

Milking smarter

Building a new dairy



DairyNZ 



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Contents

Building a new dairy can be a challenging, costly and time-consuming process. If well designed, both rotary and herringbone dairies can provide productive working environments that are both cow and milker friendly.

This guide should be used with the designs for new dairies, see dairynz.co.nz/dairy-type and dairynz.co.nz/dairy-blueprints. It expands on some of the points and features highlighted in the blueprints.

<i>Building timeline</i>	2
<i>Dairy site</i>	4
<i>Good dairy design – general principles</i>	6
<i>Good design – races and yards</i>	7
<i>Good design in the dairy</i>	13
<i>Other useful resources</i>	20

For more about choosing a dairy and yard type see:

Do you need to upgrade?

dairynz.co.nz/dairy-upgrade

Choosing a new dairy

dairynz.co.nz/dairy-type

Dairy design blueprints

dairynz.co.nz/dairy-blueprints

Technology for the dairy

dairynz.co.nz/dairy-technology

Building timeline

Information gathering

1. Decision to build or upgrade dairy.
2. Decision on type and size of dairy and yard and effluent system- coming up with a wish list and a budget.
3. Develop a timeline for the project which allows for weather/seasonal challenges, consenting and due diligence time as well as any building delays.
4. Consult with farming professionals and neighbours to review design and technology options, designers, brands and systems.
5. Consult with your dairy company to make them aware of your intentions, and get an up to date copy of their terms and conditions of supply for dairy buildings, tanker and road entrance.
6. Your Farm Dairy Assessor can advise on food safety requirements such as minimum distances between milk contact areas and facilities such as effluent holding areas. They will be the person who signs off on the dairy to ensure it is fit for purpose before milk supply can begin. You may like to refer to the Ministry for Primary Industries' NZCP1: Code of Practice for the Design and Operation for Farm Dairies available at www.foodsafety.govt.nz/elibrary/industry/dairy-nzcp1-design-code-of-practice/.
7. Contact both the Regional and District Council to discuss any consenting requirements and rules around the site and building, and timeframes for the consent application process.
8. Begin discussions with dairy designers and builders to formalise plans, budgets and timeframes (plan key milestone dates i.e. concrete poured by this date, roof on by this date, dairy completion date etc).
9. Engage with other service providers as required such as effluent system designers, earthwork contractors, electricity and network companies (unless you have gone with a designer or builder who offers a turnkey package where the whole project is managed on the farmers behalf).
10. It may be wise to seek legal advice when reviewing contracts and quotes. The two greatest risks to a new dairy build are a cost and time blowout.



Tip

It's good practice to get as many fixed price quotes as possible. Some banks require this under their lending terms.

A good rule of thumb is to aim for at least three quotes for services. You can ask to visit former clients of your chosen service provider to see examples of their work and ask farmers about their experiences. For example, earthworks is an area which often has budget overruns.

During the build

1. Holding a project team meeting before the build starts, including the electrician, plumber, builder, plant installer and effluent system designer/installer can help to make sure everyone's requirements are allowed for and everyone is on the same page.
2. Check in with key people involved in the project on at least a weekly basis to monitor progress against the project timeline and address any issues as they arise.
3. Monitor monthly expenses and track against budget.
4. Keep your bank manager in the loop if there are any significant budget changes as they arise.
5. Review your insurance policy to make sure your improvements will be adequately covered.

Completion

1. Satisfactory commissioning of new facilities. This should include a milking machine test and any regulatory approvals required by a Recognised Authority before final payments are made to builders and installers
2. Insurance in place (consider building, liability, loss of income and consequential loss cover)
3. Producer statements, warranties, user manuals and training requirements are covered
4. Debrief with project team for feedback and recommendations for those involved with future projects.

Dairy site

Information gathering

A new farm dairy or alterations to an existing dairy must be assessed to ensure compliance with NZCP1 and other relevant requirements. The site suitability, premises and plant must be assessed by a Farm Dairy Assessor prior to work starting, and on completion of the building, before milk can be collected for supply. Compliance includes the requirement that all local authority consents have been obtained e.g. building, effluent discharge and consent to take water. Full requirements for the dairy site can be found in Section 5 of NZCP1.

Choose the best site available for the dairy, as the site will dictate a lot of the design options, and have a significant influence on the build cost. Some of the factors to consider for the proposed dairy site:

- For some sites, it may be wise to seek geotechnical advice to assess the site suitability for the building and pond placement in terms of soil type, strength and stability, risk of erosion, slips or slumping and any hydrological issues such as groundwater or flooding risk. Soil types such as peat pose design challenges and risks.
- A gently sloping site is ideal for utilising gravity to convey effluent; as it's more reliable than pumps, and saves pumping costs.
- Slope can be useful for achieving desired yard and dairy levels on rotaries, however flat sites may require less earthworks if a low level pit (keeping the yard and dairy building at ground level) is chosen. It is important to include the effluent designer at this stage to make sure effluent drainage and fall requirements are addressed.
- The water table must be well below the minimum depth for any excavation requirements (e.g. the effluent pond).
- Are there any water freezing issues to address? Is a freeze-proof plumbing required?
- Be mindful of the prevailing wind and impact on cow and milker comfort. Where possible, placing the vat stand on the South side of the building will shield the vats from sunlight for much of the day, reducing cooling energy requirements. However, most of the heat gain comes through wind not the sun if a single-skinned vat used, hence shelter is also important.



More info

See NZCP1 for new dairy design criteria for Food Safety. www.foodsafety.govt.nz/elibrary/industry/dairy-nzcp1-design-code-of-practice/

- Having open sides on the dairy on the North-East/North-West sides will assist keeping the inside dry and free from algal growth.
- Proximity to three phase power, adequate potable water supply and other amenities.
- Room for all current facilities as well as room to grow in the future. Consider that the silage stack leachate, stored feed leachate, feed pad, wintering barn, and any other areas where there is effluent accumulating will need to be able to drain into the effluent storage pond (utilizing natural fall and gravity will save pumping costs). Consider that you may wish to expand the dairy, yards, pad areas or ponds in the future and you will need plenty of room for vehicle access, including stock and supplementary feed truck turn around points, etc. around this area. Consider adding all of these facilities into your initial design, even if you have no immediate plans to go ahead with them.
- The tanker pad should drain to the effluent system, but be on a raised concrete apron to avoid drainage water from the tanker track and surrounding areas entering the effluent system. Tanker pad and tanker park area need to meet dairy company requirements.
- Optimise the race and dairy layout for cow flow and functionality. This is of prime importance. Poor cow flow can lead to a number of issues including stock bottlenecks and excess effluent generation, as well as on-going frustration for staff.
- Regional and district council minimum distance requirements to boundaries, houses, public spaces, waterways or other features. Requirements may vary from Council to Council, and rules may be updated from time to time, so it pays to check requirements and apply for any required consents early.



More info

See Responsible Dairy Conversions for more about meeting dairy industry commitments around environmental responsibility

dairynz.co.nz/responsible-conversions

See Designing or upgrading effluent systems for more information

dairynz.co.nz/effluent-system-design

Good dairy design – general principles

To ensure good cow flow:

- Eliminate slippery surfaces - use rubber matting or textured concrete surfaces to prevent cows slipping.
- A slope of 2 - 3% on concrete surfaces to allow drainage without creating a slip hazard for cows. There is a move to reduce this to no more than 2% as it leads to better flood cleaning.
- Avoid dramatic changes in lighting from outdoor to indoor- use skylights to ease the transition, and avoid shadows across walkways or high contrast patterns which may be seen as a barrier or distraction for cows. Cows will prefer to move from dimly lit areas to more well lit areas, but will avoid walking into a very bright light.
- Ensure pipe work and welds provide a smooth flush contact surface for cows, eliminating places to catch hip bones or legs. Mount horizontal pipes cow-side of vertical pipes wherever practical.
- Design races requiring corners in a gentle sweeping bend; avoiding sharp turns and corners, changes to walking surface at junctions or corners, or making cows walk in the opposite directions on two sides of a fence, these will all slow cow flow.
- If a climb or drop is required, steps are more desirable than a ramp for cows.
- Minimise chances of stray voltage by ensuring pipework is well earthed.



More info

For more information about good design principles of tracks, yards and handling facilities see:

dairynz.co.nz/tracks-yards

For more information about stockmanship in the dairy see:

dairynz.co.nz/dairy-stockmanship

Good dairy design – races and yards

Race design is important for good cow flow and minimising lameness. For a more detailed explanation about good race design, see the section on Tracks and Races on the DairyNZ website dairynz.co.nz/tracks-yards.

Race and yard entry

- The race entry point to the yard should be the same width as the race or wider to prevent congestion. Consider concreting a section of race adjacent to the dairy, as it is a high use area which can degrade quickly. This concreted area will need to be bunded/nib walled and cleaned, and accounted for in the effluent system design.
- Avoid any sharp turns to enter the yard. All corners should be wide and sweeping to avoid cows pivoting on concrete or having to stop and change direction. This affects both lameness and cow flow.
- The yard entry needs to be positioned to allow cows to fill it in the same order they walked from the paddock, but allowing space for them to rearrange themselves into their milking order. The yard entry should be no less than 6m wide. No change in height between the yard and the race surfaces (no step up or down), is preferred. However, cows may step over a nib wall (50-75mm high and 300mm wide) to prevent stones being scuffed onto the concrete yard.



More info

Good race design is very important for cow flow and minimising lameness and mastitis. For more about race and yard design see:

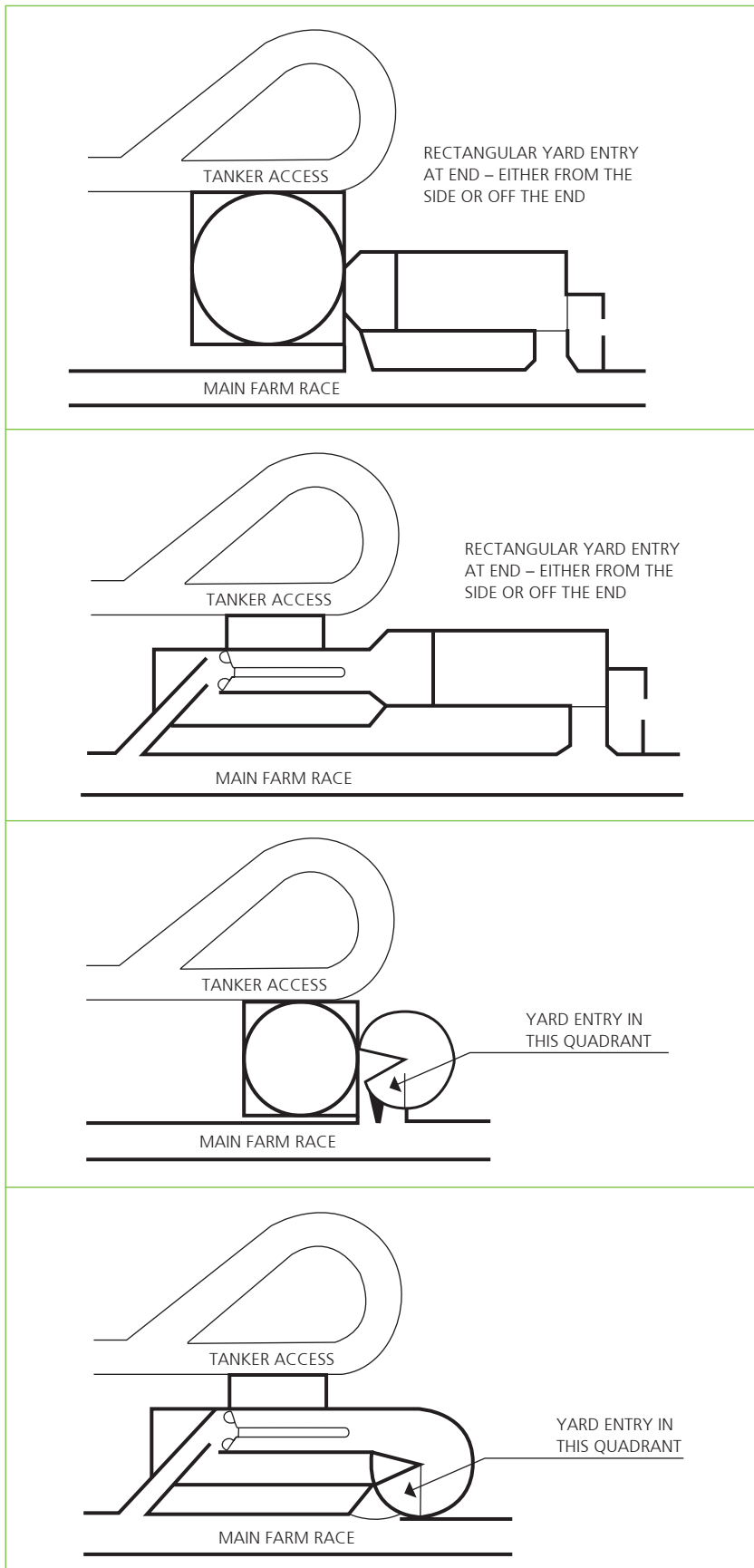
dairynz.co.nz/efficient-tracks

dairynz.co.nz/track-building

dairynz.co.nz/yard-intersection

Some examples of entry points are shown in the diagram below¹:

Siting of dairy relative to main farm race and tanker access



- For rectangular yards, enter at the rear of the yard, either on the end of the yard, or either corner.
- For circular yards, the entry point for should be as far from the point of entry into the dairy as possible, allowing for cows to fill the circular area facing toward the dairy.

¹ Reprinted with permission from Fox Eden and Associates

The above blueprints are intended as a visual aid only, professional advice and building plans should be sought for your specific site requirements.

Yard size

Calculating the yard size:

1. Start with the maximum sized herd to be held in the yard (allowing for future herd increases).
2. Multiply by the space required per cow:
 - a. 1.2m² (Jerseys)
 - b. 1.5m² (large Friesians)
3. Yard area required (m²) = m² per cow x number of cows in herd.
e.g. 400 cow jersey herd in a 50 bail rotary: 1.2m² per cow x 400 cows = 480m² yard

Yard slope and surface

- Slope should not exceed 2-3% for cow comfort and efficient washdown.
- Concrete should be textured (although not too abrasive as to cause lameness issues), by brushing, stamping, cutting or scabbling. Ensure any excessive roughness is removed before cows use the yard.
- Drainage pipework needs to be sewer quality PVC, with a minimum slope of 1.5% (1:66), and a maximum fall of 3.3% (1:33).
- The effluent designer should be involved with the positioning and fall of waste pipe work in the dairy to ensure there is adequate fall with all adjoining pipework to the effluent system. Bringing the effluent designer in too late into the project can mean costly changes or lost opportunities.
- Yard perimeter requires a 150mm nib wall to contain effluent and wash water.



More info

For more detail on calculating the yard size and shape see:

dairynz.co.nz/yard-design



More info

For more information about achieving the ideal yard surface see:

dairynz.co.nz/yard-design

Backing gates

- Consider a backing gate that doubles as a yard wash. Recycled water yard wash systems offer freshwater and effluent management savings. There are strict criteria around the use of recycled water, see NZCP1, section 8.9 for details, and speak with your dairy company.
- Backing gate controls ideally should be positioned so they are easily accessible while milking, but facing away from cows entering the bail area in a rotary so as not to cause a distraction for cows (however this arrangement may not suit left-handed people well, so there is a degree of personal preference). For rotaries, placement to the right of the cups on station (anti-clockwise dairies, and to the left for clockwise dairies), allows the operator to use the controls without turning to face the cows (turning to face cows from within the bail area can cause cow flow issues).
- A mirror facing into the yard allowing the operator to see from the cupping position how tightly the cows are packed into the yard is helpful.
- It is recommended that backing gates don't exceed 15m in length for a circular yard, and 12m for a rectangular yard. If gates are longer than about 15m, they become increasingly heavy and expensive to build.
- Backing gates should only ever be used to reduce the yard size, while still allowing cows room to move about. They should never be used to push and pack in cows tightly. Backing gate use can have a significant impact on lameness and cow flow. Use 5 second cut-off switches on backing gate controls so the gate can only be used in small increments.
- Backing gates should have a pre-start warning system for cows such as water pumps starting, or a gentle tone to warn cows it is about to start. Backing gates should also continue to sound a gentle tone or bell when the gate is moving to alert cows that they are on the move.
- Avoid electrified backing or top gate systems as they are difficult to manage without distressing the cows.
- Backing gates should be fitted with a hock rail, height of 500mm, and shouldn't form a wedge that may trap legs at the centre of circular yards.
- Circular yards with two or more backing gates can form dangerous trapping hazards and potential for gate damage if they collide. Consider adding trigger or proximity switches to the gates to prevent them forming dangerous pinch points and colliding.
- Pick-up gates are recommended in round yards. They reduce trapping areas by moving the last cows of the herd out of the centre and can be used for training cows onto a rotary platform.



More info

For more detail about backing gate design and use, please see:

dairynz.co.nz/backing-gates

Wash down/effluent

The more water used in yard cleaning, the greater the volume of effluent produced. The benefits of an efficient yard cleaning system include:

- Improved work efficiency. Efficient and effective cleaning routines save time and effort, freeing up people for other activities.
- Reduced fresh water use and wastage.
- Reduce volume of effluent produced. The efficient use of water through well designed yard wash down systems will reduce the volumes of effluent produced. Lower volumes of effluent will cost less to manage.

The two primary factors driving yard cleaning efficiency are the volume of water used and the pressure at which it is delivered. Generally high volume, low pressure systems work best.

Options for efficient yard cleaning include:

Yard slope and drainage

Single slope yards rising up towards the dairy promote good cow flow and can be cleaned effectively using a variety of cleaning systems. Yards with twin slopes or cross slopes can be cleaned by hose or hydrant systems but are not suitable for flood wash systems. There may also be problems with using backing gate cleaning systems on twin slopes.

Yard surface

The surface of the yard affects the ease of cleaning.

- Excessively rough and cracked concrete surfaces increase the time spent hosing.
- Large grooves running across the slope can slow water flow and trap sand particles. Grooves running down the slope enable sand to be flushed away.
- Concrete should not be over finished, as it can become slippery and fine material can come to the surface, which breaks down under continual washing.

Pumps

- Place water pumps close to the storage tank – this reduces the distance water has to be 'dragged' and is less effort for the pump.
- Pump suction and discharge have a large effect on the amount of water a pump can output.
- The delivery to the pump is best from above, but if suction is necessary, the lift should be as short as possible.
- The delivery pipe should be at least 51mm internal diameter.

Actions to take

- Divert water from the plate cooler into a reservoir tank, which can be used for washdown to stock water.
- If it is allowed by the dairy company you wish to supply, it may be worth considering greenwater flood-wash or backing gate yard wash systems to save time, water and effluent management costs.
- Look at other options which may suit your design such as flood wash and cleaning systems attached to the backing gate possibly using recycled water (if allowed).



More info

For more information about yard cleaning see:

dairynz.co.nz/yard-cleaning

There are strict criteria for the use of recycled water near the dairy.

The rules and requirements can be found in NZCP1, under 8.9 Cleanliness of Premise

www.foodsafety.govt.nz/elibrary/industry/dairy-nzcp1-design-code-of-practice/

External Vet and AB area

The association of painful procedures with the dairy can affect milk let-down, so if painful procedures must occur, it is best practice to do these in an alternative place, such as a vet or artificial breeding (AB) race.

When designing an AB or vet race include these features:

- Space in front and behind restrained cows is necessary to allow access for handlers.
- The race should be sized to hold batches that are easy to handle i.e. about 20 at a time, to reduce loading and unloading hassles.
- In herringbone dairies:
 - Put the AI race next to the herringbone rather than in front or behind.
 - If the race is a herringbone style it should be like the left hand side of a herringbone (If you were standing at the yard looking up the pit - cows heads facing left), as this suits most right handed AI technicians.



Example of a herringbone AI race.

- Vet races can have a drop down rail for easy access.
- Crushes should allow for safe and full access to both sides of the cow.
- The crush or head bail should be accessible from the dairy exit race or holding pen.
- The crush should not have a horizontal bar under the neck control – to avoid cows strangling themselves if they fall.



More info

For more information about the design of handling facilities see:

dairynz.co.nz/handling-facilities

Good dairy design – in the dairy

Environment in the dairy for cows and people

- Ensure the dairy is well lit - good natural lighting is best (open walls, windows and clear panels), in combination with efficient artificial light.
- Consider light and motion activated sensors to reduce the length of time artificial lights are required. LED lights can significantly reduce electricity costs and generate less heat. Go for white lighting, avoid harsh lighting in areas like the bridge which are hard on both cows and workers eyes on dark mornings. Additional lighting may be needed at the cups on/off stations and vet areas for assessing teats and milk colour/consistency and administering treatments.
- Muffle loud pumps and other noisy machinery by placing them in a separate well ventilated room preferably two walls away and especially well away from the cups-on operator.
- Consider leaving the sides of the dairy open where they do not face a strong prevailing wind. Alternatively, sliding or roller doors can be used to provide ventilation when needed, allowing the dairy to dry out and shelter from wind and rain on cool days. If possible, consider sliding doors rather than roll-up doors, as they can introduce a bird nesting site, and need to be capped at the ends.
- Make steps wide and use an anti-slip surface if required to keep them safe. Adding striped paint will make the edges easier to see.
- Consider rubber matting for areas where staff stand for long periods, and for cows in areas where sharp turns are difficult to avoid e.g. exit area of rotary.
- Use mirrors and windows to aid visibility for key areas outside the dairy building to prevent milkers having to leave the pit, i.e. go out into the holding yard, and the drafting and exit race areas.
- A roller door from the tanker track into the pump room can allow for easy delivery of consumables and plant maintenance.
- Placing a chemical shelter outside the plant area or pump room (for plant-cleaning detergents and teat spray), with plumbing through the wall can reduce the need for carting heavy drums around the dairy. Note: it is not permitted to store and mix other chemicals such as herbicides within the dairy site for food safety reasons. A designated lockable chemical storage area at least 20m away from the dairy may be required. It is worth factoring this into the overall design, as you may wish to put in an additional water line to the storage area for the mixing and cleaning of chemical handling and storage equipment.
- It may be necessary to provide a toilet for staff in the dairy. This will need to have a separate septic system (it cannot share the dairy effluent system).



More info

For more information about the environment in the dairy for cows and milkers, see:

dairynz.co.nz/dairy-environs

- Separating wet and dry areas using partition walls or steps/raised floors can be helpful for cleaning, and keeping areas such as the office and store area dry, while making it easy to clean wet and thoroughfare areas. Having drains in these areas is important for the occasions when they do need to be cleaned out.
- The dairy design should to deter birds and rodents.

Entry into the dairy

- Eliminate surfaces or protrusions which may hurt cows including sharp edges. Horizontal pipes should be mounted cow-side of vertical post wherever possible.
- Drain tanker pad, vat stand and plant area via an inspection drain in cupping area to highlight errors (e.g. vat door left open).



More info

See blueprints for diagrams:

dairynz.co.nz/dairy-blueprints

Rotary dairies – entry

- Slightly flared entry at yard (preferred width is around 1200mm), fence height also around 1200mm high.
- Bridge near platform one cow wide (preferred width is around 900mm)
- Bridge approximately two cows long, i.e., 2000-3000mm – to minimise fighting and jostling coming into the bail area.
- Safety switch to prevent crushing cows which haven't fully walked on (ideally spring loaded for auto restart).
- Milker able to step back alongside bridge (2000-3000mm) to encourage cows without turning to face cows or being obstructed by steps, underpass etc.
- Control console should be to the side of the cupping position, not behind. Left of milker for clockwise rotary, right for anti-clockwise.
- A slipway 2000-3000mm from the bridge area to enter the yard if required, in a way that does not disturb cows on the bridge.
- Placing the plant area (hot water, filter socks, wash controls) in the corner next to cups-on allows for easy access.
- Wide safe non-slip steps.



More info

For more information about rotary entry design, see:

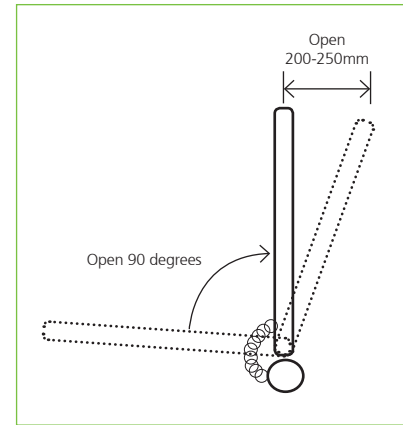
dairynz.co.nz/rotary-entry

Rotary dairies – bail design

- Breast rail should be approximately 800mm high. Feeders should be 200mm lower than the breast rail.
- Gap between bridge and platform no more than 40mm to avoid trapping feet.
- Gap between bails (where clusters are hung) is minimum of 650mm.
- Bail length 1500-1650mm long (too long allows heifers to stand too far forward).
- D-gate post positioned approximately 500mm from the platform edge, and gate should open 30° beyond parallel to the cow, so a cow can push into bail early, and 90° in opposite direction to allow a slow cow to exit safely.



D-gate opening 30°



More info

For more information about rotary bail design and cupping area, see:

dairynz.co.nz/rotary-bail

Rotary dairies – exit

- Bridge exit area needs to be a minimum of 3 cows wide, consider larger for rotaries >60 bails.
- Exit area at least 3000mm deep to allow plenty of room for cows to turn around to exit.
- Placing office next to exit area can minimise cable length to drafter and means computer is near vet stand, helpful for pregnancy testing for example.

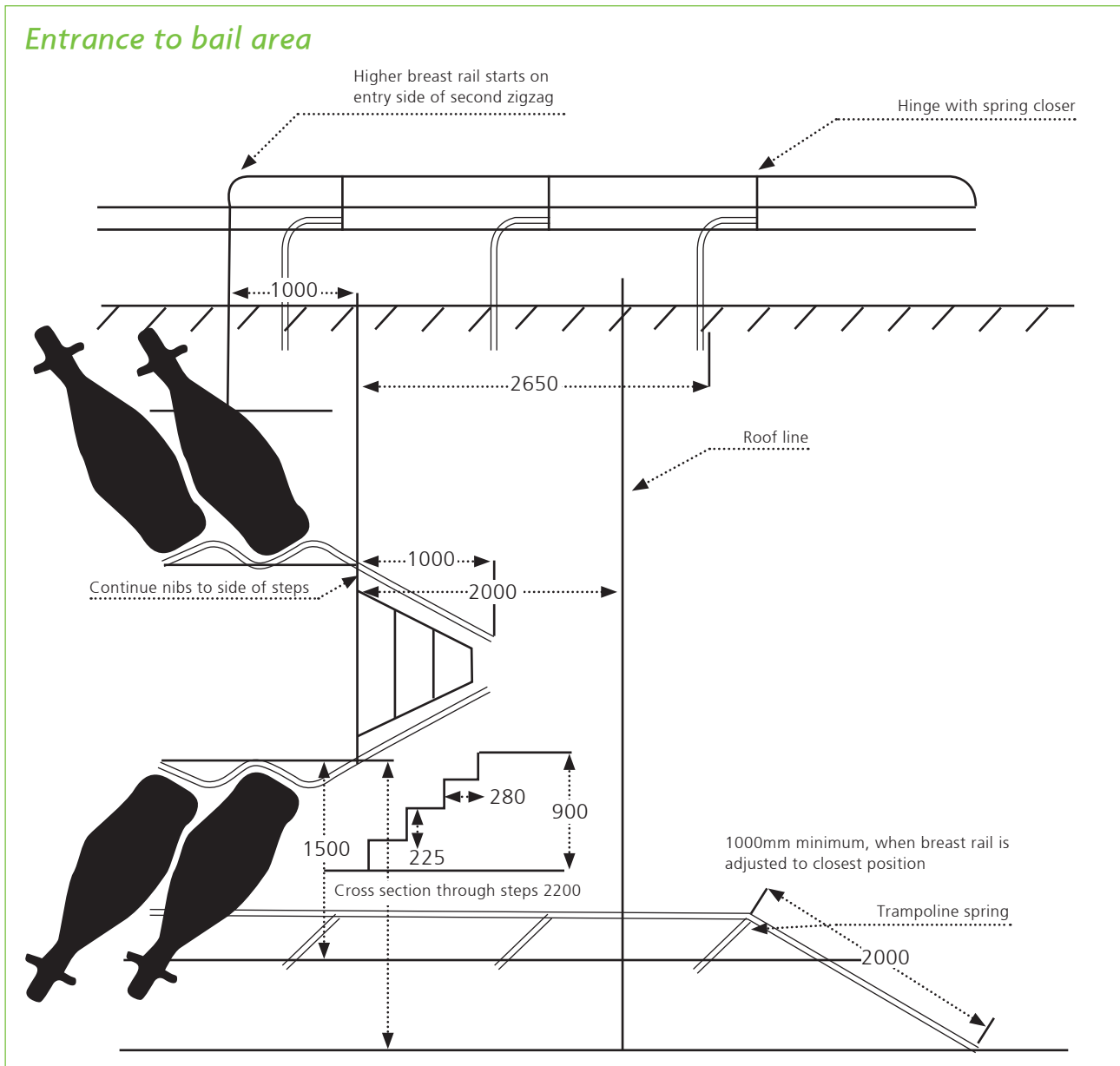
More info

For more information about rotary exit design, see:

dairynz.co.nz/rotary-exit

Herringbone dairies – entry

- Bail entry allows for 2-4 cows to line up in the entry area without rowing up (lead in)²



² Reprinted with permission from Fox Eden and Associates



Lead in breast rail height should be 900-1000mm.

More info

For more information about herringbone entry design, see:

dairynz.co.nz/herringbone-entry



A zigzag rump rail is preferred for cow/cluster alignment.



A floating/rotating back rail to hold the last cow in place, which can be put in place by the milker without having to leave the pit.



A nib rail or wall to stop cows' feet slipping into the pit, causing fear or injury. This is especially important for dairies without zigzag rump rails. E.g., 20-25mm pipe mounted 50 mm to top of pipe supported by 25 x 3mm steel straps spaced 800mm apart and bolted to the pit wall.



Add a mirror for checking yard situation and backing gate placement, rather than looking into or entering the yard (disrupting cows).

Herringbone dairies – bail area

- Meal feeders divide into two sections so you can be feed half a row at a time.
- To give the first cow plenty of room, the distance from gate to tip of the first zig-zag measured in line with the tip of the zig-zag should be a cluster spacing+ 200mm.
- Wide cluster spacing is better for cow flow- make it a minimum of 700mm.
- Pit depth between 850-950mm.
- Adjustable breast rail (breast rail height 760mm for Friesian, 700mm Jerseys).

More info

For more information about herringbone pit and bail design, see:

dairynz.co.nz/herringbone-bail

Herringbone dairies – exit

- Exit and backing gate control access in multiple places in the pit or a pull cord running full length of the pit.
- Pendulum, scissor or curtain gates for exit gates (horizontal swing gates are harder to close from within the pit).
- Exit area should be clear of poles or areas for cows to catch their heads before they can exit the gate.
- Minimise narrowing of the exit to smaller than the bail width. The head gate support post should be in line with the rump rail not jutting out into the pathway of the exiting cows.

More info

For more information about herringbone exit design, see:

dairynz.co.nz/herringbone-exit



Gates must swing high to avoid hitting cow's heads. Ensure there is at least 1400mm clearance at the breast rail. Exit gate needs to align with cow angle i.e. match cluster spacing.

Technology

- Consider security systems, fire alarms and any network, Wi-Fi or phone system requirements for dairy technology and office requirements
- Allow for the inclusion or upgrade of technology in the future (i.e. automated drafting, in-bail EID, in-shed feeding, ACRs, scales, automatic drafting etc., if not installing them at time of build).

Electricity

Reducing energy consumption for milk cooling, milk harvesting and hot water production, provide the greatest energy savings.

Consider these factors:

- Milk cooling: Adequately sized plate coolers, double-bank plate coolers, cooling towers, and milk silo insulation wraps.
- Milk harvesting: Variable speed drives for vacuum and water pumps, aiming for the shortest milking times possible (use of Max T and milk harvesting efficiency strategies).
- Hot water: Optimise water-use and temperatures, off-peak heating, insulating pipes and cylinders, heat-recovery from the milk chilling system or solar water heating systems.

ECCA have provided information and an energy efficiency calculator to help farmers calculate the cost of electricity use in the dairy, and identify opportunities to reduce costs, including the options mentioned above. For more information visit <http://www.eecabusiness.govt.nz/dairy-farms>

These options may be worth investigating to see if they demonstrate a viable benefit for installation in the dairy:

- Energy efficient and motion activated lights in and around the dairy.
- Energy saving milk cooling options such as on-roof cooling of cooler water overnight or forced air cooling towers.
- Gas water heating.
- Renewable energy generation sources such as solar or wind.
- Wiring a stand-by generator plug into the switchboard for significant power outages (this is much cheaper and easier to do when the dairy is built, than retrofitting).



More info

For more information about herringbone technologies in the dairy, see:

dairynz.co.nz/dairy-technology

Other useful resources to review when building a new dairy:

Responsible Dairy Conversions

dairynz.co.nz/responsible-conversions

Smart Water use resources for reducing fresh water use around farm and dairy

dairynz.co.nz/smart-water-use

DairyNZ Health and Safety resources

dairynz.co.nz/health-and-safety

DairyNZ effluent system design and management resources

dairynz.co.nz/effluent

dairynz.co.nz