicle divider design

- Most cubicle comfort comes from bed cushioning but design and dimension also very important
- Aim to avoid rubs, scrapes and hairloss (any signs of cows hitting cubicles)
- Supercomfort design provides
  - Borrowing space
  - Side lunge space

Cubicle divider design

- Open front design (opposite) more side-lunge space and less likely to trap limbs
- High and flexible neck rail for more standing comfort
- Small brisket rail (plus headrail) for positioning
- Slight slope uphill from back to front (maximum 10cm fall from front to back

Flexible neck rails (Kingshay display)

Open to feed alley

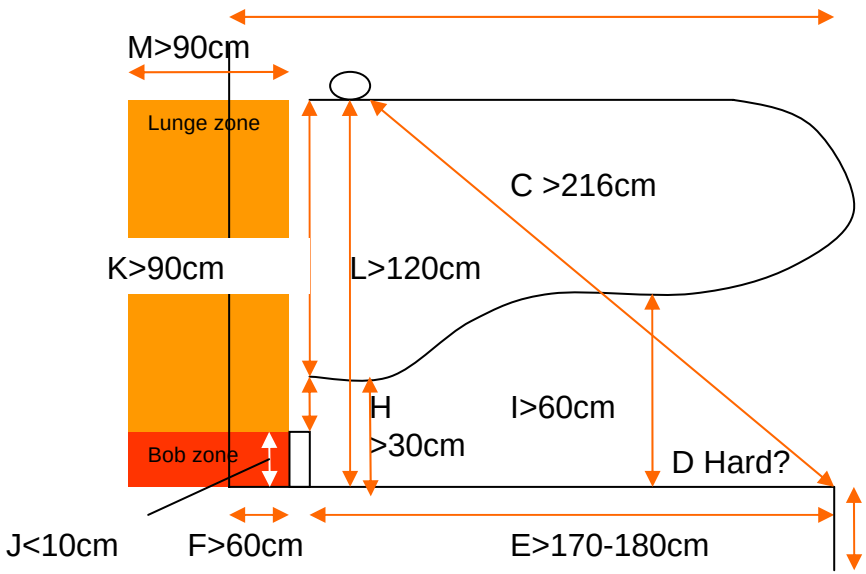
- Open fronted cubicles give cows plenty of forward lunge and cudding space
- On some units the wind may blow bedding and occasionally it is said cows dislike the exposure to wind in which case plywood may need to be installed in some sections

Other supercomfort designs – Spinder, Bulberrow

Cubicle dimensions

Cubicle feature	Ideal dimension for 700kg Holstein-Friesian cow
Total length to wall	270-300cm
Length to centre of head-to-head cubicles	240-270cm
Width	112-120cm
Length to brisket board	170cm
Length kerb to neck-rail (diagonal)	210-220cm
Height of neck rail	120-130cm
Kerb height	16-20cm
Height to bottom rail at mid-spine	60cm

Dimensions illustrated



Dimensions for other sizes of cattle

	Animal weight								
Body weight	lbs	400	600	800	1000	1200	1400	1600	1800
	Kgs	181	272	363	454	544	635	726	816
Cubicle width	Inches	29	33	36	40	44	47	51	54
	Cm's	74	83	92	101	110	120	129	138
Body resting length	Inches	43	48	52	57	61	66	70	75
	Cm's	110	121	132	144	155	167	178	189
Total cubicle length	Inches	57	65	73	82	90	98	106	114
	Cm's	145	166	186	207	228	248	269	289
Head rail height	Inches	32	35	37	40	43	45	48	51
	Cm's	81	88	95	102	109	115	122	129

Brisket boards

- 170cm from kerb
- Allow the cow to stretch one leg forward
  - No higher than 10cm
  - Rounded edges
- They can be used to fix down cubicle mats
- Chamfered/planed wooden rail, plastic drain pipe, metal pipe or plastic poly pillows all make suitable brisket boards

Feed barriers

- Vertical dividers reduces bullying

Feed barrier design

- Poor neck rail position can:
  - Cause neck lesions
  - Cause cows to push to reach food
  - Reduce dry matter intakes
- Designs to reduce stretching and bullying include
  - Neck rails offset by 20-30cm (and 120-130cm from ground)
  - Flexible neck rails
  - Raised feed surfaces (by at least 10cm)
  - Bars to prevent cows pushing against each other

Feed barrier design

Neck rail offset

20-30cm

Raised 10cm

Flexible neck rails

- Flexible neck rails are good but
  - Can cause neck rubs if wire or rope not covered with suitable plastic
  - Wire can wear through posts with time

Straps good but require constant tensioning

Yard mats along feed barriers

- Rubber matting may offset some damage caused by standing at feed barrier
  - Set above concrete can work for flush systems but are difficult to scrape
  - Recessed into concrete works for new build
  - Along one or both wings of an automatic scraper can be done

Voluntary foot bath for your dry cows and youngstock (see foot bathing notes)

Avoid automatic scrapers

- Labour saving but
  - cows exposed to bow waves which bathe feet in slurry
  - Problems when they breakdown
  - High risk for digital dermatitis
  - High risk for heel erosion
  - High risk for softening feet
  - Fresh slurry is more likely to contaminate udders (via feet and tails)
- Short runs may be the compromise
- Regular slatted sections may reduce the depth of bow wave but add an addition risk factor for lameness

Avoid slats

- Slurry can become dry in which case
  - The system can block
  - Dry slurry paste accumulates between claws
- Slats are more likely to put uneven forces through claw
- Worn slats become hazardous

Avoid cow congregation due to housing design

- When cow floor is poor. Notable causes of poor cow flow
  - Blind alleys
  - Narrow alleys
  - Lying areas distant from feed areas
  - Grids in the floor
  - Uncomfortable steps and steep slopes

Summary – think of future needs

- Higher performing cows, fewer labour units, more cows means
  - More emphasis on
    - Prevention through dry, hygienic feet
    - Lying comfort
    - Standing comfort (especially the feed barrier, collecting yard, dispersal area and cubicle alleys)
    - Management grouping

Take home point- walking & standing comfort in key areas for vulnerable cows & heifers