FEEDLOT DESIGN AND CONSTRUCTION

21. Livestock handling

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Introduction

A successful feedlot operation must be able to handle cattle properly to achieve maximum efficiencies, performance and safety while minimising stress on cattle.

Livestock handling facilities should be integrated into the overall feedlot site plan, and must be well designed, easily maintained and kept in good working order.

Livestock handling facilities are necessary for

- receiving and dispatching cattle
- moving cattle for various reasons – drafting, weighing, pen cleaning, pen maintenance
- performing routine health and management procedures
- properly managing and restraining cattle for close observation.

Handling facilities include holding pens, alleys from pens to working areas, forcing pens, races, restraining equipment, drafting pens, electronic recording equipment, catwalks, amenities and loading ramps.

Design objectives

Livestock handling systems should be designed and constructed to ensure that they

- incorporate the principles of cattle behaviour and low stress handling
- facilitate good livestock flow around the feedlot and within individual facilities
- maintain a high level of animal welfare and comfort, thus reducing injuries and stress
- provide a safe and efficient workplace
- can manage biosecurity and emergency animal disease incursions or outbreaks
- allow for any potential expansion.

Mandatory requirements

Compliance with

- Australian Animal Standards and Guidelines for Cattle (DAFF, 2013)
- Australian Animal Welfare Standards and Guidelines for Land Transport of Livestock (Animal Health Australia, 2012)
- National Guidelines for Beef Cattle Feedlots in Australia (MLA, 2012a)
- National Beef Cattle Feedlot Environmental Code of Practice (MLA, 2012b)
- NFAS standards (AUS-MEAT, 2014).

Design choices

Regardless of the size of a feedlot, a number of common functional elements are contained within a livestock handling system. Figure 1 provides a conceptual representation of the relationships and structure between the various elements of a livestock handling system.

Components

Receival and dispatch

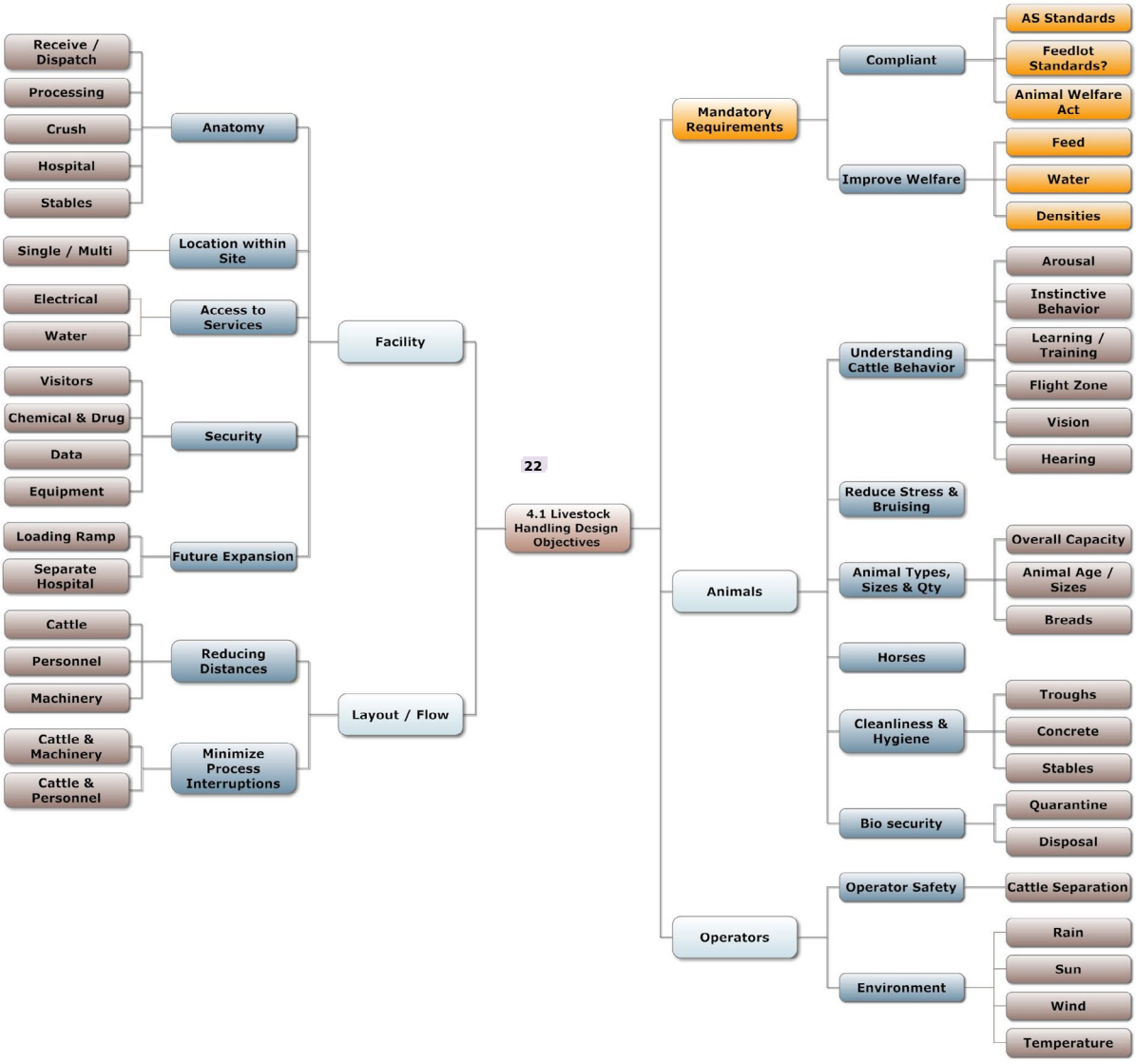


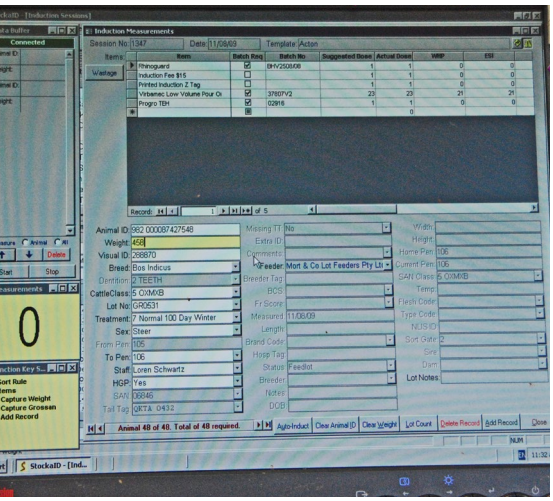
Figure 1. Conceptual representation of livestock handling system design factors

Receival and dispatch facilities allow for the efficient unloading and loading of cattle. They hold cattle on entry after unloading and before processing, or on exit after processing and before loading.

The receival and dispatch facilities may include holding pens, races to loading ramps, loading ramps and catwalks. Larger feedlots may have separate receival and dispatch facilities.

The components of receival and dispatch facilities are outlined in *Section 22 – Receival and dispatch facilities.*

Receival and dispatch facilities for loading and unloading of cattle.



Traceability, health and performance – through information about individual animals recorded on electronic data management systems during processing.

Processing facility at a small feedlot.

Processing facility

The processing facility undertakes activities associated with the induction of cattle into the feedlot, drafting of cattle already in the feedlot, or the exit of finished cattle from the feedlot.

Operations performed within the processing facility can be broadly grouped under traceability, health and welfare and performance.

The components of processing facilities are described in detail in *Section 23, Section 24* and *Section 25*.

Hospital facility

Sick or injured animals are removed promptly from production pens and treated, then placed in pens referred to as recovery, sick, treatment, convalescence or salvage pens. Animals are returned to production pens once they recover (or they may exit the feedlot as salvage cattle).

Larger feedlots generally provide an independent hospital facility, but the processing facility may serve this purpose in smaller feedlots.

The number of hospital and associated treatment pens needed depends on the feedlot size, layout, risk profile and preferred method for managing sick animals. The components of hospital facilities are described in *Section 36*.

Stables

Horses are used in most feedlots for pen riding (daily cattle observations) and for moving cattle around. Facilities for stabling and paddocking these horses should ensure their health and welfare.

The components of stable facilities are described in *Section 37*.

Location within site

The location of the livestock handling facilities within the overall feedlot site layout should allow for

- access for livestock transport vehicles (see *Section 13*)
- access to services (see *Section 3* and *Section 8*)
- good drainage (see *Section 10*)
- access for machinery for cleaning or emergencies (see *Sections 9* and *13*)
- security and biosecurity (see *Section 26*)
- proximity to production pens (see *Section 2*)
- traffic flow patterns (see *Section 2*)
- operational integration (see *Section 2*)
- future expansion (see *Section 1*).

Sometimes more than one set of livestock handling facilities may be needed.

A process flow diagram of livestock handling at a feedlot is shown in Figure 2.

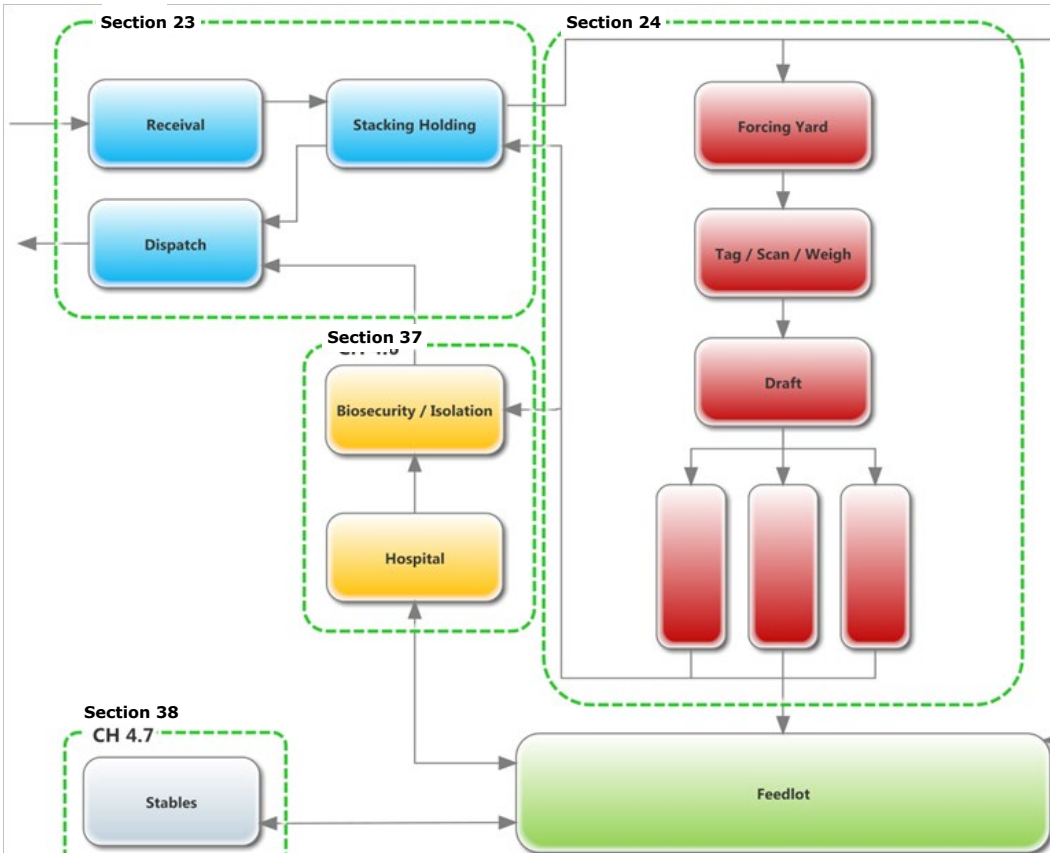


Figure 2. Livestock handling process flow diagram

Access to services

Services needed in the livestock handling facilities include electricity, water, data connections to office/internet, mobile phone coverage, drainage and product storage.

Security

Security needs to be considered for cattle, visitors (See *Section 26*), veterinary chemicals (See *Section 39*), data, equipment and against theft.

Good lighting is needed for unloading and loading livestock during the night, as is security lighting and lockable gates in the livestock handling area. However, lighting should not throw sharp contrast between light and shadow.

Restricted areas should be distinctly signed and visitors should be given workplace health and safety (WH&S) instructions before entering livestock handling facilities and supplied with relevant safety equipment.

Computers for access to feedlot data should be password protected and placed in a lockable cabinet to prevent tampering or theft. Locks for all powered equipment will prevent unauthorised use.

Cattle theft should be discouraged at every opportunity by installing lockable access gates and roadways.

Processing facilities should be designed to minimise stress for cattle and handlers.

Protection from the sun and weather reduces stress on workers and improves their cattle handling performance.

Future expansion

Potential future expansion is easier to include in the initial planning stage of a new feedlot than after construction has started or is completed. Expansion may include new handling and processing facilities.

The following upgrades may need to be considered sometime in the future

- separating the hospital treatment area from the induction area
- increasing the number of loading or unloading ramps
- separate loading and unloading areas
- addition of pens sized to hold one transport load of dispatch cattle – for double deck, B-double or road train
- addition of a cattle wash facility.

Reducing distances

An important element to any feedlot layout design is the distance travelled by animals, people, plant and machinery to each process. Some of these may be more critical in terms of safety and efficiency, for example, injured or sick cattle are not able to travel as far or fast as a feed delivery vehicle. Similarly, heavy finished cattle should walk only short distances and preferably downhill when being marshalled for load out.

Minimising process interruptions

Layouts also need to consider animal, people and machinery process paths and operation times; for example, a feed road should not cross the main cattle lane into a processing facility (see *Section 2 – Site layout*).

Understanding cattle behaviour

Professional handling of livestock in a feedlot requires knowledge of cattle behaviour and access to good facilities. Some aspects of cattle behaviour directly affect how cattle handling facilities should be designed.

Stress-free cattle will keep eating and gaining weight.

Facility designers and cattle handlers should understand the principles of cattle behaviour; this will help to reduce stress to the cattle and handlers, optimise the flow of the cattle and operational efficiency while lowering the risk of injury.

Stress

Stress reduces the ability of the animal to fight disease, limits weight gain, affects carcase value and ultimately meat eating quality.

The degree of stress is determined by three major factors – amount of contact with people, quality of handling and genetics of the cattle. Frequent, gentle handling will reduce stress. *Bos indicus* and *Bos indicus*-cross animals are more sensitive (temperamental) than British or European breeds.

Cattle, because of their size, strength, speed and potential for aggression, need to be handled thoughtfully and with confidence. The most important aspect of handling any animal is to be able to recognise and interpret its reactions. The animal's 'body language' will indicate its probable actions.

Cattle have good memories and an animal's previous experiences will affect its reaction to handling. Animals that have been handled roughly will be more stressed and difficult to handle in the future; those that are handled gently and have become accustomed to handling procedures will exhibit little stress when handled.

Principles of handling

A number of basic behavioural principles of cattle handling are based on how cattle perceive their world. The following is a list of handling principles that can improve the ease of handling cattle.

Arousal

The basic principle is to avoid getting the animal excited. Highly agitated animals are more likely to make sudden violent movements and behave in a self-protective way either by running away (flight) or fighting back (fight). Cattle can become excited in just a few seconds, but it can take 20 to 30 minutes for the heart rate of severely agitated cattle to return to normal.

Normally it is desirable to keep cattle as calm as possible, but sometimes they may need to be temporarily excited for particular purposes, such as forcing lead animals through a gateway.

Dogs and electric prodders arouse animals and should never be used in the handling facilities.

The animal on the left is staring and becoming agitated. Avoid exciting cattle during handling.

Instinctive behaviour

The animal's natural instinct to escape can be used when handling cattle that have had little contact with people.

Flighty cattle may not understand the flow system of a new handling facility, but their instinctive behaviour for flight can be used so that they 'escape' to where the handler wants them to go.

Animals' instinctive behaviour must be considered when designing handling facilities.

Regular steady handling by pen riders results in quiet animals that continue feeding.

Learning/training

Cattle have good memories so their handling experiences should also be made as pleasant as possible. *Bos indicus* cattle, in particular, soon become accustomed to the way in which they are worked through handling facilities. The best procedures for working stock in handling facilities should be developed and adhered to, and be part of an overall employee training plan.

Flight zone

The flight zone can be described as the animal's personal space, and understanding this is the key to easy and quiet handling. The size of an animal's flight zone is determined by factors such as its wildness and arousal, and the angle of the handler's approach.

Cattle can be moved easily by working on the edge of the flight zone (Figure 3). When a handler penetrates the flight zone, the animal moves away; when the handler retreats from the flight zone, the animal will stop moving. The handler needs to know when and where to penetrate this zone, and when and where to retreat so that the animal moves quietly in the desired direction.

Its fast movement suggests that this animal is becoming stressed by the handler's close presence.

The handler must be close enough to the animal to make it move, but not so close as to cause it to panic and flee. If the cattle start moving too fast, the handler must retreat.

Cattle look in the direction they are about to go and the position of an animal's head will determine the way it will turn. Cattle move most effectively if they can see the handler at all times. Experienced handlers use the point of balance of an animal to move it. Looking from a side view, this means behind the shoulder; from in front, it is from the centre of the head as shown in Figure 3. An animal is best driven when the handler is situated at a 45–60° angle from a line perpendicular to an animal's shoulder.

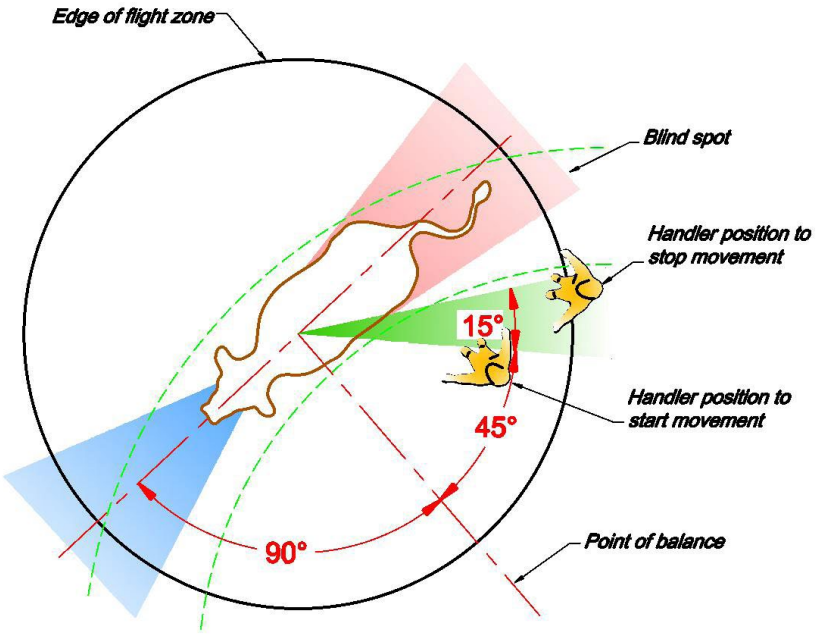


Figure 3. Flight zone of cattle

Curved races encourage steady movement of cattle. Operator safety is promoted by external walkways that separate cattle and handlers.

This same principle applies to driving mobs of cattle. A mob of cattle has a collective flight zone around the group. When the handler penetrates the zone, the mob will move.

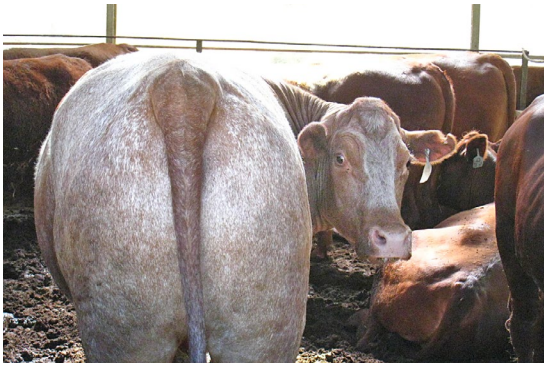
When a mob is progressing in the right direction, the handler works on the edge of the flight zone. By alternately entering and retreating from the flight zone at the optimum position of 45–60°, the handler keeps the mob moving at the desired pace.

Any change in direction of the mob, or breakouts, can be anticipated by noting the head movement of the cattle at the lead and edges of the mob.

When cattle are in an enclosed space such as a gateway, alley or forcing pen, penetrating deeply into the flight zone can result in animals panicking, jumping rails or turning back on the handler.

Cattle will normally run to a point of escape (often an entrance gate). their natural movement is in a curved direction to where they came from, thus they often tend to circle the handler in a yard. This is the principle used in curved races. The curved race encourages steady movement of cattle around the race, whereas in a straight race, cattle will often move quickly forward, baulk and then move backwards.

A curved race has a natural anti-backing effect and tends to be self-feeding. Curved races are usually used as a lead-up to crushes and/or loading ramps.



Cattle have a blind spot directly behind their body.

Vision

Cattle do not see the world as clearly and sharply focused as humans do, and they take more time to process what they have seen. Cattle have panoramic vision in excess of 300 degrees with a blind spot only directly behind their body (Figure 4).

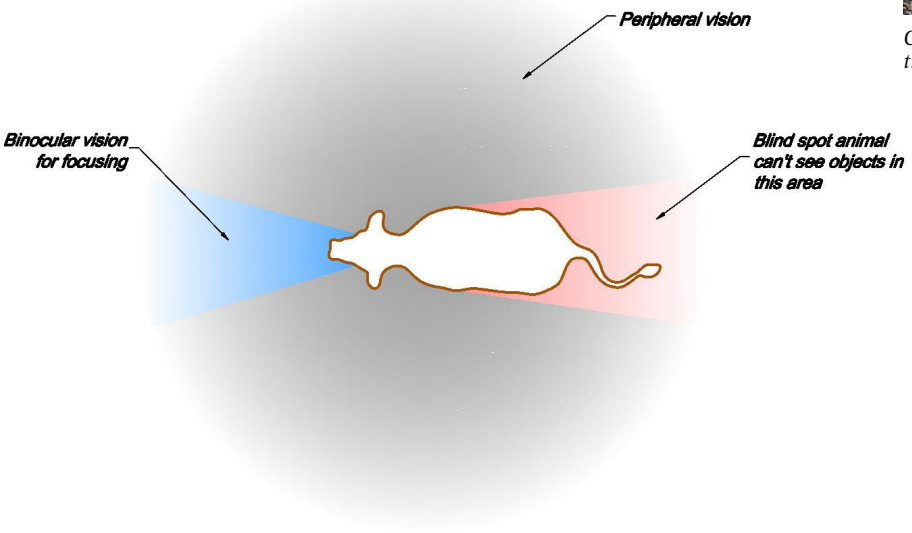


Figure 4. Cattle vision

Hence, cattle can see all around themselves without turning their heads and are often distracted by motion off to the side.

Sheeting on the sides of races, yards and the loading ramp is used to make animals focus on the exit; it eliminates baulking from visual distractions, and thus improves flow.

Cattle have poor depth perception of nearby objects and also limited vertical vision, in particular when they are moving with their heads up. Because they have only about 60 degrees of vertical vision, cattle have to stop and put their heads down to focus on something on the ground.

Because of this limited vertical vision and inability to focus quickly, cattle baulk at shadows or any strong contrast in light, and at strange objects on the ground. A dark shadow on the ground may appear to cattle as a deep crevasse.

Lighting at receival or processing facilities should not throw strong shadows or be directed straight at the advancing cattle. Cattle depend heavily on their vision and are easily motivated by fear.

Sheeting on the sides of a race eliminates baulking from visual distractions.

Hearing

Cattle can hear both lower volume and higher frequency sounds better than people. They are more sensitive to loud, high pitched noises, which induce fear. Gates in races should be designed (and lubricated) to reduce harsh metallic noise such as clanging or squeaking. Although cattle hear extremely well, they are less able to locate the source of a sound and again may take fright.

Reducing stress and bruising

An understanding of cattle behaviour combined with well designed facilities will reduce stress on both handlers and cattle. Minimising stress on cattle encourages good immune responses to infection, and acclimation to the feedlot while minimising injury and bruising.

Man gates allow handlers to exit pens rapidly and safely.

Biosecurity

Feedlot cattle sourced from diverse livestock markets or grazing properties may introduce a risk of infection and disease. The livestock handling system must ensure that any disease or problem is detected early and dealt with promptly and in isolation.

Operator safety

The best way to improving operator safety is to separate operators from the animals where possible. This can be achieved by using horses in the pens, having external walkways in the processing and crowded handling facilities, and using crushes for treatment of individual animals.

Handlers in pens should be provided with a means of rapid exit, such as man gates. Using one-direction gates, gates that can be operated from outside the animal area, or gates with appropriate safety catch mechanisms can reduce the chance of livestock forcing gates back onto handlers.

Environment

Environmental conditions such as temperature, rain, dust and wind need to be considered in the design of livestock handling facilities. See *Section 24* on buildings and structures.

A covered processing facility improves operator efficiency and animal comfort.

Ambient temperature can affect the efficiency of handling operations. Whether it is hot, cold, raining or windy, a covered processing facility helps improve operator efficiency and animal comfort. Sprinklers may need to be placed strategically to dampen down dusty facilities.

Quick tips

- Livestock handling facilities must be integrated into the overall feedlot layout.
- Good handling techniques for livestock require a knowledge of cattle behaviour and access to well designed facilities.
- Well designed handling facilities will lessen stress on cattle and operators.
- Minimise the distance travelled by animals, handlers and machinery for each process in the livestock handling system.
- Cattle have panoramic vision in excess of 300 degrees but have a blind spot directly behind the back of their head and body.
- Cattle have poor depth perception but can hear a wide range of sound frequencies, particularly high frequency sounds
- Cattle depend heavily on their vision and quick movement may motivate 'flight or fight'
- Environmental conditions affect the efficiency of handling operations.

Further reading

Blackshaw, J. (1986), Notes on some topics in applied animal behaviour, University of Queensland, St. Lucia. (*www.animalbehaviour.net*)

Herve, J. Szentleki, A. and Tozser, J. (2007), Cattle behaviour – Perceptions, relationships, studies and measurements of temperament, Animal Welfare Ethology and Housing Systems, Volume 3, Issue 1, Godollo.

Smith, B. (1998), Moving 'em: A guide to low stress animal handling, Graziers Hui, Hawaii.

Dr Temple Grandin's website: Livestock Behaviour, Design of Facilities and Humane Slaughter *(www.grandin.com)*

Bud Williams Stockmanship School (*www.stockmanship.com*)

Animal Health Australia (AHA) (2012). Australian Animal Welfare Standards and Guidelines - Land Transport of Livestock. AHA, Canberra.

AUS-MEAT, 2014, NFAS Rules & Standards (April 2014), AUS-MEAT Limited, Brisbane, Qld.

DAFF, 2013, Australian Animal Standards and Guidelines for Cattle, Department of Agriculture, Forestry and Fisheries, Australian Government, Canberra, ACT.

National Guidelines for Beef Cattle Feedlots in Australia, Meat & Livestock Australia, 2012a Sydney, NSW.

MLA, National Beef Cattle Feedlot Environmental Code of Practice. Meat & Livestock Australia, 2012b Sydney, NSW.