



FEEDLOT DESIGN AND CONSTRUCTION

22. Receiving and dispatch facilities

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Introduction

Feedlots can receive cattle from various sources and from across a wide geographical area. When cattle have reached their marketable weight or specification, they need to be transported from the feedlot to an abattoir. The process of receiving and dispatching cattle from the feedlot requires well designed cattle handling facilities.

Feedlots may have one facility which handles both the arrival and dispatch of cattle or a separate facility for each process. The decision usually depends on the size of the feedlot and the volume of cattle handled on a regular basis.

Receival and dispatch facilities are high-traffic areas for cattle, personnel and livestock transport trucks. These facilities should allow for safe, low stress ingress and egress of cattle to and from the feedlot complex while maximising worker safety. Loading and unloading cattle are some of the more stressful events of the cattle handling process, and the quality of the facilities can have a big influence on stress levels and productivity outcomes.

Requirements for any receival and dispatch facility must take into account the numbers and type of animals that are predicted to be handled, while also being flexible enough to accommodate the wide range of vehicles found in the livestock transport industry.

A receival and dispatch facility typically includes holding pens, forcing pens, races and loading ramps.

Design objectives

The receival and dispatch facilities should be designed, constructed and maintained to ensure

- a natural flow of cattle from the holding pens to the transport vehicle or vice versa
- adequate space to allow livestock trucks to comfortably manoeuvre into position for side and rear loading and unloading
- even, well-drained approaches to the load/unload ramp
- stable unloading and loading equipment
- minimised stress and bruising on cattle
- maximised cattle welfare and worker safety

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

While all receive and dispatch facility layouts are unique, the functional elements contained within each are similar and largely independent of feedlot size.

Figure 1 provides a conceptual representation of the relationships and structure between the various elements of cattle receive and dispatch facilities.

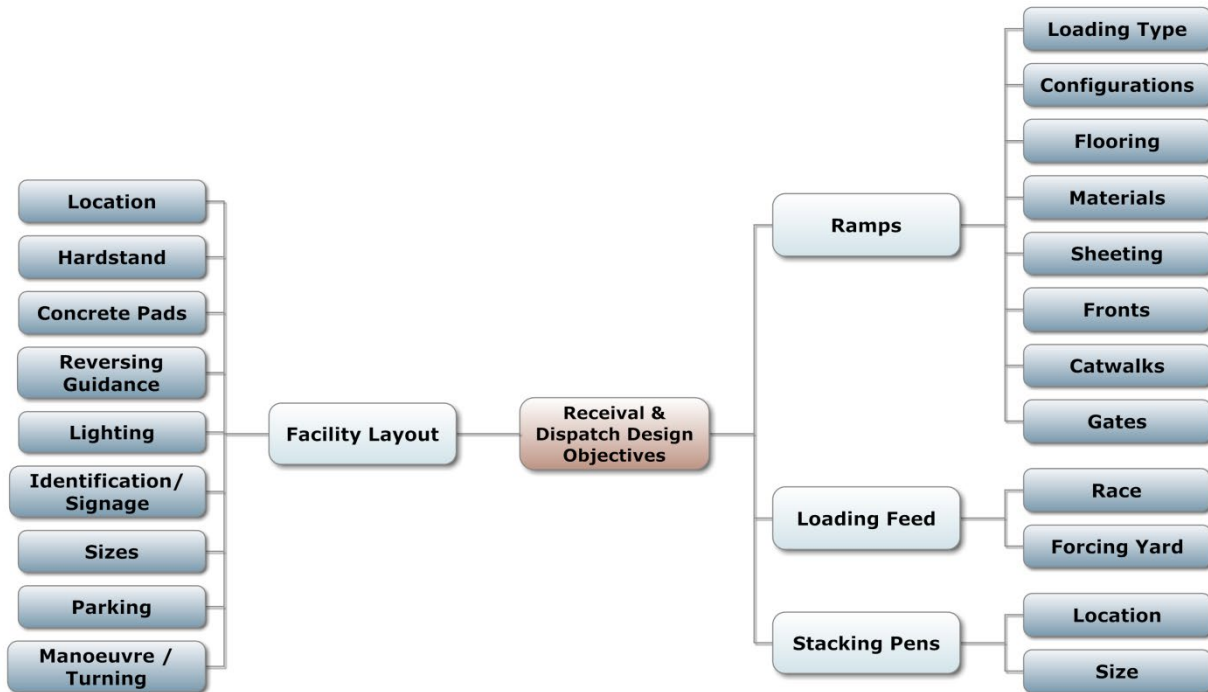


Figure 1. Conceptual representation of cattle receive and dispatch design factors

The facility layout will vary with the type of cattle (e.g. Brahman versus European, large versus small body size), number of animals to be handled, vehicle loading methods, space restrictions and personal preferences for facility layout.

The design should accommodate all the operations to be performed as efficiently and economically as possible to minimise stress on animals and operators.

Receive and dispatch facilities will include various associated components including holding pens, forcing pens, races, catwalks and loading ramps and vehicle manoeuvring areas. Some of these elements serve multiple purposes within a receive and dispatch facility and the associated processing facility.

Receive and dispatch facilities must

- be able to accommodate varying types and configurations of livestock transport vehicles expected
- be able to accommodate the type and number of cattle to be handled
- provide access to holding pens and processing facilities
- prevent injuries to and minimise stress on cattle
- prevent injuries to operators



Loading and unloading ramps

- consider the environmental conditions – rainfall, wind direction, daily temperature, shade, dust and noise
- use fence sheeting to prevent cattle baulking
- provide feed and water for unloaded cattle
- provide water for cattle to be loaded
- have lockable slide gates to prevent accidental escapes, illegal/unauthorised cattle delivery or removal, provide quarantine measures
- consider size and shape of the components
- consider vehicle traffic and cattle flow
- provide drainage
- provide non-slip surfaces
- consider access for truck drivers
- consider type of construction materials (wood, steel, concrete) against corrosion or rot
- position ramp so that the truck driver may back in with a good view from the driver's side of the vehicle. (It is almost impossible for a semi-trailer to be backed accurately to a ramp on left hand lock)
- consider the direction of sun in morning and evening; avoid walking cattle directly towards bright light (artificial or sun)
- consider lighting to avoid strong contrast between bright light and shadows
- consider cleaning – pressurised water, skid steer access
- vehicle access to deal with downer cattle.



Concrete hardstand in front of loading ramp

Location

The location of the receival and dispatch facilities within the overall site layout must provide good access for trucks and trailers and appropriate traffic flow of livestock transport vehicles. The movement of livestock vehicles must not interfere with the movement of normal feedlot vehicles.

Section 2 outlines design choices for the location of receival and dispatch facilities within the overall feedlot layout, while various factors that will influence the location are outlined in *Section 21 – Livestock handling*.

Hardstand

The hardstand is the area around the loading ramp that is used by the trucks. When rear loading is used, the area directly in front of the loading ramp should be relatively flat and well drained. A good solid hardstand will reduce future maintenance. *Sections 13 – Access and internal roads* and *17 – Pen and road surfaces* outline design choices for livestock vehicle turning areas.

Concrete pads

Concrete pads in front of the loading ramps are used for larger operations where frequent use and rain can cause ruts and erosion. These pads also help maintain the unloading height and levelness of the trailer.

The concrete pad should have a minimum area of 3.5 m in width and 5.25 m in length to accommodate the rear axle group of the trailer. The concrete pad should be 175–200 mm thick and reinforced with a mixture strength of between 25 MPa and 32 MPa to support the trailer loadings and provide durability.

Reversing guidance

Guides can aid trucks reversing. These may include painted straight lines or a row of cones on sealed roads; a concrete strip for unsealed gravel roads; timber rails or steel balustrades at ground level. Solar indicator lights can be fitted to assist at night.

Lighting

If night time loading or unloading is likely, the area should have appropriate lighting. Lighting should cover all areas including the stacking/holding pens and personnel access areas, with a number of lights to prevent shadows that can cause cattle to baulk. Lighting should not affect the truck driver's line of sight or be reflected in the reversing mirrors.

Halogen lighting with a diverse lighting pattern provides soft yet adequate light; it also minimises contrast between shadow and bright light.

Identification

If there are multiple ramps in the facility, identifying each one will help communicate the correct ramp to the truck driver. Identification commonly uses a single letter or number, but needs to be large enough to be visible from at least 100 m away.

Parking

If receiving or dispatching a large number of animals requires a number of trucks, a suitable stationing or parking area may be needed for the waiting trucks. Inadequate road space leads to congestion, trucks travelling unnecessary distances from poorly located parking areas and road safety concerns with internal feedlot traffic.

Manoeuvre/turning

Adequate room is required for turning and reversing, with the area depending on the size of the trucks and the number of trailers.

Fully-loaded livestock transport vehicles require a significant turning area to prevent road damage and cattle instability.

Floats

Horse trucks will require a loading/unloading area that has good lighting and adequate space on the ramp. Support bars and braces must be removed or be removable to prevent injury to horses during loading and unloading.

Horse floats rarely require a ramp for loading or unloading as they are low to the ground and generally have their own drop-down ramp attached. However, a tie-up area near the horse loading area is recommended.



Markers embedded into paving as a guide for reversing vehicles



Identification number on a loading ramp



Fluorescent strip lights installed over loading ramp for night loading

Loading and unloading ramps

Well designed and constructed loading facilities result in quicker, safer loading with less stress on livestock carriers, stock and owners.

Cattle need a loading dock or loading ramp between the holding pens and the livestock transport vehicle.

Docks

A loading dock has the appropriate step in ground level so that the level of the receive/dispatch pens are the same height as the floor of the livestock transport vehicle or trailer.

Loading docks are used if the topography of the site has a natural slope or easily engineered step or when the cattle yards are at the same height as the trailer deck.

In this case, the truck hardstand is usually about 1.2 m lower than the yards and a concrete retaining wall is used at the edge of the yards to provide a place for the truck to back up to. For a single deck loading, a ramp is not required and for double deck loading, only the upper deck requires a ramp. A dock reduces the need for catwalks when loading only single decks.

Ramps

A loading ramp is used to elevate cattle to the standard height of the livestock transport vehicle trailer and is the most commonly used system for loading and unloading of cattle.

Loading height will vary slightly with the type of livestock transport vehicle to be used, but is generally 1.1–1.2 metres for most body trucks and semi-trailers.

Livestock transport vehicle trailers can be loaded through the back (end load) or through the side (side load). All trailers are equipped with rear loading and those having both rear and side are becoming more common.

For rear loading, the livestock transport vehicle needs adequate distance in front of the ramp (or dock) to turn, straighten and reverse. For side loading, the livestock transport vehicle path must clear any fences, be straight when it reaches the ramp (or dock) and without a sharp turning radius. See *Section 2.4 Access and internal roads* for further information on livestock vehicle turning areas.

Baulk gates or ramp flaps should not protrude from the front of the loading/unloading ramp as they can be damaged during vehicle alignment for side loading.

Ramps are permanently located; the handling facility layout starts from the position of the loading ramp that is needed for truck access and for the type of trucks intended to be used.

As loading ramps are the most common loading system in Australian feedlots, further discussion on these follows.

Ramp configurations

Styles of ramp design include single deck, double deck and an unloading dump (fast unload).



A single deck loading dock



Single deck steel loading ramp

Single deck

The single deck ramp is the most common. Double deck trailers can still be loaded and unloaded from these using the internal ramp of the double deck trailer. However, as the internal ramp of a double deck trailer is steep, double deck ramps are recommended for larger finished animals.

A loading ramp should have a non-slip surface and be narrow, as in a race, with an minimum internal width of 710 mm so that cattle will load in single file and cannot turn back.

At the top of the ramp, a level platform about 2–3 m long will allow cattle to balance and gain more confidence to move onto the different flooring material of the trailer.

A slight curve or deviation in ramp direction will utilise natural stock movement principles and improve the animals' willingness to move up and down the ramp.

Loading is easiest with a slope of about 20 degrees; this is derived from the best length of an animal's stride being 450 mm with a rise of no more than 100 mm. Ramps steeper than 20 degrees will generally inhibit stock flow.

Stock will generally flow well with a gentle stepped ramp of around six metres in length to reach the standard 1.2 metre loading height.

Adjustable ramps

Adjustable ramps allow their height to match that of the trailer as trailer suspension and body type can vary. A small step between trailer and ramp is acceptable as the ramps themselves can be stepped types, but there should not be a gap between trailer and ramp where an animal can get a leg caught. Some single adjustable ramps can be raised or lowered between upper and lower decks; these act like the trailer's internal ramp but provide a lower degree of slope, better footing and a less stressful approach into the stock crate. Alternatively, a hinged drop-down plate can be used to span between the ramp and the truck.

Double deck

For larger operations with more or larger cattle, a double deck ramp can reduce loading and unloading time by not having to use the internal ramp of a double deck trailer. The top and bottom decks can be loaded simultaneously by alternating groups of cattle from the dispatch pens.

Unloading dumps

For unloading only, a truck-width ramp like that used for unloading machinery can be used. These ramps are often termed unloading dumps, dump ramps or wide unloading ramps. The unloading dump helps reduce unloading time and is normally constructed alongside a narrower loading ramp sharing a common fence.

The unloading dump improves animal welfare with less stress on cattle and truck driver due to the ease and speed of unloading.



Adjustable steel ramp for access to double deck livestock vehicles. Note the adjustable batwing gates on the top deck platform.



Double deck steel ramp for loading livestock transport vehicle. The front of the ramp has batwing gates and a short platform.



Double deck ramp – side loading of livestock transport vehicle



Unloading dump



Concrete ramp with steps with pattern stamped into concrete to provide a non-slip surface.



Spring-loaded front with D-mould rubber for cushioning impact.

Flooring

The loading ramp should have a slope of no more than 20 degrees with a floor of concrete, steel or timber; timber or steel floors are more susceptible to rot or corrosion.

Ramp floors should give good grip, be easy to walk on, not flexible and bouncy, and should not resonate or create undue noise. Anti-slipping techniques may include cleats on wooden, steel or flat concrete floors or grooved concrete. See *Section 24 – Buildings over processing facilities* for more information on grooves in concrete flooring.

Concrete floors may be suspended and poured on site with steps/grooves pressed in when pouring. Concrete provides a strong stable footing with no noise. Steel floors should not move or buckle under weight and animals should not be able to see through ramp floors.

If cleats are used, they should be 300 mm apart and protrude at least 40 mm for a ramp slope of 1 in 5, or higher for steeper slopes. Where side sheeting is not used or does not extend to the floor, the cleats should extend beyond the width of the ramp by about 100 mm on both sides.

Sheeted flooring should have drainage to minimise the build up of manure, dirt and moisture.

Soft flooring such as rubber matting may be used. See *Section 24 – Buildings over processing facilities* for more information on soft flooring.

The best floor for the wider dump ramp is a non-slip grooved concrete base poured on site before the rest of the ramp is constructed. This would include associated infrastructure such as personnel access paths on the outside.

Materials

Any combination of materials can be used in the construction of the facility, the choice depending on local availability of materials and budget constraints. The key design criteria will be to balance strength, durability and cost.

The main material used for panels in yards is steel. Steel products are available in various profiles e.g. round pipe, oval pipe, square section (RHS), rope, cable and sheeting, and various surface finishes (e.g. painted steel, galvanised, stainless).

There should be no protrusions or sharp edges in materials and finishes.

Timber and concrete are less frequently used now. Good quality timber is becoming expensive and can still suffer from rot and splintering. Concrete rails will not rust or rot but they are susceptible to breakage from impact either from cattle or cleaning machinery, and cannot be repaired.

Sheeting

Sheeting the sides of the forcing pen, lead-up race and the loading ramp makes animals focus on the exit, eliminates baulking from visual distractions and thus improves flow. Cattle are generally calmer and easier to manage up the loading ramp. Some ramps incorporate a mid-slot in the sheeting, which may be only at the

flat sections of the ramp to allow handlers on the ground to see the movement of cattle in the ramp. Sheeted ramp sides prevent cattle getting legs caught.

Sheeting materials include sheet metal, rubber belting or form ply. Sheeting is typically 1200 mm in height.

Fronts and buffers

Fronts may be fixed, pivoting or spring-loaded. Fixed fronts commonly use timber or D-mould rubber buffers against which the truck backs. A horizontally-pivoting front allows minor out-of-alignment of the trailer to the ramp, preventing a gap. The spring-loaded front also accounts for minor out-of-alignment as well as small variations in distance from the ramp; this is useful in double loading ramps where the hardstand in front of the ramp is not exactly level. A spring-loaded front helps take up any gap at either the upper deck and ramp or lower deck and ramp.

Fronts can also have a short hinged platform mounted to the loading ramp; this platform drops down to cover the gap between the truck and ramp. Short panels (called batwings) are fitted to block off the gaps at the two sides between the truck and the ramp. Batwings can be as a fixed panel or a swinging gate; they are also used when side loading and the trailers side loading gates can be chained open to them.

A flexible buffer on the front of any ramp will protect both the ramp and the livestock transport vehicle trailer from damage. The buffer should also adjust to the angle of the livestock transport vehicle to ensure that there are no spaces where the cattle can fall or break a leg. Buffers may include simple small vertical gates on either side to block the gap.

Catwalks

Raised walkways (catwalks) fitted to the ramp provide operators with safe access to cattle without having to climb fences. Catwalks can be located down one or both sides of loading ramps and along holding pens.

For safety requirements, catwalks should have a non-slip surface and be fitted with handrails to Australian standards.

Gates

Gates throughout the receipt and dispatch facilities provide access for cattle, handlers, truck drivers and machinery. Operator safety is also a major priority, allowing quick and easy access in and out of the forcing pen, lead-up race and ramp.

Design considerations for cattle and machinery gates are outlined in *Section 23 - Cattle processing*.

The truck driver needs access along the side of the vehicle for opening and closing both rear and baffle trailer gates. If an elevated walkway cannot be provided, a simple elevated rail would enable the driver to attach a safety harness. Truck driver access doors (about 800 mm wide) should only swing inwards to prevent personnel injury.



D-mould rubber front for cushioning impact, and slide gates behind the batwing gates.



Personnel catwalk along side of the loading ramp.



Swing out (batwing) gates and fully sheeted lead-up race and loading ramp.



WH&S inclusions on a loading facility sign, with railing and handrails on stairs for operator access



A gantry over parking area for a double deck livestock transport vehicle. Truck drivers would be attached via harness to the gantry for safe working on the top deck of the vehicle

Other design considerations are sliding/stop gates. Slide gates can be located either at the top or bottom of the ramp, preferably at the top with a double ramp. These slide gates also protect the truck driver when opening or shutting the tail gate; once the truck's tail gate is open, the slide gate can be opened from the ramp's catwalk.

For a dump ramp, a surging gate can be used at the bottom as it is too wide for a slide gate.

Lockable gates need to be considered to prevent illegal or unauthorised stock deliveries and removals and for quarantine measures.

The position of the loading ramp should not interfere with the functions of gates, races and other existing facilities.

Feeds to loading ramps

Race

The race leading up to the loading ramp is an essential part of the overall loading facility. It should hold the animals in single file and should be 680–760 mm internal width, depending on the size of the animals to be loaded out or unloaded.

A race in a receival or dispatch facility will have the same design principles as races in other on-site cattle handling facilities (e.g. processing, hospital). Further design detail on races can be found in *Section 23 - Cattle processing*.

A curved race encourages steady movement of cattle around the race whereas in a straight race, cattle will often move quickly forward, baulk and then try to move backwards. A curved race has a natural anti-backing effect and tends to be self-feeding.

A catwalk may be added to the race to elevate the operator to the right height to access cattle if persuasion is required to move cattle onto transport vehicles. This separation is desirable from a safety and operational perspective.

Forcing yards

Forcing yards offer a safe method with which to feed the races. More information on forcing yards and their operation can be found in *Section 23 - Cattle processing*.

Stacking pens

The receival and dispatch facility requires pens to hold the cattle after unloading and before loading.

These holding pens must be large enough to hold the largest group of animals required for handling as a batch, and lead directly into the forcing pen and race or loading ramp. These pens may serve for sorting cattle into dispatch lots, groups and/or quarantine pens for newly arrived cattle.

The size of the holding pens will be based on the number of cattle being worked. Each animal requires around 1.8 m² of space within the holding pen.

The pen must allow incoming cattle access to feed and water and outgoing cattle access to water.

If the cattle to be handled are originating from separate groups, it may be necessary to be able to subdivide the holding pen. Several pens should be built into the dispatch facilities to break cattle into livestock transport vehicle deck/pen sizes, rather than having one large pen for all animals. This makes loading safer and more manageable.

The race leading up to the loading ramp is an essential component of the overall loading facility.

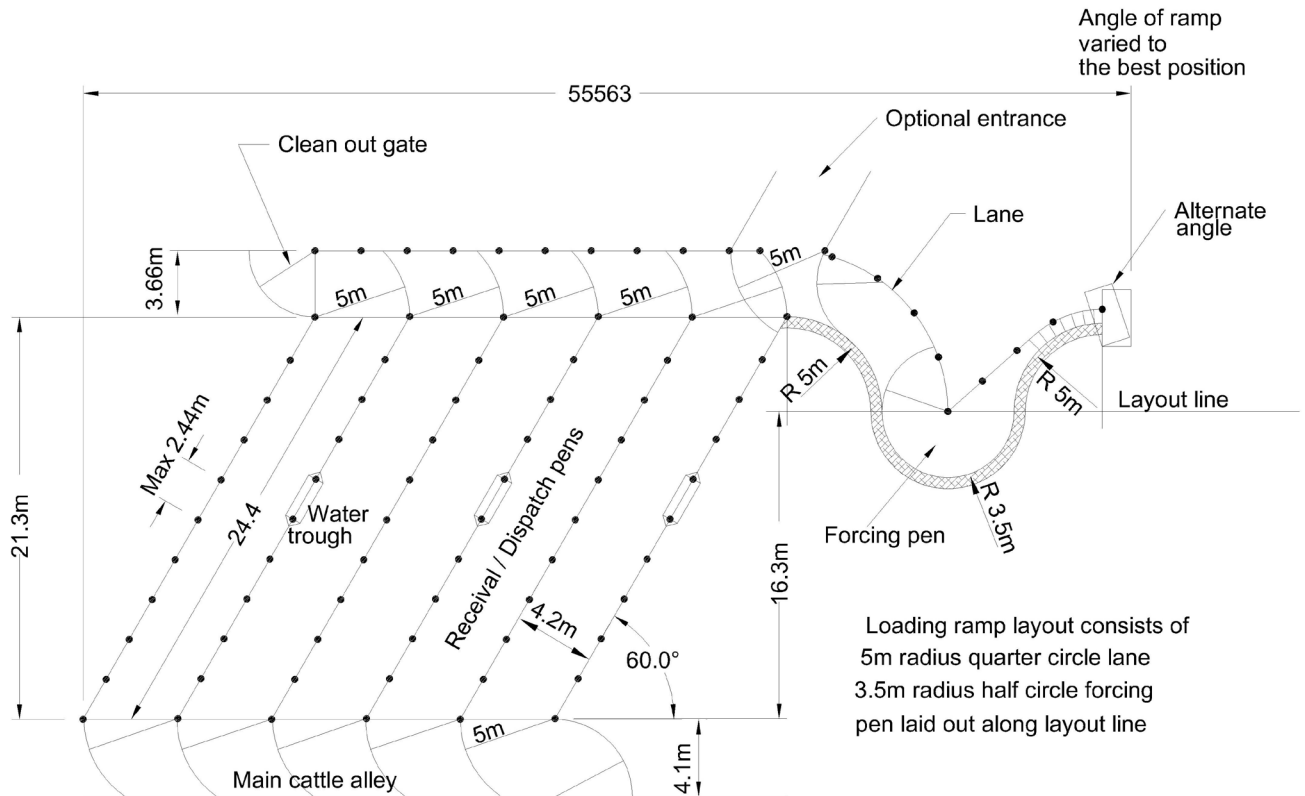


Figure 2. Layout of herringbone stacking pens

NFAS Standards provide minimum space allowances for transporting cattle of different weights (Table 1). This allows for the determination of the maximum number of cattle that can fit in the different types of trucks for transport to the abattoir (Table 2).

Table 1. Livestock loading densities

| Mean liveweight (kg) | Minimum floor area (m ² /head) standing | Number of head per 12.2 m × 2.4 m deck |
|----------------------|--|--|
| 250 | 0.77 | 38 |
| 300 | 0.86 | 34 |
| 350 | 0.98 | 30 |
| 400 | 1.05 | 28 |
| 450 | 1.13 | 26 |
| 500 | 1.23 | 24 |
| 550 | 1.34 | 22 |
| 600 | 1.47 | 20 |
| 650 | 1.63 | 18 |
| 700 | 1.78 | 16 |
| 750 | 1.94 | 14 |
| 800 | 2.13 | 12 |



Stacking pens to hold cattle after unloading and before loading.

Table 2. Number of animals eligible for transport at different weights using different truck types

| Truck type | Table top 1 deck | Semi- trailer 1 deck | Semi- trailer 2 decks | B double 3 decks | B Triple 5 decks | Road train 4 decks | Road train 6 decks |
|---------------------------------|---------------------|-------------------------|--------------------------|---------------------|---------------------|-----------------------|-----------------------|
| Floor area (m ²) | 14.6 | 29.3 | 58.5 | 87.8 | 146.3 | 117.0 | 175.6 |
| Animal liveweight (kg) | Number of animals | | | | | | |
| 250 | 19 | 38 | 76 | 114 | 190 | 152 | 228 |
| 300 | 17 | 34 | 68 | 102 | 170 | 136 | 204 |
| 350 | 15 | 30 | 60 | 90 | 150 | 119 | 179 |
| 400 | 14 | 28 | 56 | 84 | 140 | 111 | 167 |
| 450 | 13 | 26 | 52 | 78 | 130 | 104 | 155 |
| 500 | 12 | 24 | 48 | 71 | 120 | 95 | 143 |
| 550 | 11 | 22 | 44 | 66 | 110 | 87 | 131 |
| 600 | 10 | 20 | 40 | 60 | 100 | 80 | 119 |
| 650 | 9 | 18 | 36 | 54 | 90 | 72 | 108 |
| 700 | 8 | 16 | 33 | 49 | 80 | 66 | 99 |
| 750 | 8 | 15 | 30 | 45 | 75 | 60 | 90 |
| 800 | 7 | 14 | 28 | 41 | 70 | 55 | 83 |

Quick tips

- The receival and dispatch facility should be designed to provide a fast and efficient way to load and unload cattle on and off livestock transport trucks while providing a safe working environment for handlers and cattle.
- The functional elements contained within receival and dispatch facilities are largely independent of feedlot size.
- Poorly designed or maintained facilities can lead to confusion, stress and injury to both cattle and handlers.
- The basic element of facility design is to encourage good stock flow.
- Access and traffic flow of livestock transport vehicles are important when selecting the location of the receival and dispatch facility in the overall site layout.
- A firm and level pad in front of the loading ramps should be maintained to ensure an even unloading height and levelness of the trailer.
- Appropriate lights should be installed to prevent shadows, light blinding and bright spots which can spook or balk the cattle.
- A slight curve or deviation in ramp direction will utilise natural stock movement principles and improve the animals' willingness to move up the ramp.
- Ramp floors need to provide good grip, be easy to walk on, should not be slippery and should not resonate or create undue noise.
- Sheeting the sides of the lead up race and the loading ramp eliminates baulking from visual distractions, thus improving flow and preventing legs from getting caught.

Further reading

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